INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Interwest Mining Company
Huntington Office
P. O. Box 310
15 North Main Street
Huntington, UT 84528

December 3, 2018
Submitted Electronically

C/015/0018
C/015/0019
Received 12/5/18
Task #5831

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

Subj: Submittal of Supplemental Volume 3, 18 Lease Relinquishments, November 7, 2018, PacifiCorp, Deer Creek Mine, C/015/0018, and Cottonwood Mine, C/015/0019, Emery County Utah.

PacifiCorp, by and through its wholly-owned subsidiary, Interwest Mining Company, as mine manager, hereby notifies the Division that PacifiCorp has relinquished the following Federal Leases as of November 7, 2018. These leases are associated with the Deer Creek and Cottonwood Mines and comprised the East Mountain Logical Mining Unit (UTU-73336). Lease relinquishment documents for the following Federal Leases were submitted to the Bureau of Land Management (BLM) on November 7, 2018.

UTU-06039	Partial Relinquishment
UTU-024317	Full Relinquishment
UTSL-051221	Partial Relinquishment
UTU-2810	Full Relinquishment
UTSL-050862	Partial Relinquishment
UTU-014275	Full Relinquishment
UTU-024319	Full Relinquishment
UTU-47977	Full Relinquishment
UTU-084923	Full Relinquishment
UTU-084924	Full Relinquishment
UTU-47979	Full Relinquishment
UTSL-070645-02292	Full Relinquishment
UTSL-064607-064621	Partial Relinquishment
UTU-083066	Full Relinquishment
UTU-040151	Partial Relinquishment
UTU-1358	Full Relinquishment
UTSL-064900	Partial Relinquishment
UTU-47978	Full Relinquishment

The remaining un-relinquished portions of the partially relinquished leases contain the disturbed surface areas of the Deer Creek and Cottonwood mine sites. These areas are retained so that Interwest/PacifiCorp will have right-of-entry to the disturbed areas for reclamation. All leases listed fall within the Deer Creek Mine permit area except for UTU-47978, which is entirely within the Cottonwood Mine permit area. Leases UTU-083066, UTU-040151, UTU-1358, and UTSL-064900 are in both permit areas.

Federal Lease UTU-044025, entirely within the Cottonwood Mine permit area, that contains the majority of the Cottonwood Mine portal and disturbed area, will be retained in full and is not referred to in the Supplemental Volumes.

Federal Leases UTU-88554 and UTU-84285 have already been relinquished; this information was submitted in separate volumes in June, 2018. Electronic copies (.pdf files) of these two relinquishments were submitted electronically by e-mail at that time. Electronic versions of the 18 relinquishments submitted in this volume are included on CD-ROM with the volume. In the CD-ROM, each relinquishment is a separate .pdf file of approximately 50 - 150 pages.

Copies of the lease relinquishment documents are hereby submitted to the Utah Division of Oil, Gas, and Mining as supplemental information in the form of Supplemental Volume 3, Lease Relinquishments, 18 Federal Coal Leases. Please date stamp each copy and return one copy to Interwest Mining. In the electronic version, each relinquishment is a separate .pdf file of approximately 50 - 150 pages.

If you have any questions or concerns regarding this notification, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Enclosures – Supplemental Volume – paper copy and CD

Cc: Chuck Semborski, IMC
Dennis Oakley, IMC
Scott Child, IMC
file

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: PacifiCorp

Mine: Deer Creek Mine, Cottonwood Mine **Permit Number:** C/015/0018, 0019

Title: Amendment to Add Supplemental Volume, 18 Lease Relinquishments, PacifiCorp Deer Creek Mine C/015/0018, Cottonwood Mine C/015/0019 Emery County, Utah

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

Copies of Federal Lease Relinquishments Submitted to BLM Dated November 7, 2018 for Reference Purposes

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

☐ Yes ☒ No 1. Change in the size of the Permit Area? Acres: _____ ☐ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes ☒ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # _____
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☐ Yes ☒ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes ☒ No 15. Does the application require or include soil removal, storage or placement?
☐ Yes ☒ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes ☒ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes ☒ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☒ Yes ☐ No 19. Does the application require or include certified designs, maps or calculation?
☒ Yes ☐ No 20. Does the application require or include subsidence control or monitoring?
☐ Yes ☒ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

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

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

Kenneth Fleck — Print Name

Kenneth S. Fleck — Sign Name, Position, Date — Manager of Environmental Affairs DEC. 3, 2018

Subscribed and sworn to before me this 3rd day of December, 2018

Miranda Lofley — Notary Public

My commission Expires: 03-26, 2022

Attest: State of Utah } ss:
County of Emery

MIRANDA LOFLEY
NOTARY PUBLIC
STATE OF UTAH
COMMISSION # 699728
COMM. EXP. 03/26/2022

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining

Form DOGM- C1 (Revised March 12, 2002)

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

Permittee: PacifiCorp
Mine: Deer Creek Mine, Cottonwood Mine **Permit Number:** C/015/0018, 0019
Title: Amendment to Add Supplemental Volume, 18 Lease Relinquishments, PacifiCorp Deer Creek Mine C/015/0018, Cottonwood Mine C/015/0019, Emery County, Utah)

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	Supplemental Volume, Lease Relinquishments, PacifiCorp Deer Creek Mine C/015/0018, Cottonwood Mine C/015/0019, Emery County, Utah.
☐ Add	☐ Replace	☐ Remove	
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Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	**Received by Oil, Gas & Mining**
This is a new volume of supplemental information related to partial and full relinquishments of 18 Federal Leases in the East Mountain LMU UTU-73336 for reference purposes.	

Full Relinquishment
Federal Coal Lease
UTU-47977

November, 2018

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Prepared by:

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-47977, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-47977 The total acreage being surrendered is 640.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTU-47977 is described below:

Federal Coal Lease UTU-47977		
Lease Readjustment Effective Date:		10/1/2012 to 10/1/2022
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**640.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 32:	All	640.00
	Total Lease Acres for Full Relinquishment:	**640.00**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

SMC\Interwest\UTBLM2018-10(UTU-47977FullRelinq).docx

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47977

LEASE ACTIVITIES

1) Coal Lease Number: UTU-47977 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 640.00; Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of area relinquished. No areas retained. See also Figure 1 (a map depicting the area to be relinquished in its entirety).*

Original Lease Acreage: 640.00 Relinquished to date: 0.00 acres Remaining: 640.00 acres

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)?
YES ☐ NO ☒ (If "YES", describe:

11) Date of initial mining: May 1993; last mining: April 1999.

12) Number of coal beds mined: 1 coal seam (Blind Canyon)

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47977

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to hydrographs*

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47977

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
   - *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities? YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐ (If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

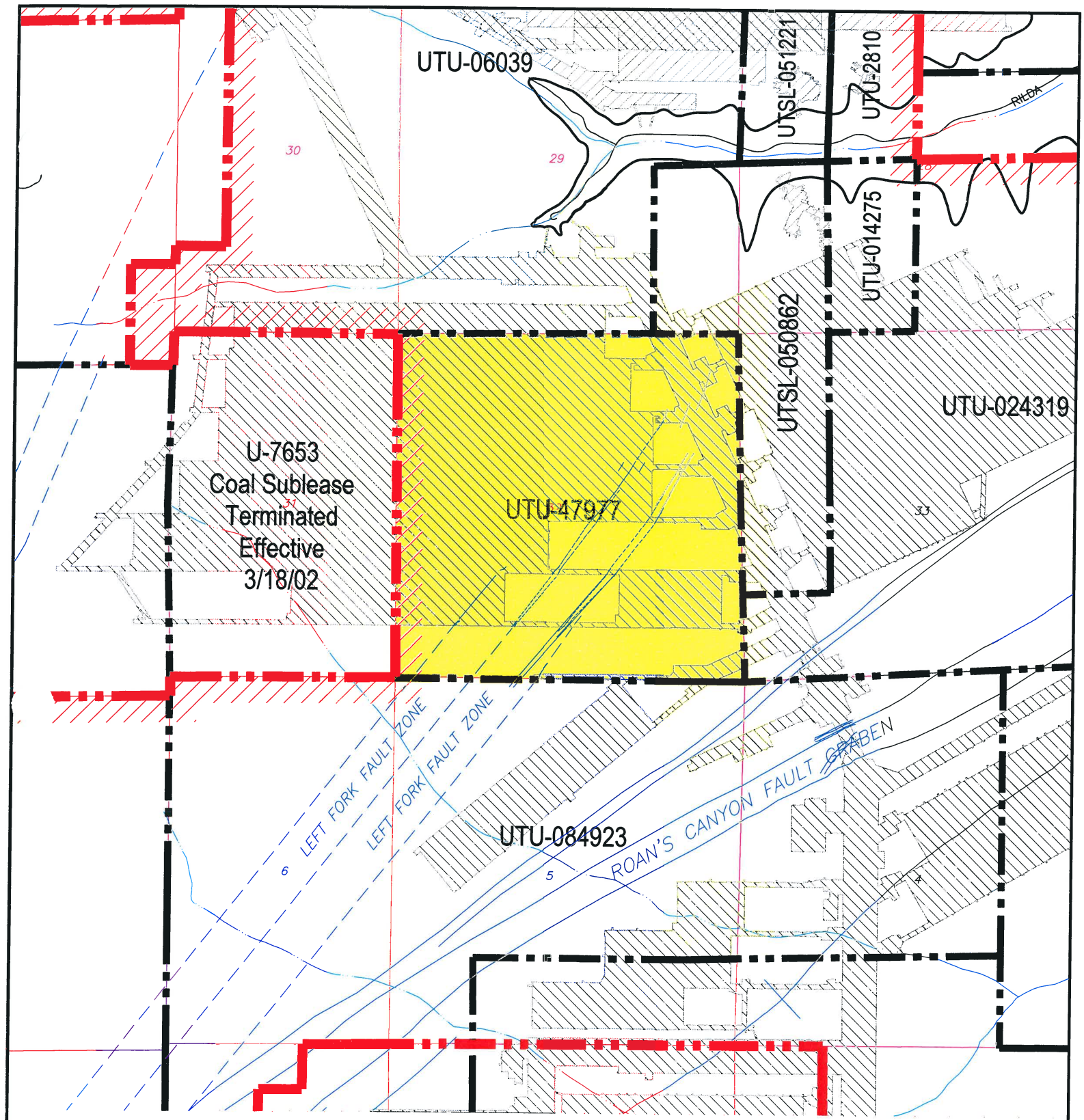
Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47977

Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTU-47977 is described below:

Federal Coal Lease UTU-47977		
Lease Readjustment Effective Date:		10/1/2012 to 10/1/2022
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**640.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 32:	All	640.00
	Total Lease Acres for Full Relinquishment:	**640.00**
	Total Lease Acres Remaining:	**0.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

CAD FILE NAME/DISK#: UTU-47977

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47977

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTU-47977
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-47977 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Blind Canyon seam. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam took place between 5/1993 and 4/1999.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In

steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the East Mountain Area were collected in 1980. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

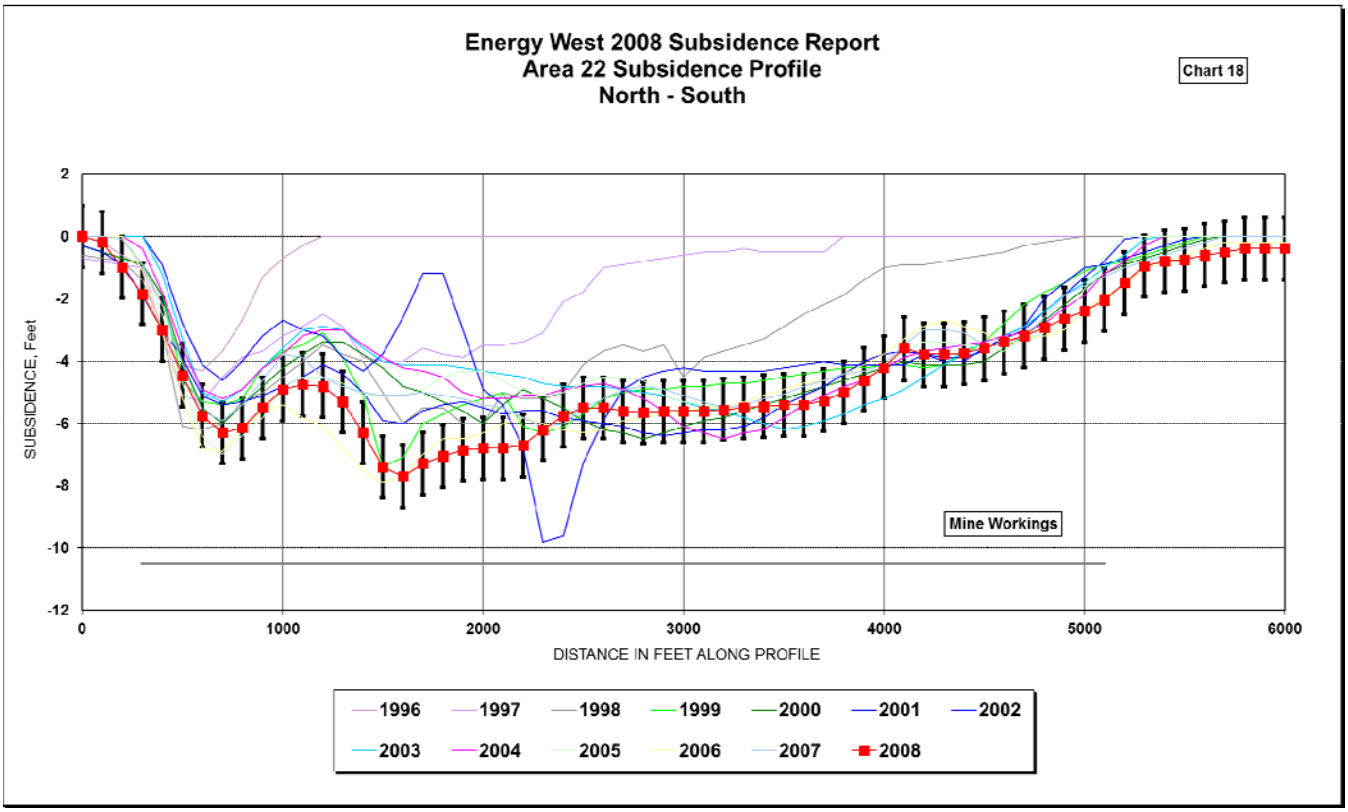
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

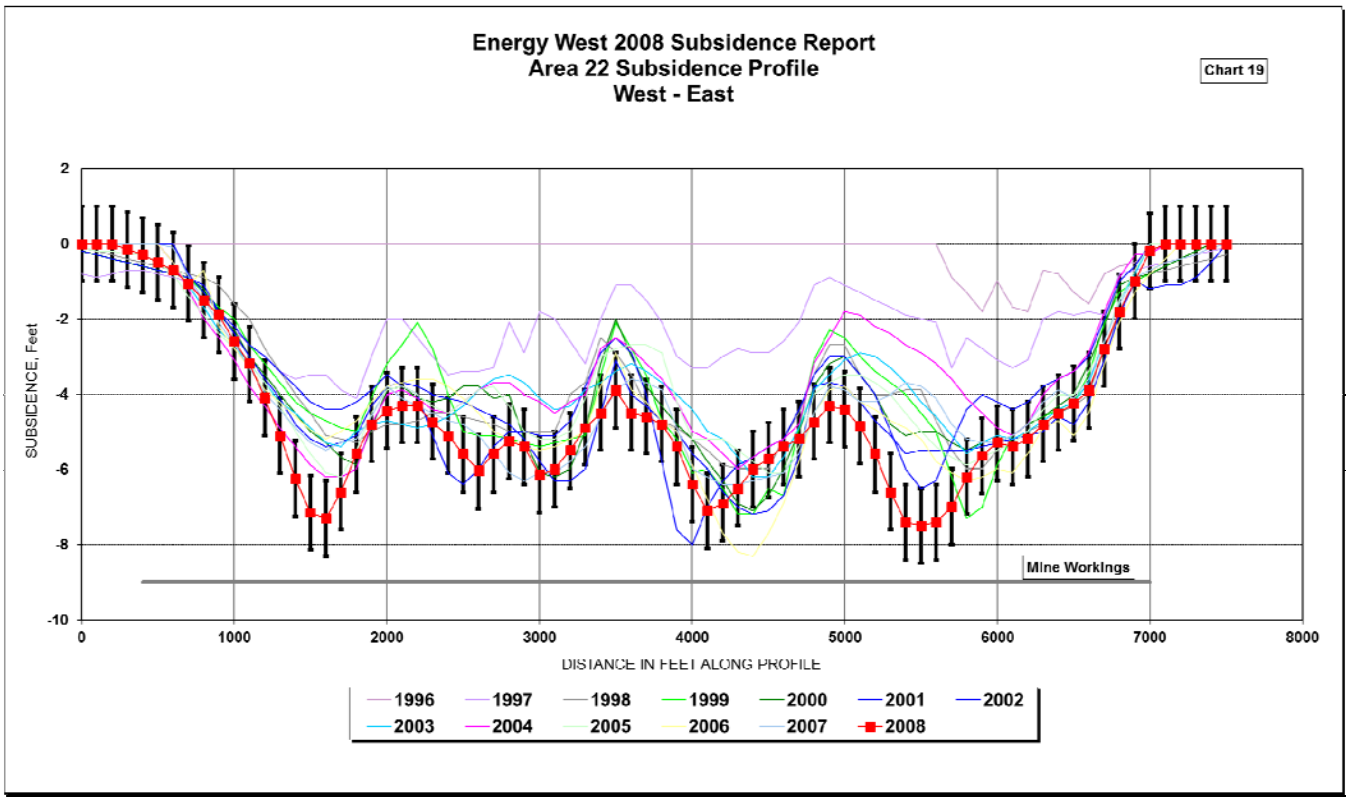
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-47977 Subsidence Data

Subsidence in the lease UTU-47977 area was monitored from 1996 to 2008. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1996 and 2008. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

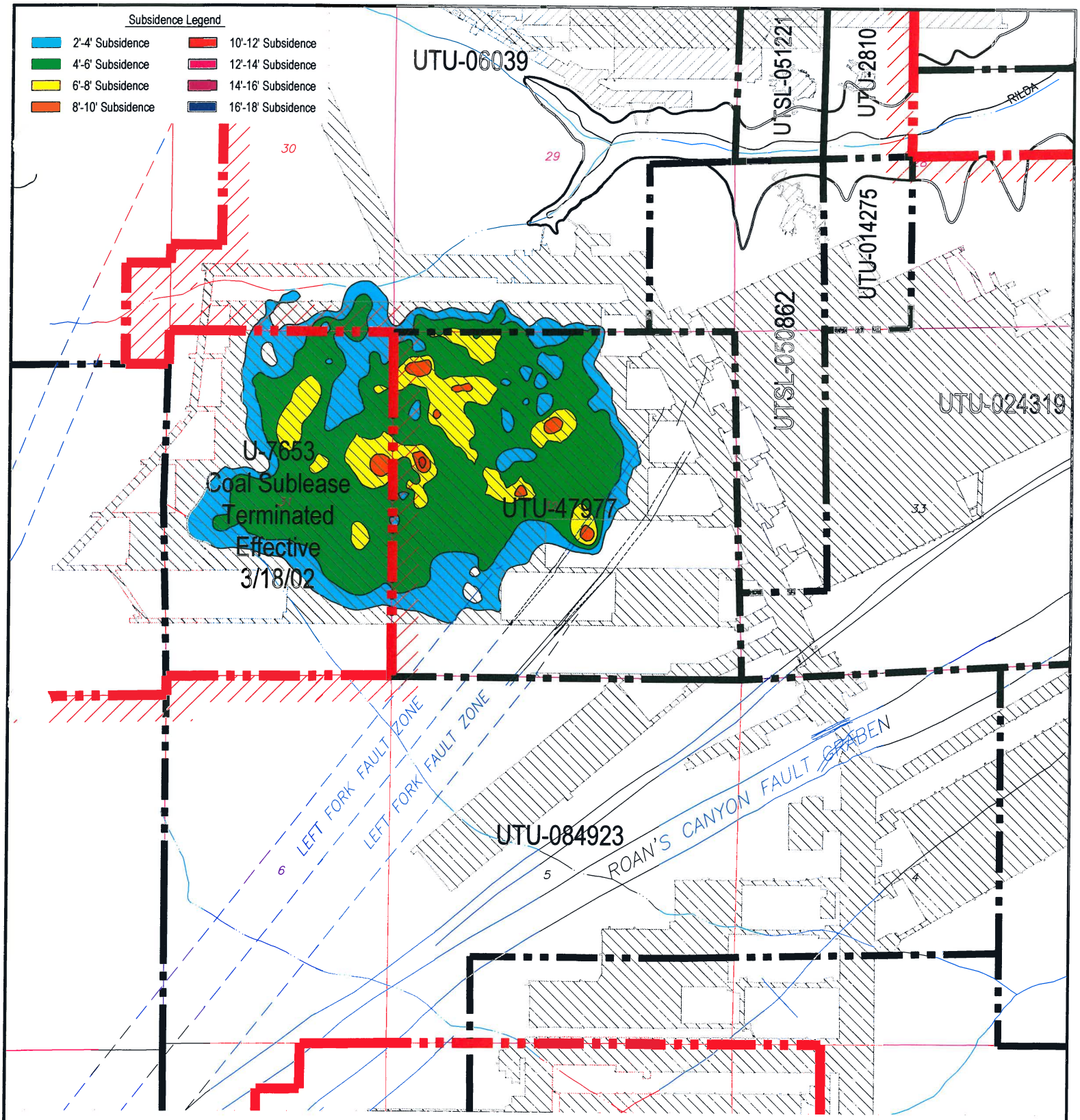
PacifiCorp delineated a series of two profiles (Area 22) covering the main longwall panel district in Lease UTU-47977 that are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 9 feet. No surface effects from subsidence were noted. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-47977.

The proposed relinquishment area of Lease UTU-47977 is stable and subsidence is substantially complete.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-47977

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

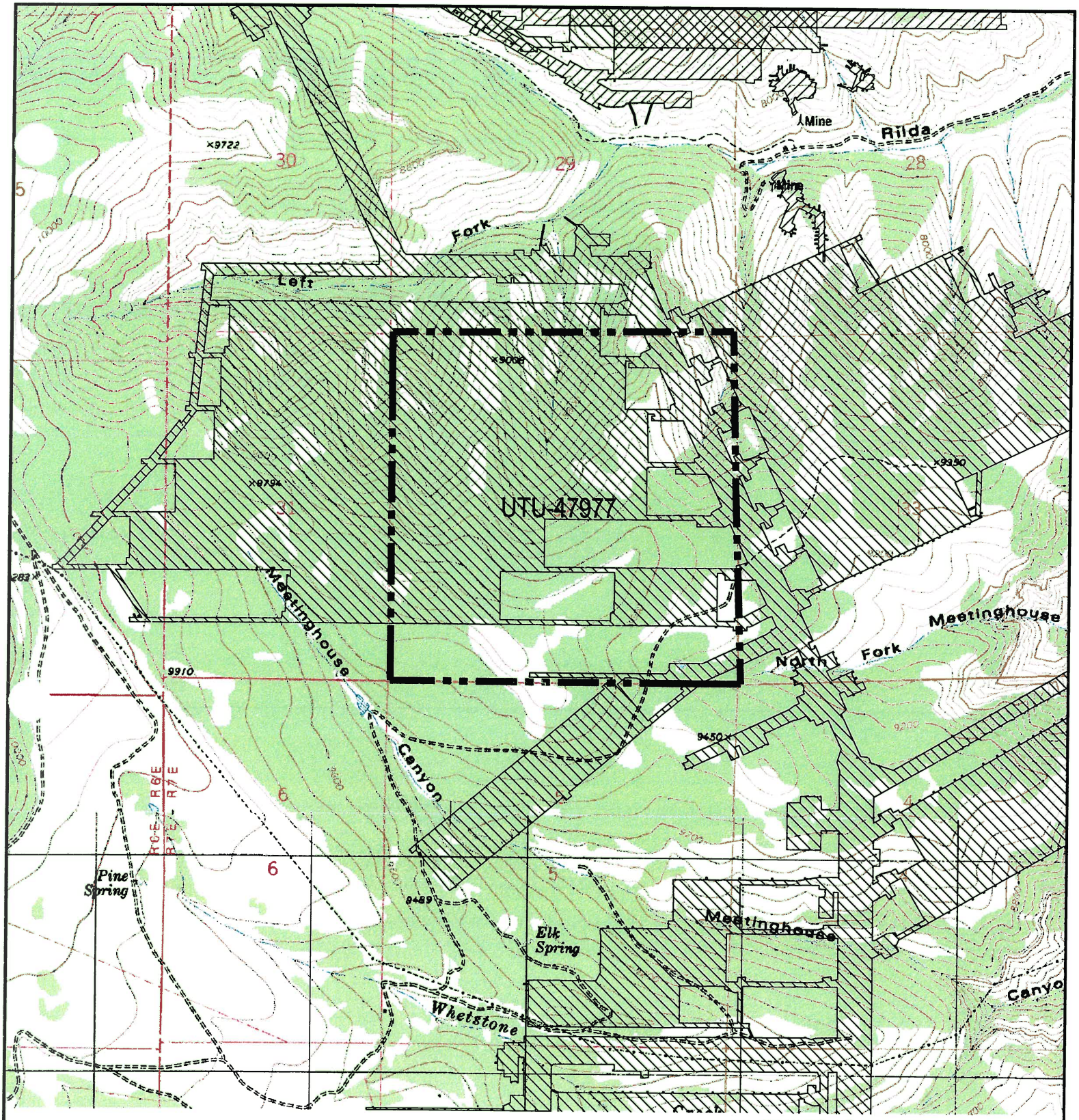
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47977
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-47977 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-47977 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-47977. No restoration and/or mitigation efforts are required for Lease UTU-47977. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-47977 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTU-47977

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

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INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47977
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-47977 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 100 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTU-47977 and surrounding area (North Rilda Ridge).

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP). Lease UTU-47977 is near to the Mill Fork Lease area and includes within the adjacent ½ mile zone some of the surface sites that are part of the surface hydrology monitoring plan.

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTU-47977.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The North Rilda Ridge 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the North Rilda Ridge 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. 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 PacifiCorp mining area covers portions of East Mountain.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable

calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, and is exposed in the North Rilda Ridge area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the North Rilda Ridge area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 of this 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the North Rilda Ridge area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the East Mountain area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet. There is no Flagstaff Limestone in the North Rilda Ridge area.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone

are limited to a narrow north-south trending ridge located several miles west of the North Rilda Ridge area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the water bearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 the North Rilda Ridge area.

Folding:

Strata in the North Rilda Ridge area are gently folded in two broad structural features. The Flat Canyon Anticline crosses to the west of the lease 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. The strata within Lease UTU-047977 are located on the southeastern limb of the Flat Canyon Anticline, which is also the northwestern limb of the Straight Canyon Syncline. Strata dip about 2 - 4 degrees to the southeast.

Faulting:

There is no faulting within the UTU-47977 lease area. The nearest known faulting to the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes about 1 mile to the northwest of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates

general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk

Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The δ2H and δ18O compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.
7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years

b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of

surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its CO2(g) in the soil zone where the partial pressure of CO2 greatly exceeds atmospheric levels. This CO2 combines with water to form carbonic acid according to

$$CO2(g) + H2O = H2CO3 \quad (1)$$

Carbonic acid dissociates into H+ and HCO3- as

$$H2CO3 = HCO3^- + H+ \quad (2)$$

The H+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H+ + \underset{\text{(dolomite)}}{CaMg(CO3)2} = Ca2+ + Mg2+ + 2HCO3^-, \text{ and} \quad (3)$$

$$H+ + \underset{\text{(calcite)}}{CaCO3} = Ca2+ + HCO3^- \quad (4)$$

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$\underset{\text{(gypsum)}}{CaSO_4 \cdot 2H_2O} = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute

concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-clay} = 2Na^+ + Ca\text{-clay} \quad (9)$$

$$Mg^{2+} + Na\text{-clay} = 2Na^+ + Mg\text{-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs

discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically

dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} -HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent

with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and $\delta^{18}O$

The δ^2H and $\delta^{18}O$ composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and $\delta^{18}O$ composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Interwest and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork area spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^3H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^3H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^3H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^3H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is

minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir

downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less

than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute

significant groundwater to the discharge from the spring.

Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – NORTH RILDA RIDGE AREA

A. GROUNDWATER

Groundwater within the North Rilda Ridge area was monitored according to the schedules in established in the Deer Creek MRP. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining. There are no surface springs within the lease area of UTU-047977 that is to be relinquished. PacifiCorp has conducted baseline and operational monitoring of spring sources adjacent to the lease area. The nearest springs within ½ mile of the relinquishment boundary are located at the North Emery Water Users Special Service District Rilda Canyon Springs collection system, which taps a series of alluvial springs in the floor of Rilda Canyon.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the adjacent Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.

The ground water monitoring plan in Appendix C includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights

- Measurable flow based on historical surveys
- Reliable measuring point(s)

Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency. There are no monitored surface springs within the lease area of UTU-47977 that is to be relinquished. The spring 80-50 is within ½ mile of the lease boundary (see table below). The spring collection system operated by the North Emery Water Users Special Service District is within ½ mile. Data related to monitoring point RCF3 is included in Appendix C.

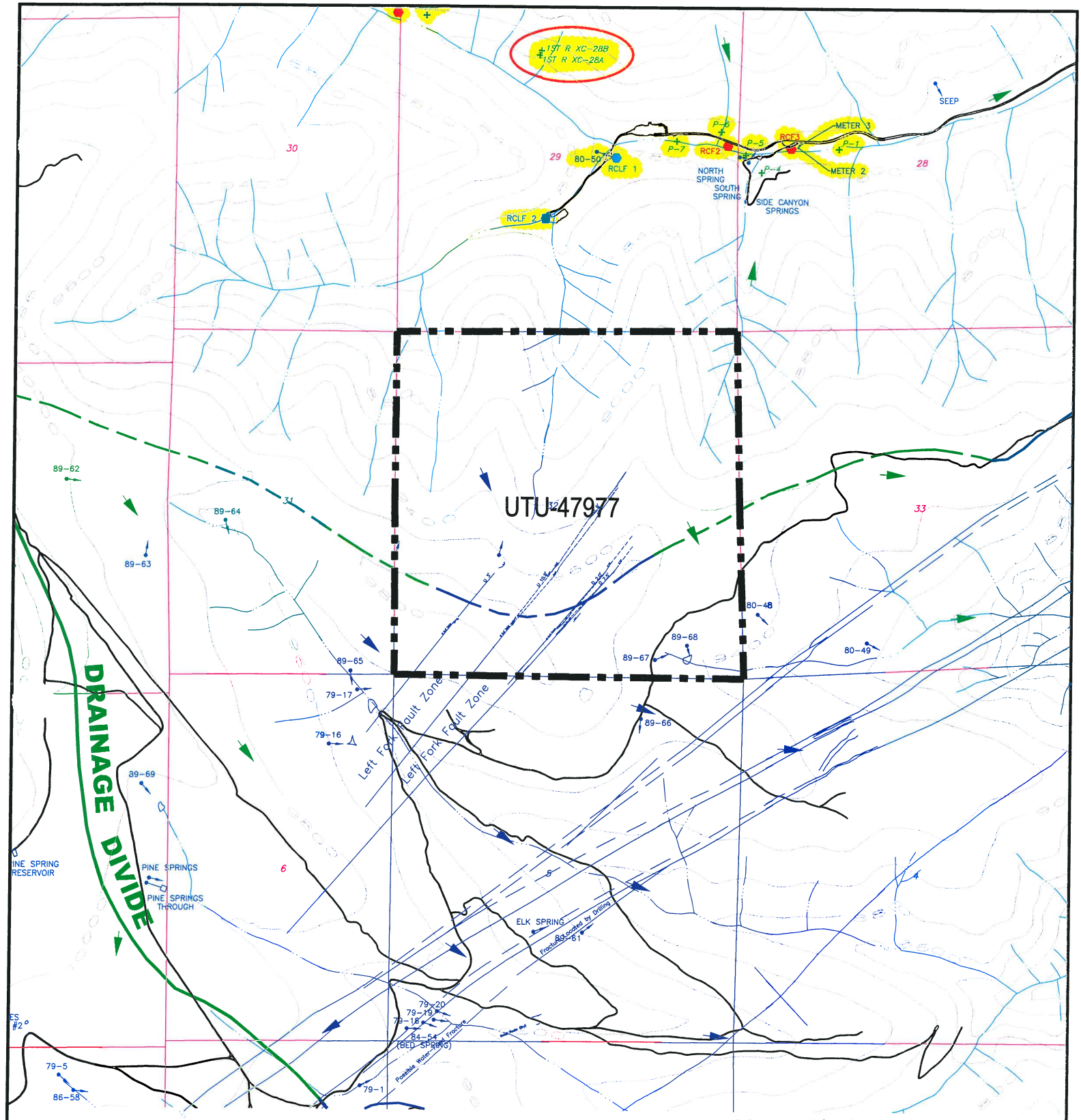
GROUNDWATER MONITORING PLAN - SPRINGS							
Spring	Stratigraphic Position	Projected Subsidence Zone	Regional Location	Water Rights	Historical Measurable Flow	Reliable Measuring Point	Comment
80-50	✓		✓		✓	✓	

Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTU-47977 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTU-47977 are ephemeral. The majority of the surface flow from the lease area drains to the north into Rilda Canyon which reports to Huntington Creek. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



CAD FILE NAME/DISK#: UTU-47977

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47977
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Location: Section 29, Township 16 South, Range 7 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-06039.

Lease Association: Spring 80-50 is located within Federal Coal lease UTU-06039. The lease was originally issued effective May 1, 1953. Both the Hiawatha and Blind Canyon seams have been mined in this lease. Room and pillar mining began in the Blind Canyon Seam in November 1993 with the first longwall retreat in August 1999. Hiawatha seam development began in October 2000 with the first longwall retreat in April 2002. . No mining occurred in vicinity of 80-50.

Subsidence: No subsidence has been detected near 80-50. The 2008 Annual Subsidence Report reported that the subsidence west of the spring has been stable since at least 2005. 80-50 is outside of the subsided area.

For additional data related to subsidence refer to the 2008 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring 80-50. Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected from 2001 and has continued through 2017. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, and 5. The East Mountain weather station is located on the southern tip of East Mountain.
  - 80-50 is located on east facing hillside which is densely populated with spruce trees above the Rilda Canyon road (Emery County Road #306) turn around. Flow from spring 80-50 generally ranges from 0gpm/seep to a maximum of 3.5 gpm.

Geologic Mode of Occurrence for spring 80-50:

- Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.
- Geologic Formation: Blackhawk Formation (refer to Geologic Occurrence sheet).
- Stratigraphic Position: 100' above base.

Justification for removal from monitoring: 80-50 has been monitored by PacifiCorp from 1980 through 1986 and from 1996 through 2018. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in Lease UTU-88554 and adjacent Federal Lease UTU-84285 (west and north of UTU-06039) ceased as of January 7, 2015. Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site 80-50 be removed from the monitoring program.

EAST MOUNTAIN

EAST MOUNTAIN & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **80-50**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
2850’ S.	2230' W.	NW	29	16S	7E	7810

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
Blackhawk	None	None	100' above bottom

Location Comments: Spring located on east facing hillside which is densely populated with spruce trees.

Probable Recharge Area: Areas of higher elevations which are located to the west.

Relationship to Adjacent Springs: Spring not associated with any other springs.

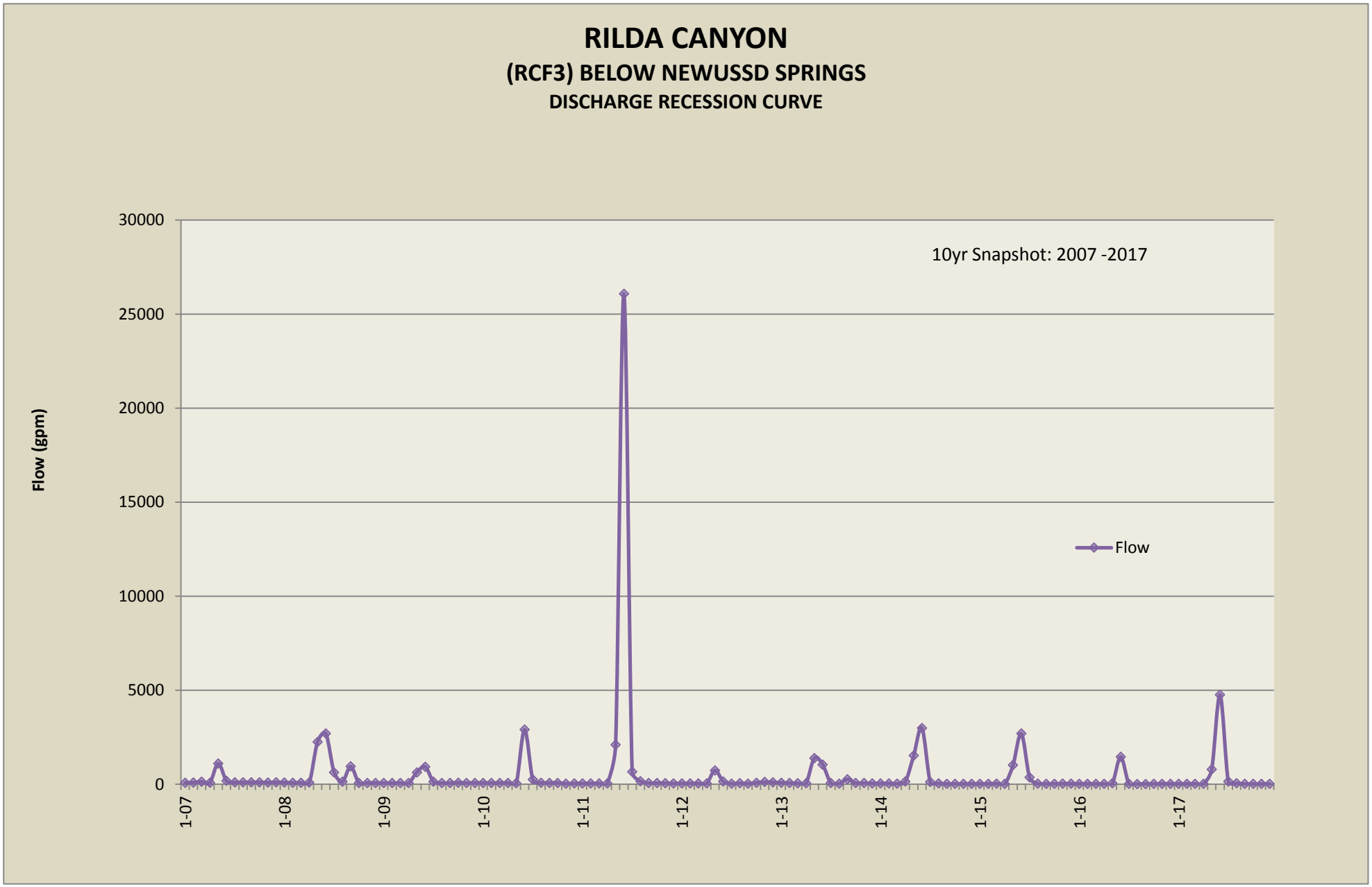
Geologic Occurrence of Spring:

Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.

Spring 80-50, May 22, 2018

East Mountain Spring: 80-50
Water Quality Data: Operational
Mine Association: Deer Creek Mine - East Mountain
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 1890'
Date of Nearest Mining: May-05

	Pre-Mining Data: 19770101 THROUGH 20031001				Post-Mining Data: 20031030 THROUGH 20171231				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	574	456	504.375	16	421	343	387.23	13	BICARBONATE
CALCIUM	150	44	59.8625	16	70.84	48.5	57.9692	13	CALCIUM
CARBONATE	0				0	0	0	9	CARBONATE
CHLORIDE	28	9	18.025	16	24	8	14.4615	13	CHLORIDE
CONDUCTIVITY	1298	872	1073.06	16	1249	800	991.538	13	CONDUCTIVITY
DISSOLVED OXYGEN	10.2	6.3	8.25	2	0				DISSOLVED OXYGEN
FLOW	3	0.38	1.436875	16	2.36	0.18	1.11538	13	FLOW
HARDNESS	670	452	566.214	14	679	420	525.384	13	HARDNESS
TOTAL IRON	0.8	0.063	0.4315	2	3.06	0	0.37363	11	TOTAL IRON
DISSOLVED IRON	0.4	0.33	0.365	2	0	0	0	9	DISSOLVED IRON
MAGNESIUM	133	27	98.63125	16	132	65.31	92.4038	13	MAGNESIUM
DISSOLVED MANGANESE	0				0.141	0	1.82222	9	DISSOLVED MANGANESE
MANGANESE	0				0.009	0	0.0009	10	MANGANESE
OIL AND GREASE	0				0				OIL AND GREASE
PH	8.14	7.04	7.748125	16	8.23	7.12	7.97692	13	PH
POTASSIUM	12	3	4.3125	16	3.58	2.53	3.03461	13	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	46	18	26.3125	16	25.5	19.18	21.943	13	SODIUM
SULFATE	252	114	184.525	16	256	89	154	13	SULFATE
SUSPENDED SOLIDS	79	1.5	40.25	2	0				SUSPENDED SOLIDS
TEMPERATURE	8.3	6.3	7.51875	16	11.4	7.6	9.15384	13	TEMPERATURE
TOTAL DISSOLVED SOLIDS	810	494	651.625	16	721	470	588.153	13	TOTAL DISSOLVED SOLIDS


RILDA CANYON
(RCF3) BELOW NEWUSSD SPRINGS
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
30000
25000
20000
15000
10000
5000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - BELOW NEWUA SPRINGS

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170313	0.0	354.0	99.2	0.0	32.0	1013.0	8.1	493.0	0.2	0.1	59.6	0.0	0.0	8.1	4.2	28.5	177.0	0.0	611.0
20170608	0.0	222.0	60.7	0.0	2.0	449.0	10.2	239.0	0.5	0.0	21.2	0.0	0.0	8.6	1.0	5.4	15.0	165.0	252.0
20170907	6.0	320.0	82.0	0.0	15.0	885.0	10.4	407.0	0.1	0.0	49.1	0.0	0.0	8.6	3.1	20.9	137.0	0.0	514.0
20171205	0.0	331.0	90.7	0.0	12.0	901.0	13.1	443.0	0.1	0.0	52.6	0.0	0.0	8.0	3.4	21.6	143.0	8.0	575.0
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2017																			
MIN	0	222	61	0	2	449	8	239	0	0	21	0	0	8	1	5	15	0	
MAX	6	354	99	0	32	1013	13	493	1	0	60	0	0	9	4	29	177	165	
MEAN	0.00	306.75	83.14	0.00	15.25	812.00	10.45	395.50	0.23	0.01	45.62	0.01	0.00	8.32	2.91	19.11	118.00	43.25	
2016**																			
MIN	0.0	205.0	55.2	0.0	1.0	381.0	8.7	210.0	0.0	0.0	17.5	0.0	0.0	8.0	0.0	4.4	12.0	0.0	272.0
MAX	6.0	350.0	95.0	0.0	10.0	880.0	9.9	483.0	0.5	0.0	59.6	0.0	0.0	8.1	2.9	23.6	159.0	56.0	589.0
MEAN	1.5	302.8	82.3	0.0	7.8	746.5	9.4	398.5	0.3	0.0	46.8	0.0	0.0	8.1	2.1	18.5	115.0	19.3	493.0
2015**																			
MIN	0	218	52	0	2	419	10	218	0	0	22	0	0	8	1	5	14	0	277
MAX	0	343	87	0	10	895	10	454	3	0	58	0	0	9	3	24	157	221	583
MEAN	0	303	78	0	8	769	10	388	1	0	47	0	0	8	2	19	117	83	506
2014**																			
MIN	0	339	85	0	9	871	0	425	0	0	52	0	0	8	3	25	139	0	550
MAX	6	343	89	0	10	920	0	447	0	0	54	0	0	8	4	55	170	0	586
MEAN	3	341	87	0	10	896	0	436	0	0	53	0	0	8	3	40	155	0	568
2013**																			
MIN	0	205	53	0	1	155	0	221	0	0	20	0	0	8	1	7	17	0	214
MAX	5	339	97	11	10	901	0	486	12	0	59	0	0	9	3	25	154	1092	562
MEAN	3	274	76	3	6	599	0	351	3	0	39	0	0	8	2	16	88	284	386
2012**																			
MIN	0	250	67	0	4	576	8	297	0	0	32	0	0	8	1	12	56	0	334
MAX	30	350	101	0	10	921	8	495	0	0	59	0	0	8	3	26	159	8	556
MEAN	8	312	85	0	8	782	8	413	0	0	48	0	0	8	2	20	113	4	468
2011**																			
MIN	0	212	59.9	0	2.0	423	8.70	228	0.16	0.00	19.14	0.00	0.00	7.95	0.80	4.79	13.0	0.0	258
MAX	5	351	97.0	0	11.0	899	8.70	481	14.79	0.00	58.07	0.03	0.00	8.54	2.82	24.63	152.0	1786.0	573
MEAN	1	287	79.9	0	7.0	702	8.70	373	3.86	0.00	42.22	0.02	0.00	8.19	1.97	16.74	95.0	448.0	436
2010**																			
MIN					2.0	411	6.10	221	0.29		18.45	0.00		7.87	0.81	5.10	13.0	0.0	233
MAX					11.0	922	10.20	510	1.37		62.65	0.04		8.56	3.10	26.36	157.0	100.0	592
MEAN					7.3	765	8.80	419.75	0.65		48.58	0.02		8.14	2.42	19.78	111.3	34.0	488
2009**																			
MIN	0	217	62		2	462	8	251	0		23	0		8	1	7	26	6	288
MAX	15	374	108		10	1005	9	545	1		67	0		8	3	30	183	90	678
MEAN	9	330	91		8	840	8	448	1		53	0		8	3	22	130	31	550
2008**																			
MIN	0	179	61		2	470	9	242	1		22	0		8	1	5	18	8	247
MAX	20	378	115		10	1072	16	577	1		70	0		9	4	29	213	12	742
MEAN	10	322	97		8	911	12	471	1		55	0		8	3	23	147	10	571
2007**																			
MIN		285	77.6		6.0	834	10.09	378	0.20		44.70	0.02		7.54	1.86	15.60	90.0	5.0	438
MAX		400	132.0		12.0	1304	12.48	614	1.17		69.10	0.09		8.04	3.51	30.06	255.0	6.0	746
MEAN		370	111.2		10.2	1128.2	11.26	536.2	0.50		62.75	0.05		7.79	3.14	26.11	196.0	5.5	652.6
2006**																			
MIN		220	62		3.0	487	10.3	252	0.16		23.8	0		7.78	0.98	6.4	25	6	278
MAX		376	112		12.0	1073	12.5	563	0.30		69.0	0		8.18	3.32	26.8	185	18	626
MEAN		328	94		8.8	906	11.7	454	0.25		53.3	0		7.97	2.57	20.9	135	10	517
HISTORICAL 1989-2016																			
MIN	0.0	179.0	50.4	0.0	1.0	155.0	4.4	204.0	0.0	0.0	17.5	0.0	0.0	7.5	0.0	4.4	7.0	0.0	199.0
MAX	38.0	500.0	132.0	30.0	50.0	1304.0	15.5	748.0	14.8	0.4	70.2	0.2	5.0	8.8	5.0	55.0	255.0	1786.0	746.0
MEAN	6.6	344.7	84.5	3.1	8.7	748.0	8.7	403.5	0.7	0.0	45.5	0.0	1.1	8.1	2.3	17.9	107.3	67.5	464.1
COUNT	67	103	103	62	103	104	79	103	101	56	103	75	59	104	100	103	103	79	103

*** Quality parameters are reported as mg/l unless otherwise noted.**
**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTU-47977 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 100 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface vegetation characteristics of the area.

Vegetation of Lease UTU-47977 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-47977:

Aspen/Conifer	AS/C
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Mountain Shrubland	MS
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

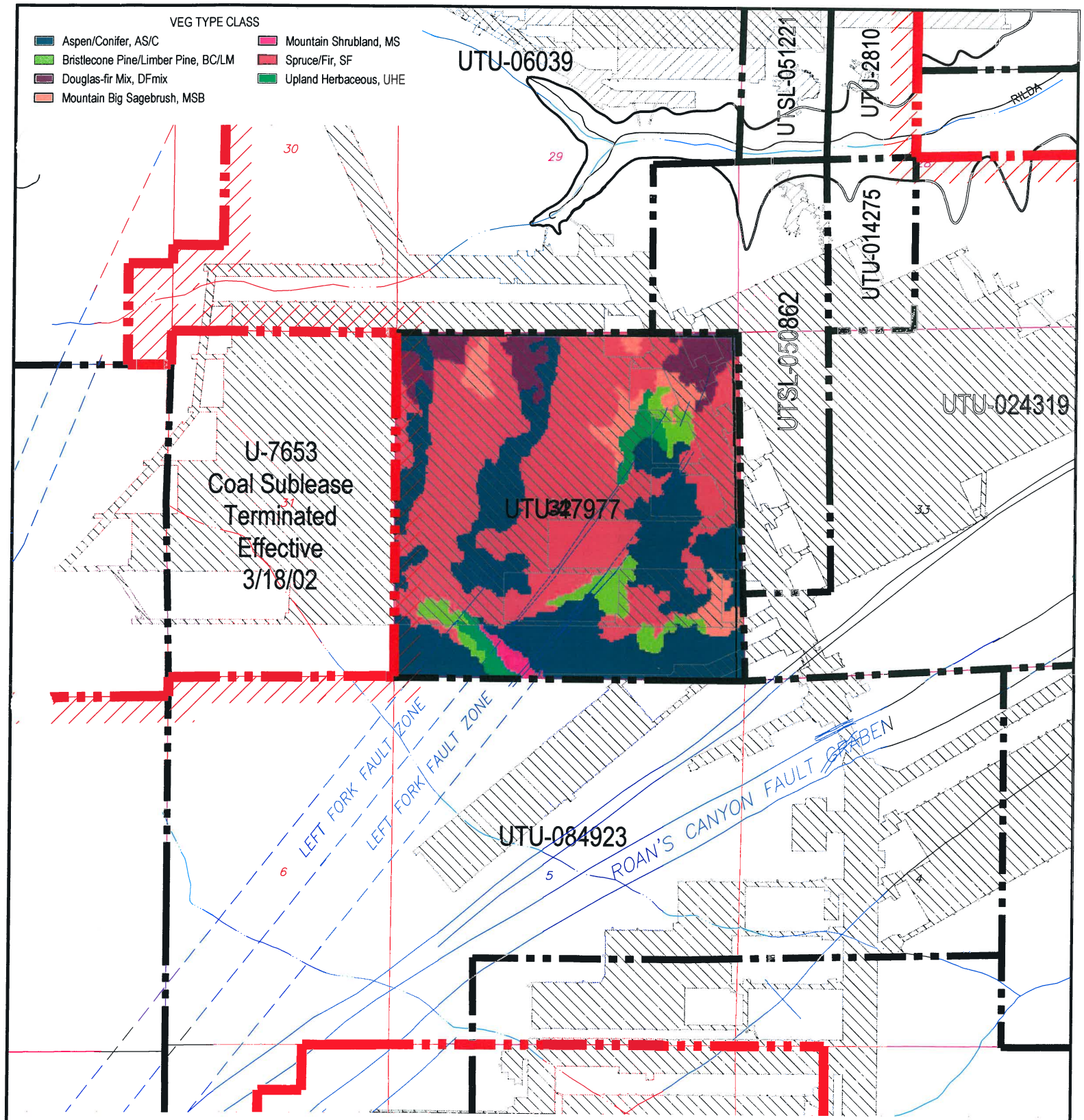
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-47977 area. There were no surface facilities or installations on this lease.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-47977

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47499
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-47977 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in Lease UTU-47977.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-47977 lease have been submitted when those districts were sealed. The original CERCLA inspection within UTU-47977 to seal the 3rd North B West side panel district took place in September 1999, and BLM approved the sealing plan in September, 1999. CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

UTU-47977

(10)

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-47977 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3N Mains, 5th, 6th E, 6th, 7th E LW Panels, 2nd - 8th W, 4th - 9th W LW Panels and Remainder of Mine Workings

Coal Bed: Blind Canyon Coal Seam

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-47977 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3N Mains, 5th, 6th E, 6th, 7th E LW Panels, 2nd - 8th W, 4th - 9th W LW Panels and Remainder of Mine Workings

Coal Bed Blind Canyon Coal Seam

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-47977 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3N Mains, 5th, 6th E, 6th, 7th E LW Panels, 2nd - 8th W, 4th - 9th W LW Panels and Remainder of Mine Workings

Coal Bed: Blind Canyon Coal Seam

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV 7, 2018

Lease(s) # UTU-47977 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3N Mains, 5th, 6th E, 6th, 7th E LW Panels, 2nd - 8th W, 4th - 9th W LW Panels and Remainder of Mine Workings

Coal Bed Blind Canyon Coal Seam

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-47977 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3N Mains, 5th, 6th E, 6th, 7th E LW Panels, 2nd - 8th W, 4th - 9th W LW Panels and Remainder of Mine Workings

Coal Bed Blind Canyon Coal Seam

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-47977 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3N Mains, 5th, 6th E, 6th, 7th E LW Panels, 2nd - 8th W, 4th - 9th W LW Panels and Remainder of Mine Workings

Coal Bed Blind Canyon Coal Seam

Dates: 11/05 – 04/15

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-47977
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 3N Mains, 5th, 6th E, 6th, 7th E LW Panels, 2nd - 8th W, 4th - 9th W LW Panels and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (01/86 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	01/86 - 04/15	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	01/86 - 04/15	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	01/86 - 04/15	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	01/86 - 04/15	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	01/86 - 04/15	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	01/86 - 04/15	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	01/86 - 04/15	Naptha	40 - 50%	64742-94-5	All Sections
	01/86 - 04/15	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	01/86 - 04/15	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	01/86 - 04/15	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	01/86 - 04/15	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	01/86 - 04/15	Propane	14%	74-98-6	All Sections
	01/86 - 04/15	Butane	13%	106-97-8	All Sections
	01/86 - 04/15	Toluene	17%	108-88-3	All Sections
	01/86 - 04/15	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	01/86 - 04/15	Napthalene	0.40%	91-20-3	All Sections
	01/86 - 04/15	Acetone	41%	67-64-1	All Sections
	01/86 - 04/15	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	01/86 - 04/15	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	01/86 - 04/15	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	01/86 - 04/15	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	01/86 - 04/15	Mineral Oil	20 - 25%	8042-47-5	All Sections
	01/86 - 04/15	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	01/86 - 04/15	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	01/86 - 04/15	Methanol	<20%	67-56-1	All Sections
	01/86 - 04/15	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	01/86 - 04/15	Heptane	69 - 79%	142-82-5	All Sections
	01/86 - 04/15	Ethyl Ether	11 - 21%	60-29-7	All Sections
	01/86 - 04/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	01/86 - 04/15	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	01/86 - 04/15	Heptane	60 - 70%	142-82-5	All Sections
	01/86 - 04/15	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	01/86 - 04/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	01/86 - 04/15	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	01/86 - 04/15	None			All Sections
Cat Transmission and Drive Train Oil	01/86 - 04/15	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	01/86 - 04/15	Monoethanolamine	<10%	141-41-3	All Sections
	01/86 - 04/15	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	01/86 - 04/15	Mineral Oil	70 - 95%	Mixture	All Sections
	01/86 - 04/15	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	01/86 - 04/15	Lubricant base oil	87 - 91%	Various	All Sections
	01/86 - 04/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	01/86 - 04/15	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	01/86 - 04/15	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	01/86 - 04/15	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	01/86 - 04/15	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	01/86 - 04/15	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	01/86 - 04/15	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	01/86 - 04/15	Trichloroethylene	95 - 99%	79-01-6	All Sections
	01/86 - 04/15	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	01/86 - 04/15	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	01/86 - 04/15	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	01/86 - 04/15	Deionized Water	1 - 3%	7732-18-5	All Sections
	01/86 - 04/15	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-47977
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 3N Mains, 5th, 6th E, 6th, 7th E LW Panels, 2nd - 8th W, 4th - 9th W LW Panels and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (01/86 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	01/86 - 04/15	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	01/86 - 04/15	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	01/86 - 04/15	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	01/86 - 04/15	Calcium sulfate	2 - 10%		All Sections
	01/86 - 04/15	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	01/86 - 04/15	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	01/86 - 04/15	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	01/86 - 04/15	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	01/86 - 04/15	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	01/86 - 04/15	Lead	34%	7439-92-1	All Sections
	01/86 - 04/15	Lead Dioxide	31%	1309-60-0	All Sections
	01/86 - 04/15	Lead Sulfate	<1%	7446-14-2	All Sections
	01/86 - 04/15	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	01/86 - 04/15	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	01/86 - 04/15	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	01/86 - 04/15	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	01/86 - 04/15	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	01/86 - 04/15	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	01/86 - 04/15	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	01/86 - 04/15	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	01/86 - 04/15	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	01/86 - 04/15	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	01/86 - 04/15	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	01/86 - 04/15	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	01/86 - 04/15	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	01/86 - 04/15	Portland Cement		65997-15-1	All Sections
	01/86 - 04/15	Crystalline Silicon Dioxide		13397-24-5	All Sections
	01/86 - 04/15	Calcium Hydroxide		001-305-620	All Sections
	01/86 - 04/15	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	01/86 - 04/15	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	01/86 - 04/15	Polyglycols	60 - 100%	Mixture (2)	15 W
	01/86 - 04/15	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	01/86 - 04/15	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	01/86 - 04/15	Polyester Resin	5 - 15%	Not Reported	All Sections
	01/86 - 04/15	Styrene Monomer	3 - 7%	100-42-5	All Sections
	01/86 - 04/15	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	01/86 - 04/15	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	01/86 - 04/15	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	01/86 - 04/15	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	01/86 - 04/15	Isobutane	2 - 10%	75-28-5	All Sections
	01/86 - 04/15	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	01/86 - 04/15	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	01/86 - 04/15	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	01/86 - 04/15			64742-48-9	All Sections
	01/86 - 04/15			64742-88-7	All Sections
	01/86 - 04/15	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	01/86 - 04/15	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	01/86 - 04/15	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	01/86 - 04/15	Lubricant base oil	>99	Various	All Sections
	01/86 - 04/15	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	01/86 - 04/15	Lubricant base oil	87 - 91%	Various	All Sections
	01/86 - 04/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	01/86 - 04/15	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	01/86 - 04/15	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-47977
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

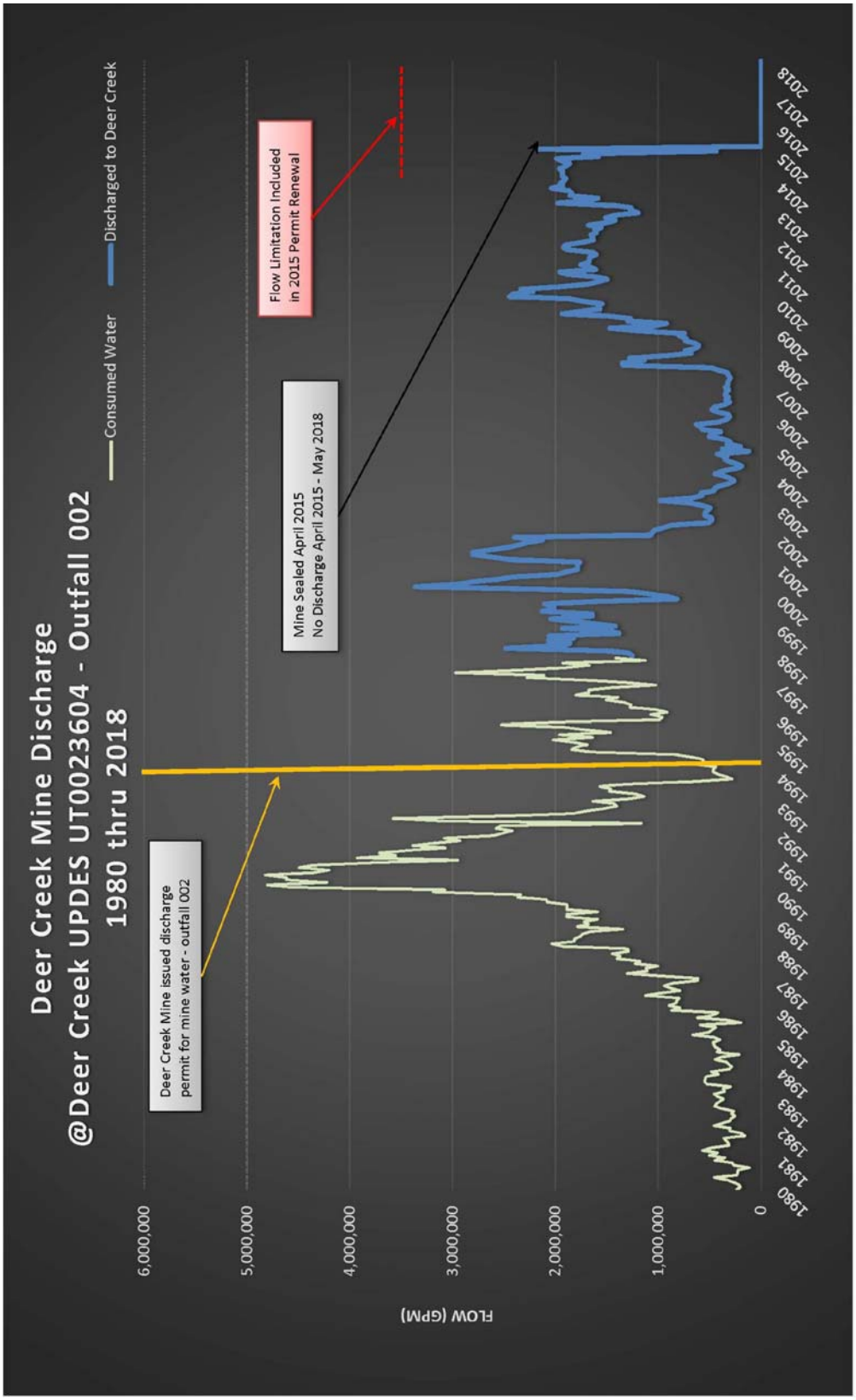
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



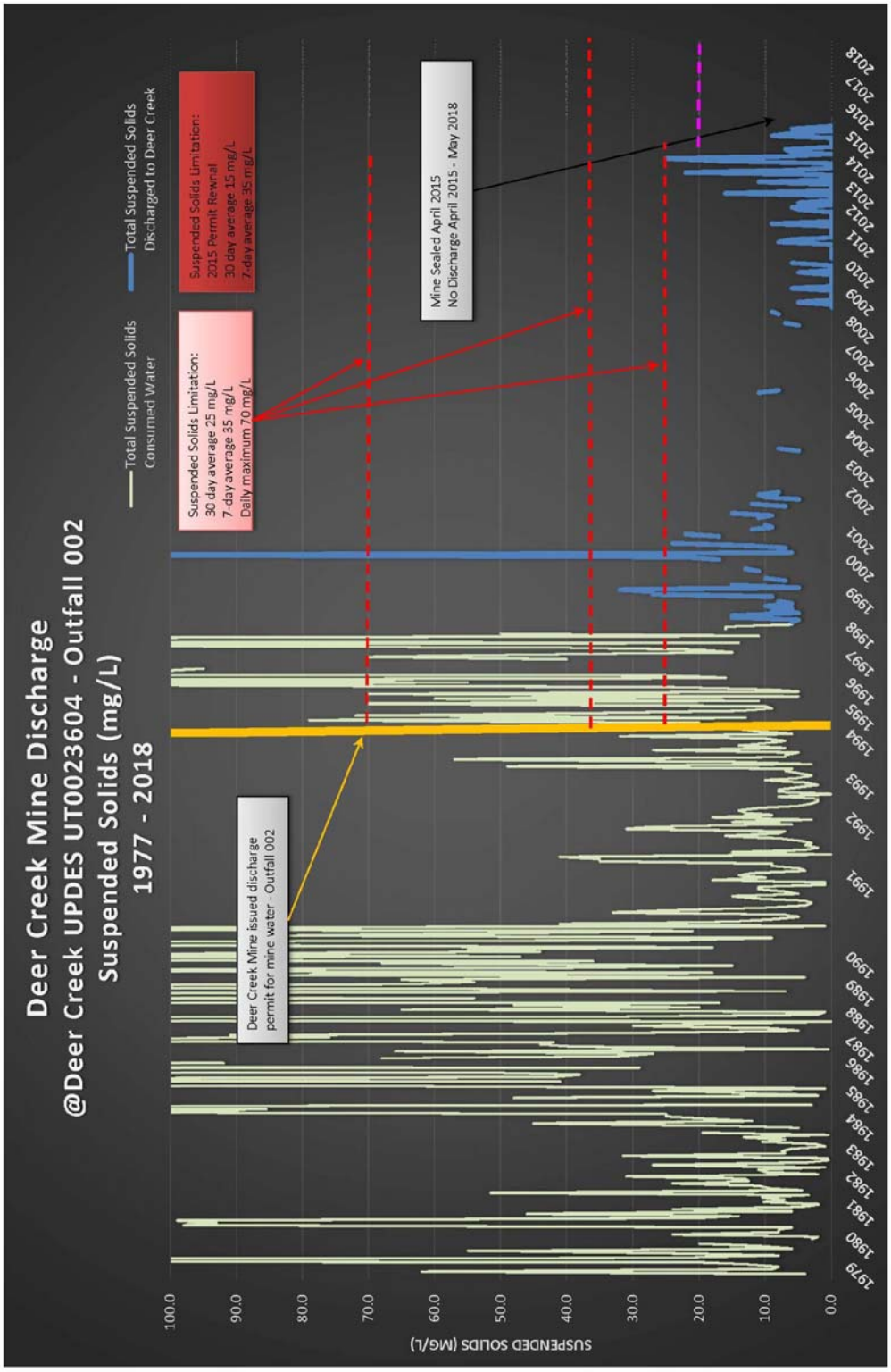
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



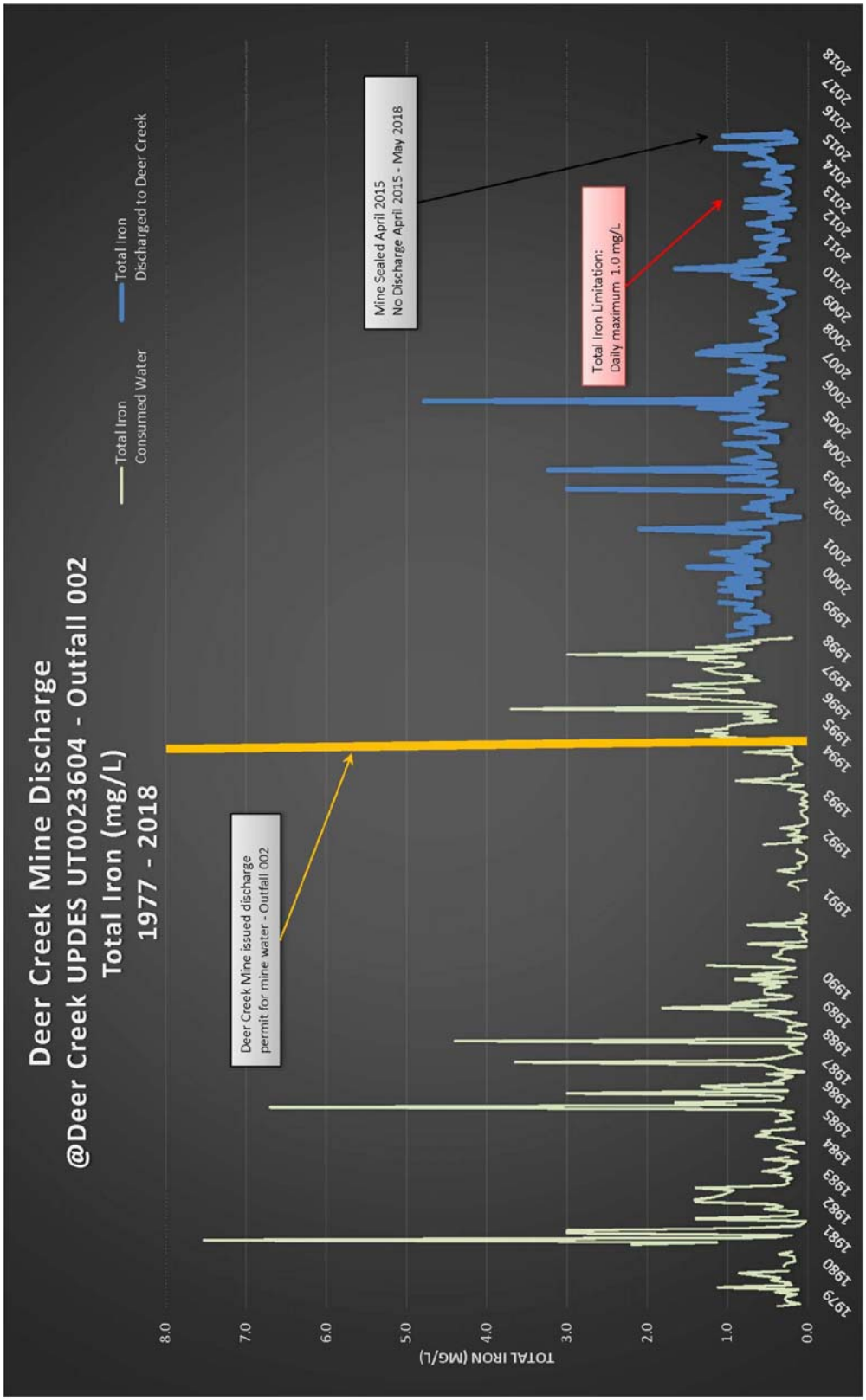
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



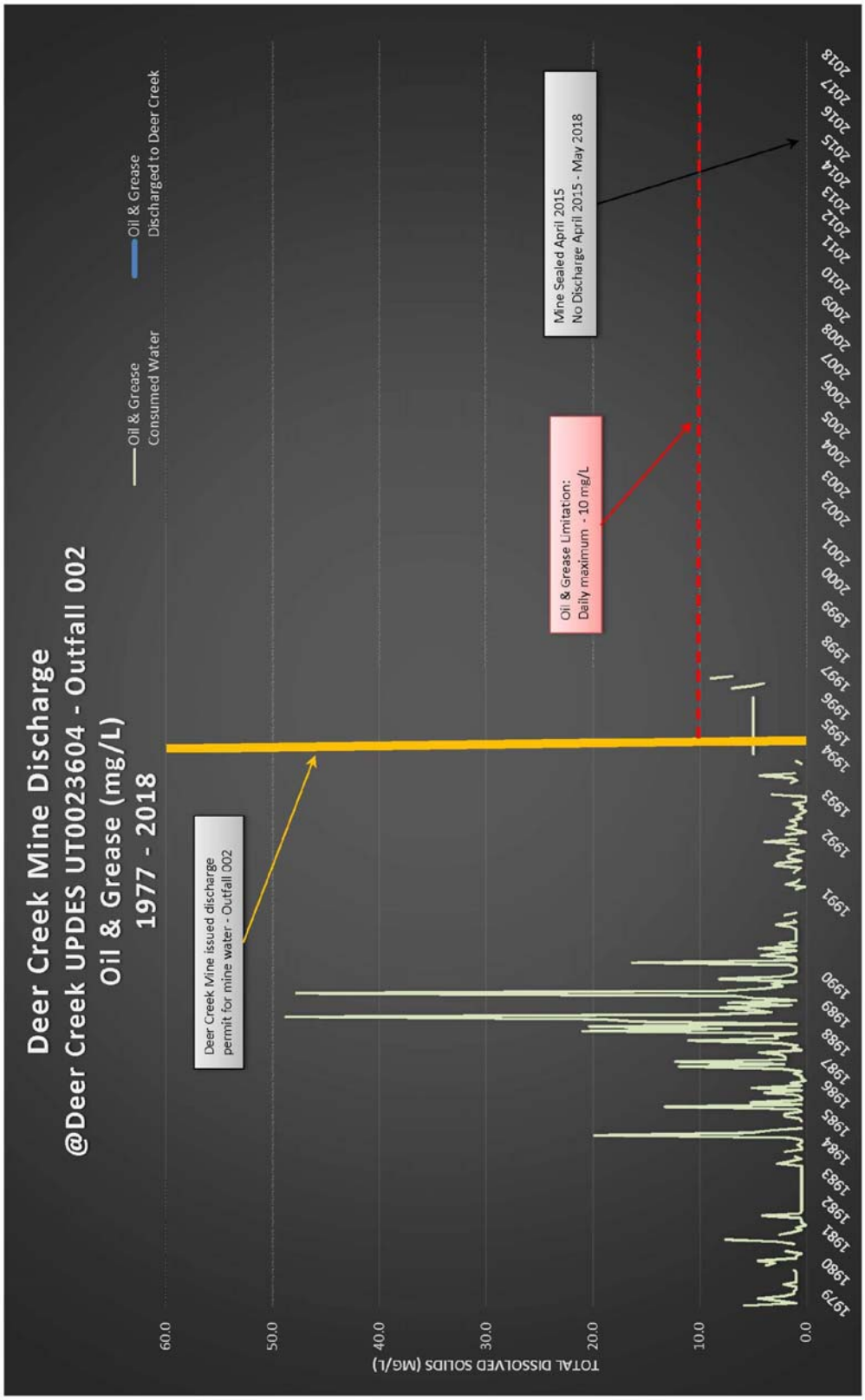
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



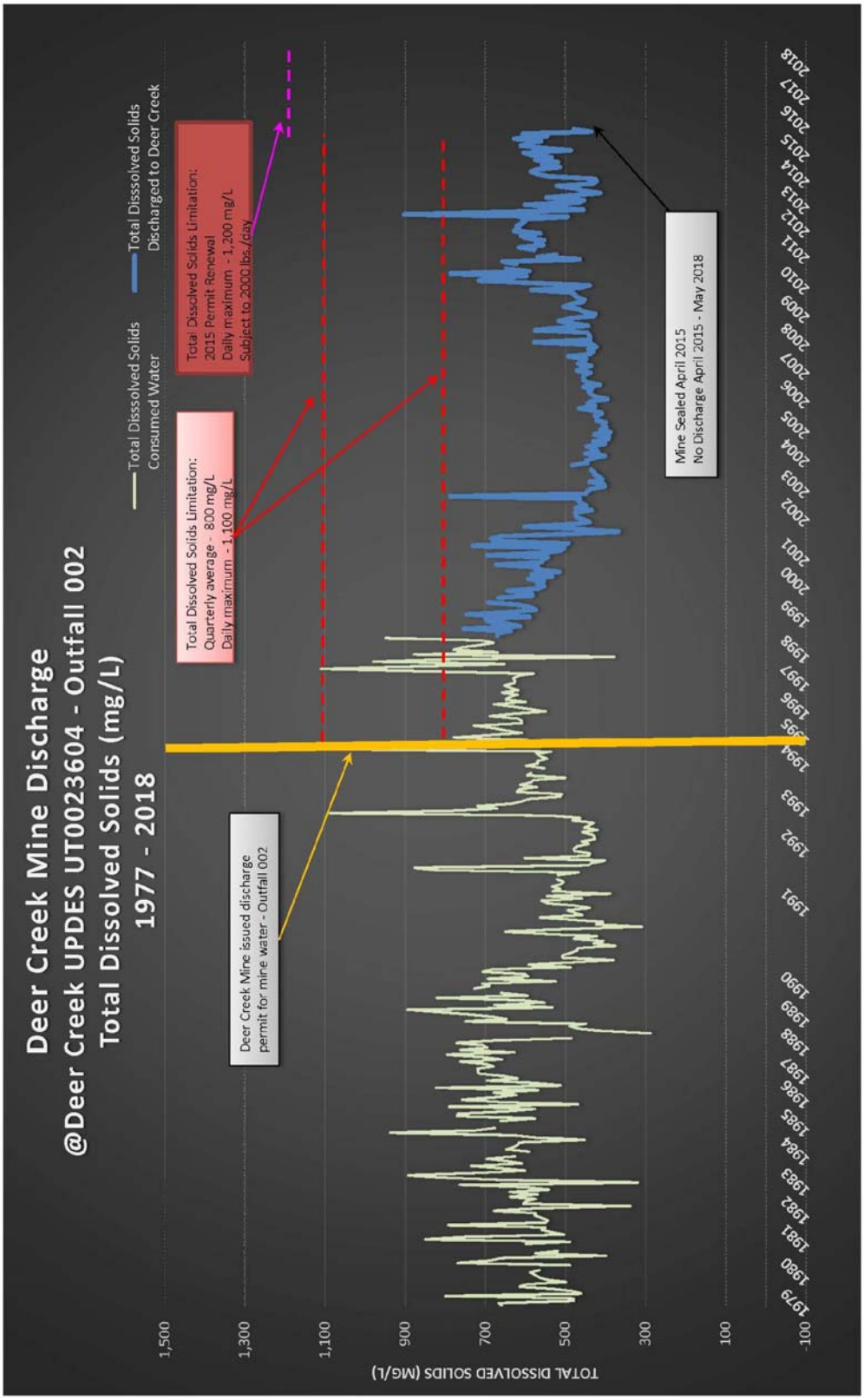
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



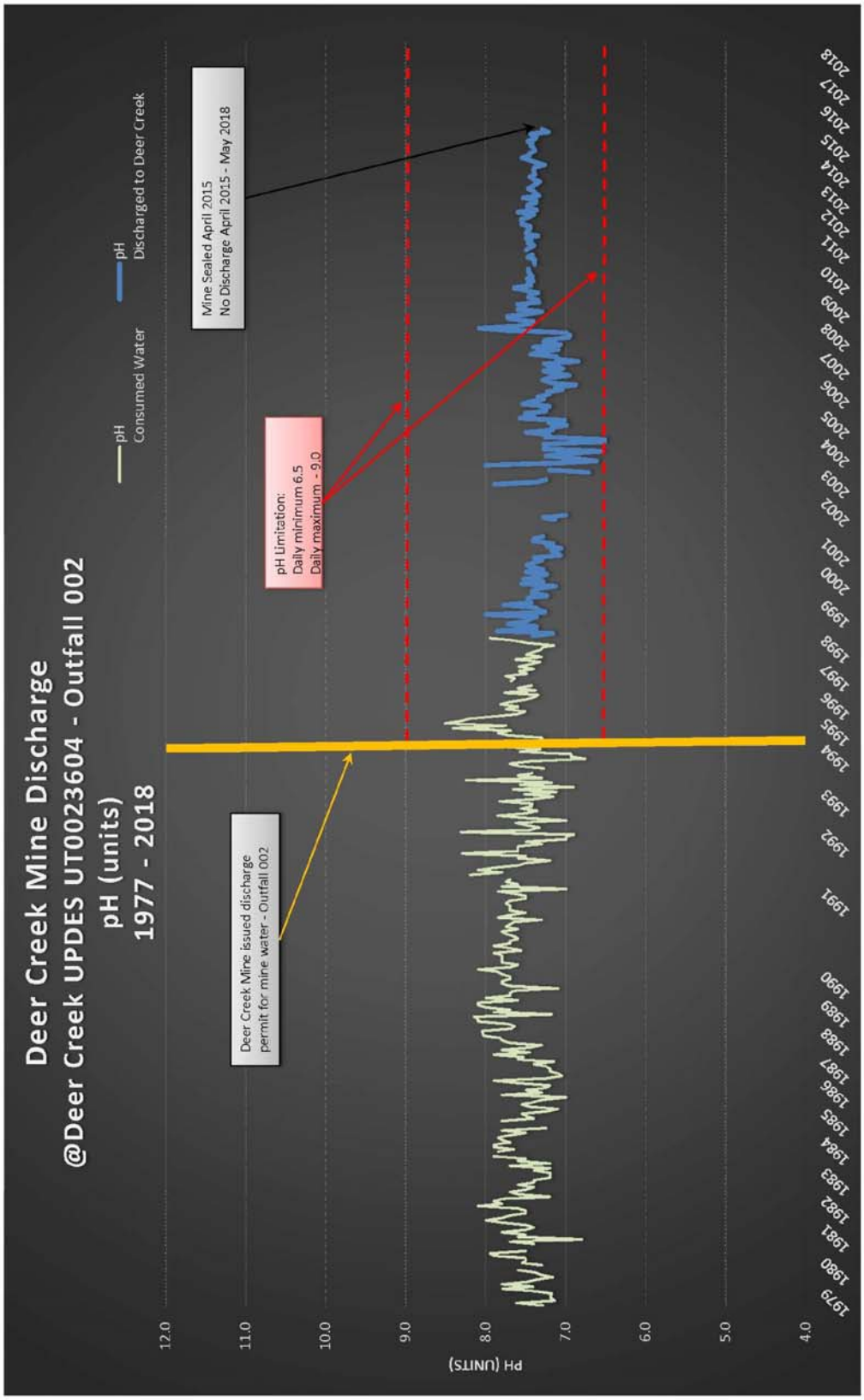
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTU-084924

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-084924, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-084924. The total acreage being surrendered is 1,211.48 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTU-084924 is described below:

Federal Coal Lease UTU-084924		
Lease Readjustment Effective Date:		8/1/2014 to 8/1/2024
Lessee of Record:		Armeda McKinnon Illiquid Assets Trust
Sublessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,211.48**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R6E, SLB&M Emery County, UT		
Sec 1:	Lots 1-3, S½NE¼, SE¼NW¼, E½SW¼, SE¼	491.48
Sec 12:	E½, E½W½	480.00
Sec 13:	NE¼, E½NW¼	240.00
	Total Lease Acres for Full Relinquishment:	**1,211.48**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of the Armeda McKinnon Illiquid Assets Trust (Trust) as the lessee of record and PacifiCorp as the sublessee of record. Consent to relinquishment is acknowledged by the accompanying Relinquishment and Consent signed by the Trust dated September 26, 2018, and as set forth below by PacifiCorp.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7TH of NOV., 2018 by PacifiCorp, the sublessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-084924

LEASE ACTIVITIES

1) Coal Lease Number: UTU-084924 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine)

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 1,211.48; Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of area relinquished. No areas retained. See also Figure 1 (a map depicting the area to be relinquished in its entirety).*

Original Lease Acreage: 1,211.48 Relinquished to date: 0 Remaining: 1,211.48 acres

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☐ NO ☒ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☐, Room & Pillar ☐, Surface ☐, Other ☒ (Explain) None

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)?
YES ☐ NO ☒ (If "YES", describe:

11) Date of initial mining: (none) ; last mining: (none) .

12) Number of coal beds mined: No mining occurred on this lease

13) Range of thickness of coal removed for each bed: 0

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-084924

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
   - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
   - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☐ NO☒ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☐ NO ☐ N/A ☒ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☐ NO ☐ N/A ☒ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.) *The Trail Mountain wildfire in June 2018 burnt a portion of the vegetation and baked the soils on this federal coal lease.*

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-084924

24) Was there any surface disturbance conducted independent of mining activities?
YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐
(If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

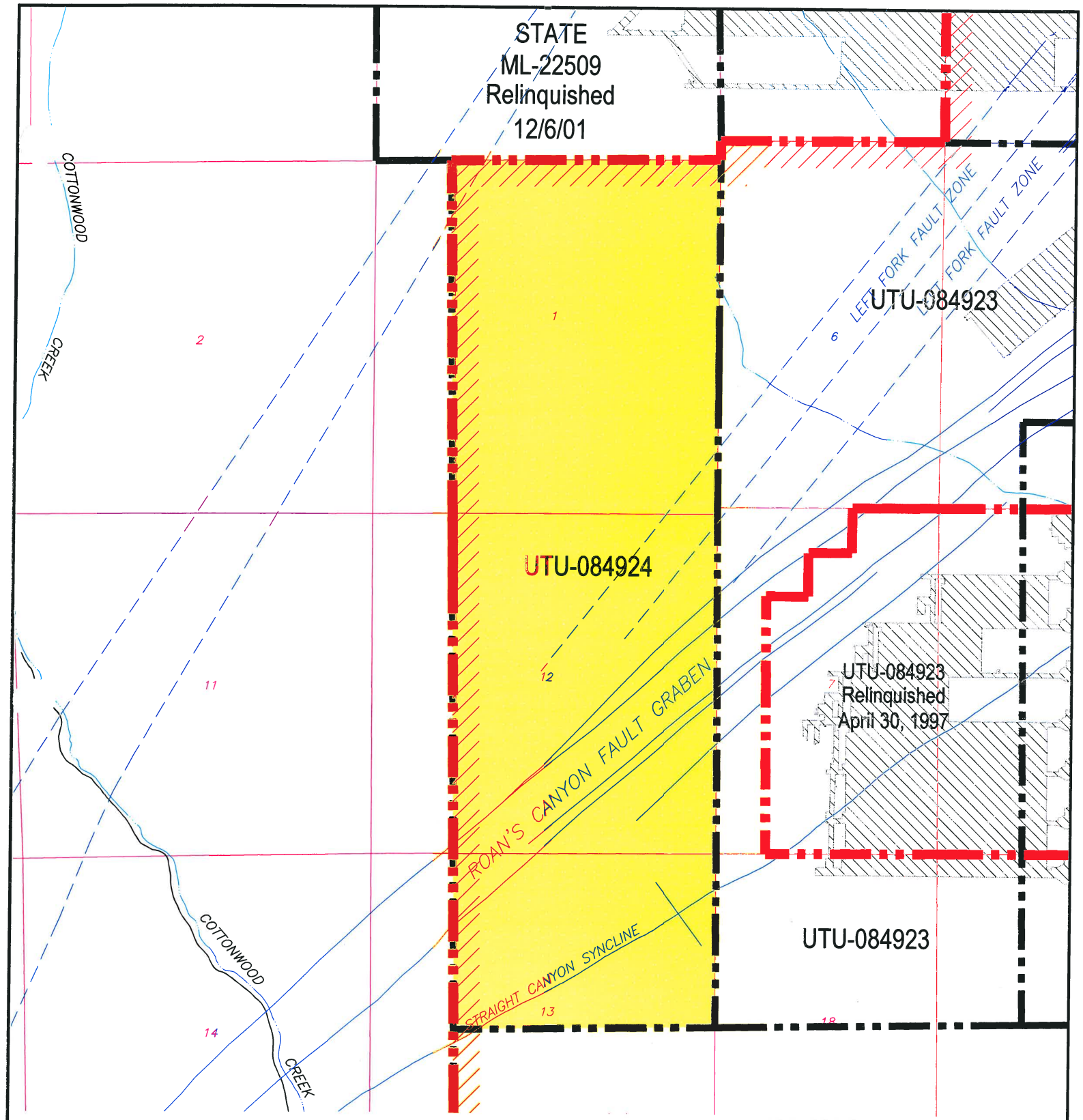
Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-084924

Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTU-084924 is described below:

Federal Coal Lease UTU-084924		
Lease Readjustment Effective Date:		8/1/2014 to 8/1/2024
Lessee of Record:		Armeda McKinnon Illiquid Assets Trust
Sublessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,211.48**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R6E, SLB&M Emery County, UT		
Sec 1:	Lots 1-3, S½NE¼, SE¼NW¼, E½SW¼, SE¼	491.48
Sec 12:	E½, E½W½	480.00
Sec 13:	NE¼, E½NW¼	240.00
	Total Lease Acres for Full Relinquishment:	**1,211.48**
	Total Lease Acres Remaining:	**0.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-084924 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

CAD FILE NAME/DISK#: UTU-084924

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084924

DRAWN BY:	K. LARSEN	FIGURE 1	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV. ___

RELINQUISHMENT AND CONSENT
Federal Coal Lease UTU-084924

WHEREAS, the Armeda McKinnon Illiquid Assets Trust (successor-in-interest to the Malcolm N. McKinnon Trust)(the "***Trust***"), acting through Wealth & Fiduciary Service, a Division of ZB, N.A. Wealth Management, as trustee (the "***Trustee***") of the Trust, is the lessee of record of that certain coal lease, issued by the United States of America (the "***United States***"), acting through the Bureau of Land Management, identified by Serial Number UTU-084924 (the "***Lease***"), whereby, among other things, the Trust leased certain coal bearing property from the United States, which property is more specifically described in Exhibit A attached hereto;

WHEREAS, the Trust, through the Trustee, subleased the Lease to Peabody Coal Company, and Peabody Coal Company assigned the sublease (the "***Sublease***") to Utah Power and Light Company ("***UP&L***");

WHEREAS, PacifiCorp is the successor-in-interest by merger to UP&L and, as such, is the assignee and holder of the Sublease and all rights and obligations of UP&L in the Sublease, and the Lease;

WHEREAS, PacifiCorp has represented to the Trustee that the entirety of the property covered by the Lease has been mined, and the coal resource extracted, to the extent economically feasible;

WHEREAS, PacifiCorp and the Trustee have determined and concluded, therefore, that the Lease should be fully relinquished and surrendered to the United States; and

WHEREAS, pursuant to the terms of the Lease and applicable regulations, PacifiCorp wishes to fully relinquish and surrender the Lease to the United States and, to the extent it has rights, title or interest in the Lease, the Trust wishes to fully relinquish and surrender the Lease to the United States, and consents to the relinquishment and surrender of the Lease to the United States by PacifiCorp.

AGREEMENT

NOW, THEREFORE, the Trust, through the Trustee, to the extent it has any right, title or interest in the Lease, hereby (1) fully relinquishes and surrenders the Lease to the United States, and (2) consents to the full relinquishment and surrender of the Lease to the United States by PacifiCorp.

FURTHERMORE, PacifiCorp shall comply with all Lease and Sublease terms and conditions and is responsible for any and all payments and fees due under the disposition and reclamation process. PacifiCorp is responsible for all reclamation processes.

FURTHERMORE, the Trust and Trustee provide no warranties or representations whatsoever.

WEALTH & FIDUCIARY SERVICES
A division of ZB, N.A. Wealth Management
Trustee of the Armeda McKinnon Illiquid Assets Trust

Jason Postma

By: Jason Postma

Its: Assistant Vice-President

STATE OF UTAH)
: ss.
COUNTY OF SALT LAKE)

On the 26th day of September, 2018, personally appeared before me Jason Postma, who being first duly sworn, did say that he/she is the Assistant Vice President of WEALTH & FIDUCIARY SERVICES, a division of ZB, N.A. Wealth Management, Trustee of the Armeda McKinnon Illiquid Assets Trust, that he/she signed the foregoing document on behalf of Zions First National Bank by authority of a resolution of its Board of Directors, and that Zions First National Bank duly executed the foregoing document.

Notary Public
Residing at: Salt lake

My commission expires:
June 23, 2022

NOTARY PUBLIC
Thais B.A Sharp
700809
My Commission Expires
06/23/2022
STATE OF UTAH

97484808.1 0076000-02003

Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTU-084924 is described below:

Federal Coal Lease UTU-084924		
Lease Readjustment Effective Date:		8/1/2014 to 8/1/2024
Lessee of Record:		Armeda McKinnon Illiquid Assets Trust
Sublessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,211.48**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R6E, SLB&M Emery County, UT		
Sec 1:	Lots 1-3, S½NE¼, SE¼NW¼, E½SW¼, SE¼	491.48
Sec 12:	E½, E½W½	480.00
Sec 13:	NE¼, E½NW¼	240.00
Total Lease Acres for Full Relinquishment:		**1,211.48**
Total Lease Acres Remaining:		**0.00**

FEDERAL COAL LEASE UTU-084924
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

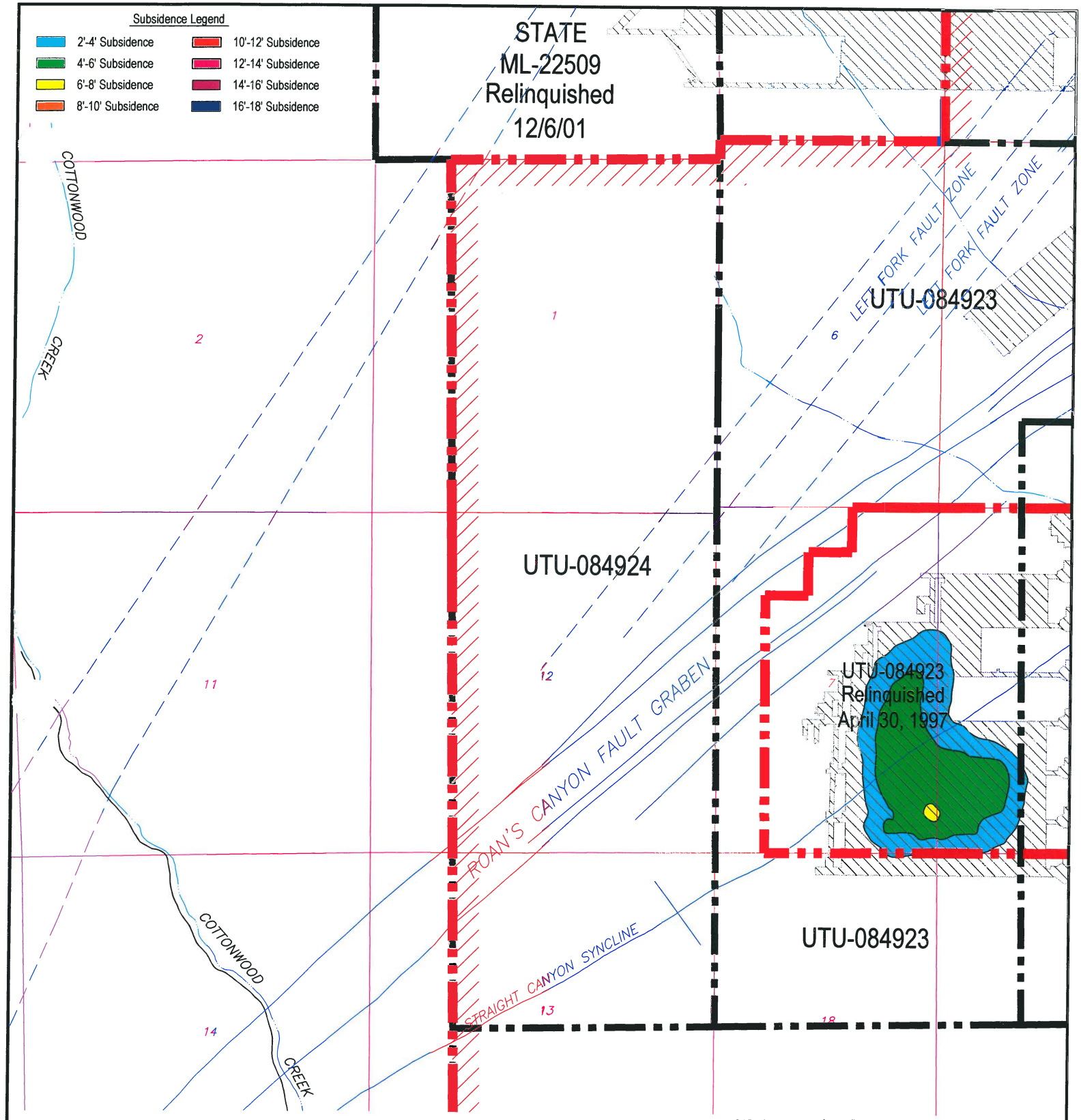
Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-084924 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

No mining took place on this lease. As no mining took place on the lease, no mining related subsidence was possible and no subsidence monitoring took place. The surface remains stable.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-084924 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-084924

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

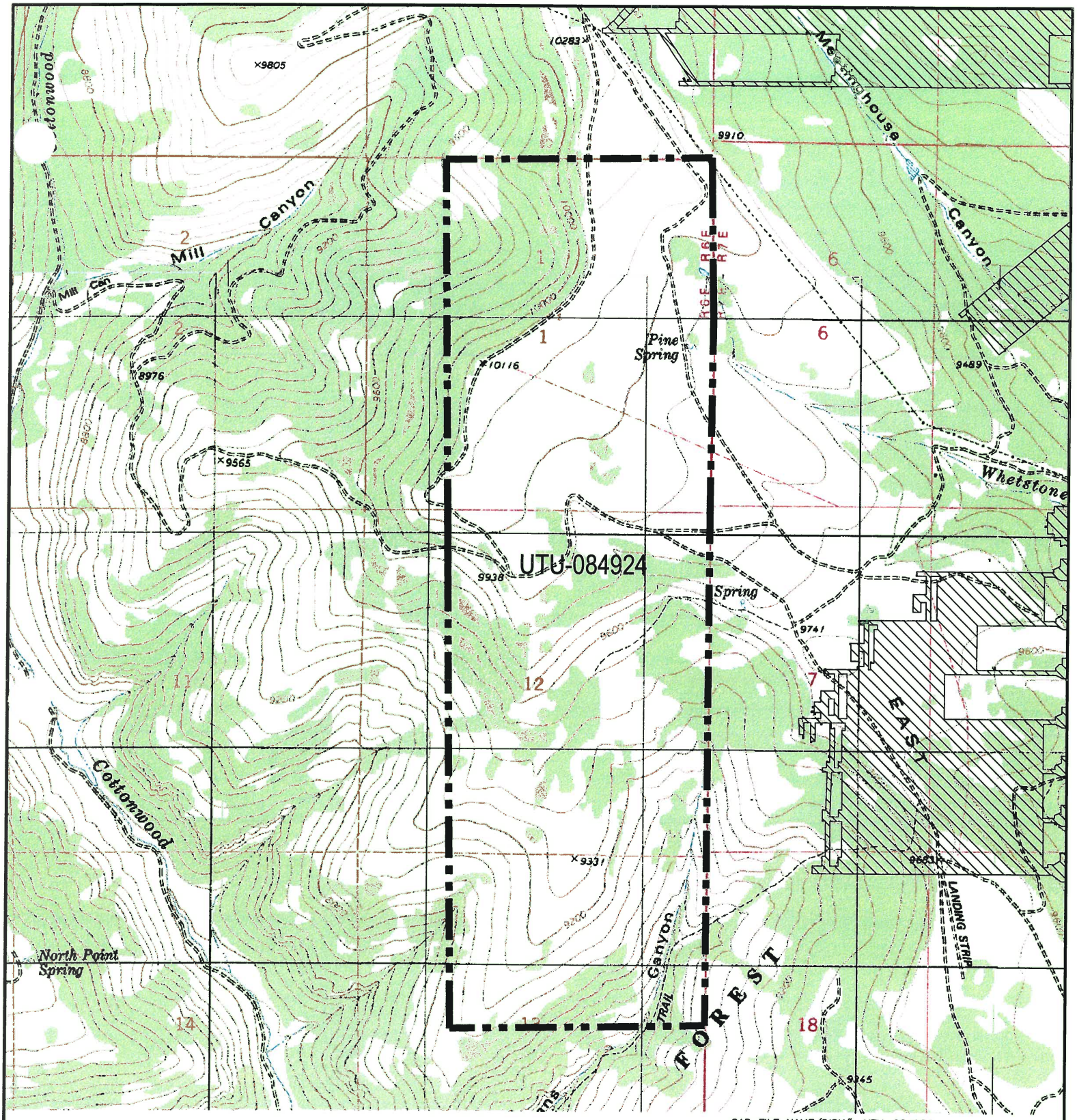
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084924
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-084924 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

No mining took place on this lease. As no mining took place on the lease, no mining related impacts to surface topography took place. The surface remains stable.



CAD FILE NAME/DISK#: UTU-084924

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

N

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084924
TOPOGRAPHIC BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX B
SCALE:	1" =2000'	DRAWING #:
DATE:	MAY 1, 2018	SHEET 1 OF 1 REV. ___

Deer Creek Mine
Federal Coal Lease UTU-084924 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 13 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over most of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

No mining took place on this lease. As no mining took place on the lease, no mining related impacts to surface or groundwater hydrology were possible.

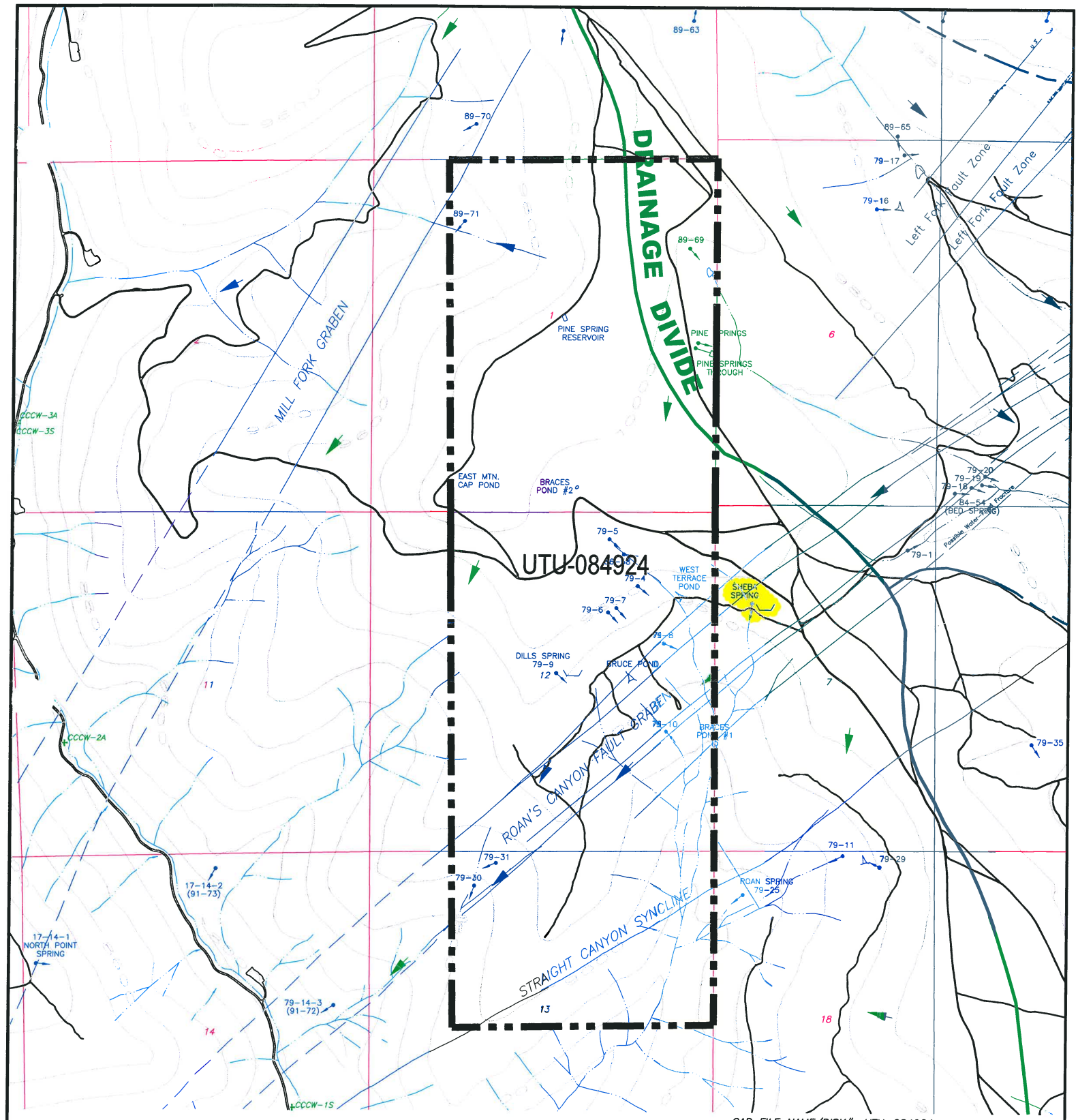
Sheba Spring is the only monitored spring within ½ mile of the boundaries of UTU-084924.

Statement concerning Hydrologic Monitoring Reduction Amendment, submitted May 03, 2013, and approved by UDOGM November 25, 2014 and previous reduction amendments and relinquishments.

The purpose of this amendment was to reduce the hydrologic monitoring responsibilities of PacifiCorp for the following reasons:
To eliminate sites outside of existing permit boundaries,
To eliminate sites outside of federal lease boundaries,
To eliminate sites in areas that were mined out and stabilized,
To eliminate sites in areas that will not be mined.
Two investigations are referred to in the amendment which conclude that there is no significant relationship between underground mining and intercepted groundwater and changes in surface and groundwater quantity or quality.
PacifiCorp submitted the first of three phases of lease relinquishment to the BLM for areas in the southern part of the LMU that had been mined out and where subsidence was considered to be substantially complete, or would not be mined. These relinquishment phases were approved by BLM and its Memorandum Of Understanding (MOU) partners (UDOGM, USDA Forest Service) in 1992, 1997 (East Mountain LMU UTU-73336), and 2009 (Trail Mountain LMU). The approval of the monitoring reduction amendment by DOGM in 2014 is an indication of

agreement by all parties involved that there have been no impacts to surface or groundwater from the mining in these leases. The fact that PacifiCorp is no longer required by the MOU participant agencies to monitor surface or groundwater in this area is sufficient documentation for the remainder of the leases to be relinquished.
Mining in the southern half of the East Mountain LMU has been essentially complete since the year 2001, when the Cottonwood Mine ceased production and the portals were closed. In the intervening years, as those areas have stabilized, monitoring of subsidence and hydrology were terminated as those areas were considered to be stable and not impacted by mining.

The only remaining spring in the monitoring program that is within ½ mile of Federal Lease UTU-084924 is Sheba Spring, near the top of East Mountain. Full documentation of the unaffected nature of this spring is included in this submittal and with the relinquishment submittal for UTU-084923. PacifiCorp has applied to the Utah Division of Oil, Gas, and Mining to remove this spring from the monitoring program since it has not been affected by mining.



CAD FILE NAME/DISK#: UTU-084924

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084924
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

EAST MOUNTAIN SPRING DATA
East Mountain Area

Federal Lease UTU-084923							
SPRING	**MINING HISTORY**		**STATUS**	**LOCATION**			**Approximate Subsidence (feet)**
	Type of Mining	**Date of Mining** (Pre/Post water quality analysis based on dates listed for each spring)		**Sec.**	**T.**	**R.**	
SHEBA SPRING	Not Undermined	NA Nearest second mining: 1890' Mar. 1991	Within Relinquishment	7	17S	7E	NA

Location: Section 7, Township 17 South, Range 7 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-084923.

Lease Association: Sheba Spring is located within Federal Coal lease UTU-084923. The lease was originally issued effective August 1, 1964. Room and pillar mining began in the Blind Canyon Seam in July 1983 with final production from the lease in June 2005. No mining occurred in vicinity of Sheba Spring.

Subsidence: No subsidence has been detected near Sheba Spring. The 2008 Annual Subsidence Report reported that the subsidence west of the spring has been stable since at least 2005. Sheba Spring is outside of the subsided area.

For additional data related to subsidence refer to the 2008 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring Sheba Spring. Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected from 1981 and has continued through 2018. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, and 5. The East Mountain weather station is located on the southern tip of East Mountain.
  - Sheba Spring is located on south facing hillside vegetated with mountain brush and grass. Spring collection box and trough located adjacent to USFS Forest Development Road #303. Flow from spring 80-50 generally ranges from 0 gpm/seep to a maximum of ~25 gpm.

Geologic Mode of Occurrence for spring Sheba Spring:

- Spring located along the northern fault of the Roan's Canyon fault graben. Water percolating down fractures along the fault within the Flagstaff Formation intersect the North Horn Formation and flows laterally to the surface.
- Geologic Formation: Flagstaff Limestone (refer to Geologic Occurrence sheet).
- Stratigraphic Position: at base.

Justification for removal from monitoring: Sheba Spring has been monitored by PacifiCorp from 1981 through 2018. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in the Deer Creek Mine (federal leases UTU-88554 and adjacent Federal Lease UTU-84285 [Mill Fork area]) ceased as of January 7, 2015 Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site Sheba Spring be removed from the monitoring program.

EAST MOUNTAIN

EAST MOUNTAIN & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **Sheba Spring**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
1540' S.	500' E.	NW	7	17S	7E	9740

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
Flagstaff	Spring box and trough	None	0' above bottom

Location Comments: Spring developed for livestock. Water flows through an underground pipe to a trough.

Probable Recharge Area: Areas of higher elevations to the northwest.

Relationship to Adjacent Springs: Located along the same fault as spring 79-10.

Geologic Occurrence of Spring:

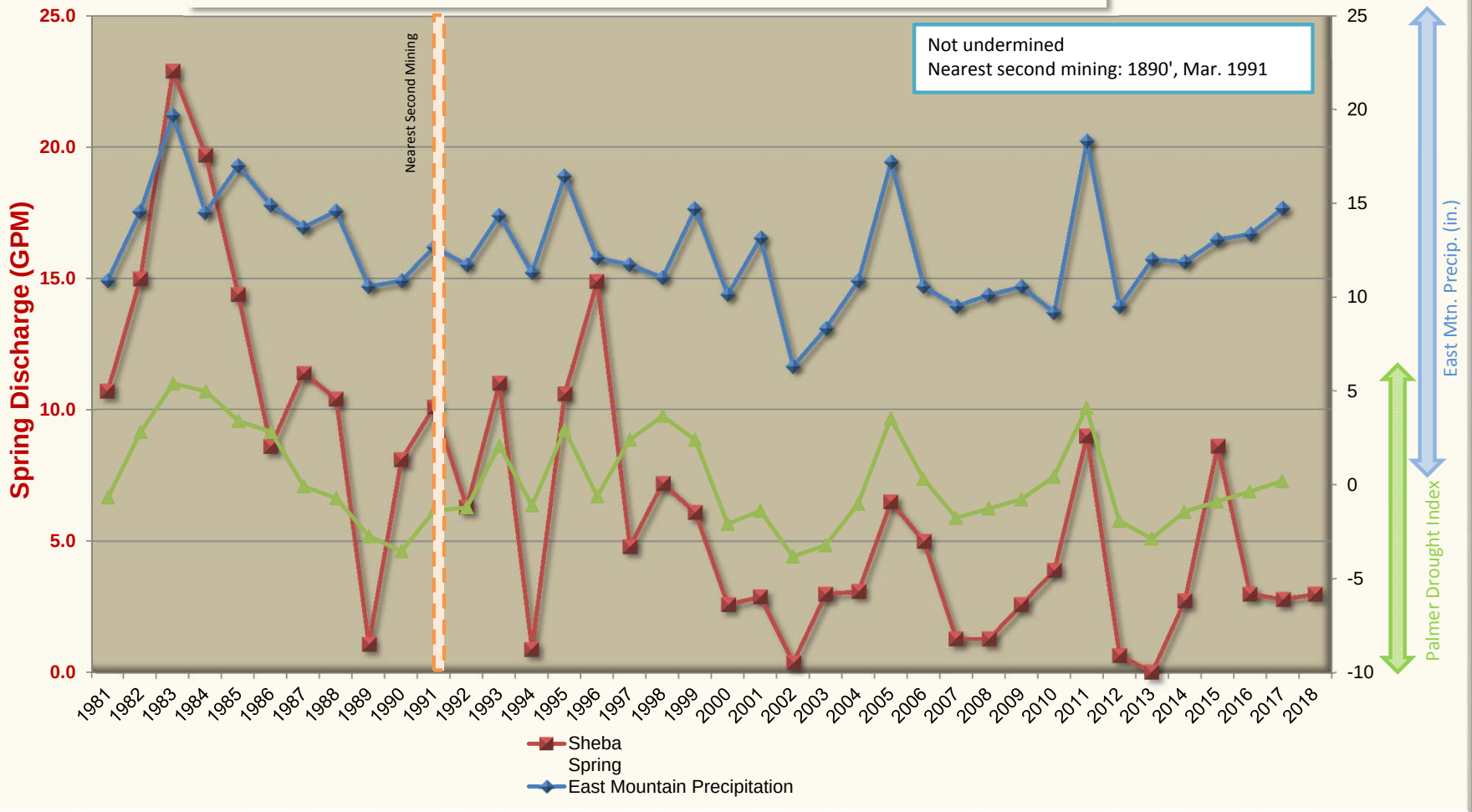
Spring located along the northern fault of the Roan's Canyon fault graben. Water percolating down fractures along the fault within the Flagstaff Formation intersect the North Horn Formation and flows laterally to the surface.

Sheba Spring, May 23, 2018

Sheba Spring Trough, May 23, 2018. Flow rate 3.0 gpm.

EAST MOUNTAIN SPRINGS - EAST MTN. SPRING: Sheba Spring vs. PRECIPITATION

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION AND PALMER DROUGHT INDEX



East Mountain Spring: Sheba Springs
Water Quality Data: Operational
Mine Association: Deer Creek Mine - East Mountain
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 1890'
Date of Nearest Mining: Mar-91

	Pre-Mining Data: 19770101 THROUGH 19910301				Post-Mining Data: 19910331 THROUGH 20171231				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	493	234	289.954	22	336	225	278.48	52	BICARBONATE
CALCIUM	137	64.3	89.8037	27	98.4	53.7	81.7456	57	CALCIUM
CARBONATE	1	1	1	18	5	0	0.81481	27	CARBONATE
CHLORIDE	15	2.1	5.15	20	25	0	3.56041	48	CHLORIDE
CONDUCTIVITY	700	230	434.518	27	556	304	467.771	57	CONDUCTIVITY
DISSOLVED OXYGEN	8.6	6.6	7.6625	8	11.6	5.6	8.25555	18	DISSOLVED OXYGEN
FLOW	19.8	0.09	5.23787	33	14.9	0.08	3.15927	55	FLOW
HARDNESS	314	191	250.944	18	296	198	251.803	56	HARDNESS
TOTAL IRON	0				0.36	0	7.7826	23	TOTAL IRON
DISSOLVED IRON	0.8	0.02	0.12454	22	0.2	0	4.23076	26	DISSOLVED IRON
MAGNESIUM	13.2	5.5	9.92074	27	23.16	7.5	11.2368	57	MAGNESIUM
DISSOLVED MANGANESE	0				0.025	0	3.7647	17	DISSOLVED MANGANESE
MANGANESE	0.02	0.01	1.17647	17	0.2	0	4.41612	31	MANGANESE
OIL AND GREASE	1	0.1	0.55	2	0				OIL AND GREASE
PH	8.4	6.95	7.58906	32	8.2	6.8	7.47267	56	PH
POTASSIUM	9	0.01	1.606	20	18	0	1.39296	27	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	14	1.61	5.562	20	5	0.64	3.25803	51	SODIUM
SULFATE	181	1	32.85	22	14	3	5.11176	51	SULFATE
SUSPENDED SOLIDS	15	0.1	4.36956	23	13	1	5.5	8	SUSPENDED SOLIDS
TEMPERATURE	49	3.3	24.3037	27	53.6	5.1	18.6762	54	TEMPERATURE
TOTAL DISSOLVED SOLIDS	392	212	265.217	23	320	204	264.647	51	TOTAL DISSOLVED SOLIDS

Deer Creek Mine
Federal Coal Lease UTU-084924 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

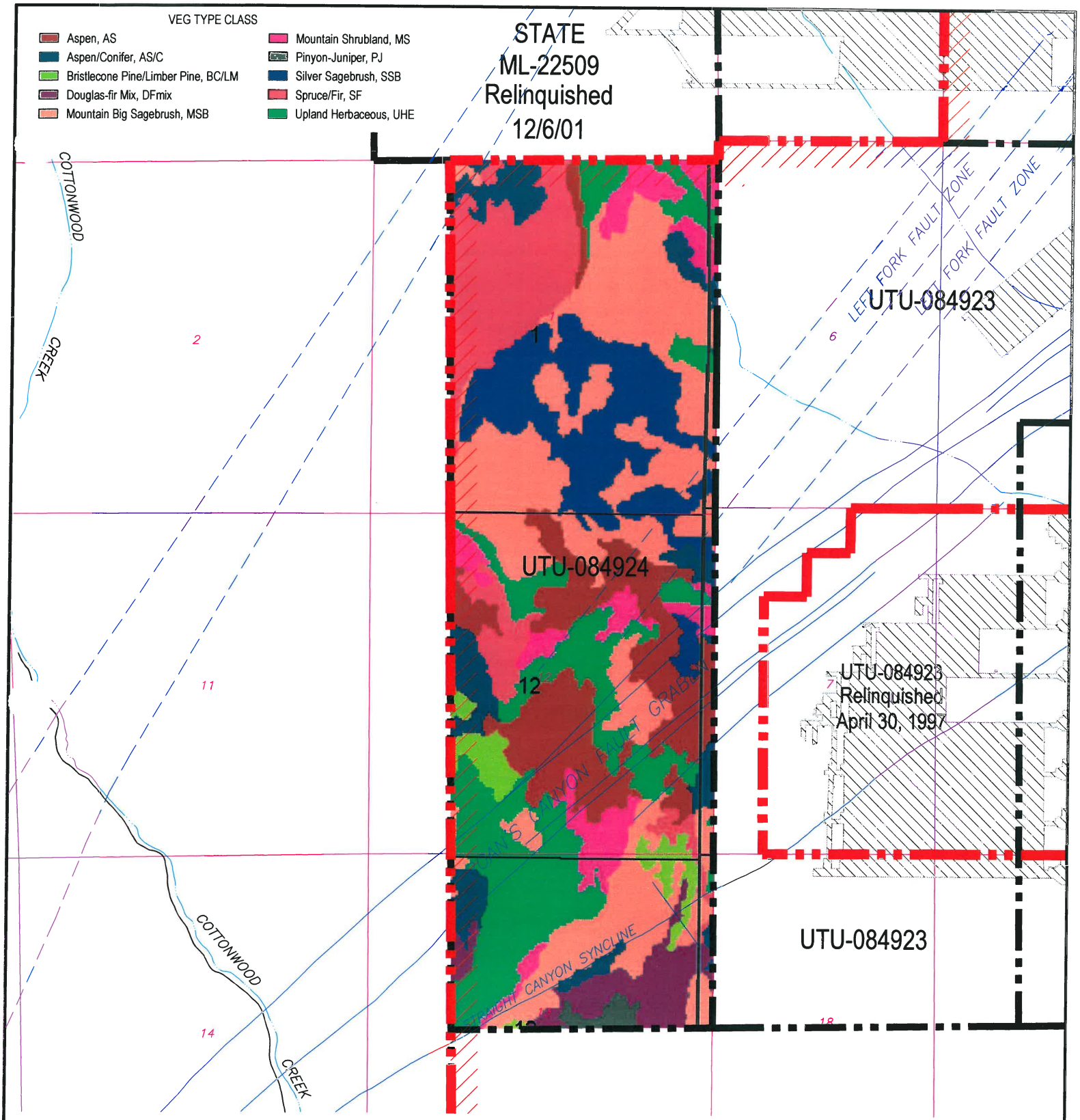
Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 13 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over most of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water or vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology and vegetation characteristics of the area.

No mining took place on this lease. As no mining took place on the lease, no mining related impacts to vegetation were possible.

Vegetation Types – UTU-084924:

Aspen	AS
Aspen/Conifer	AS/C
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Mountain Shrubland	MS
Pinyon-Juniper	PJ
Silver Sagebrush	SSB
Spruce/Fir	SF
Upland Herbaceous	UHE

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-084924 area. There were no surface facilities or installations on this lease.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-084924 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-084924

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084924
VEGETATION BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX D
SCALE:	1" =2000'	DRAWING #:
DATE:	MAY 1, 2018	SHEET 1 OF 1 REV. ___

Deer Creek Mine
Federal Coal Lease UTU-084924 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

No mining took place on this lease. As no mining took place on the lease, no mining related impacts to private improvements were possible. There are no private surface improvements in Lease UTU-084924.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

No mining or underground activities took place on this lease. CERCLA documents are provided in any case.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7 2018

Lease(s) # UTU-084924 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) None

Coal Bed: None

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

D-m [illegible] 11/7/18

(Officer of the Lessee) (Date)

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV 7 2018

Lease(s) # UTU-084924 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) None

Coal Bed None

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			

CERCLA CERTIFICATION

Lease(s) # UTU-084924 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) None

Coal Bed: None

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

D. M. [illegible] 11/7/18

(Officer of the Lessee) (Date)

PETROLEUM PRODUCT REPORT

Submittal Date NOV, 7, 2018

Lease(s) # UTU-084924 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) None

Coal Bed None

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-084924 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) None

Coal Bed None

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
None			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-084924 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) None

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: None

Submittal Date: NOV. 7, 2018

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-084924
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

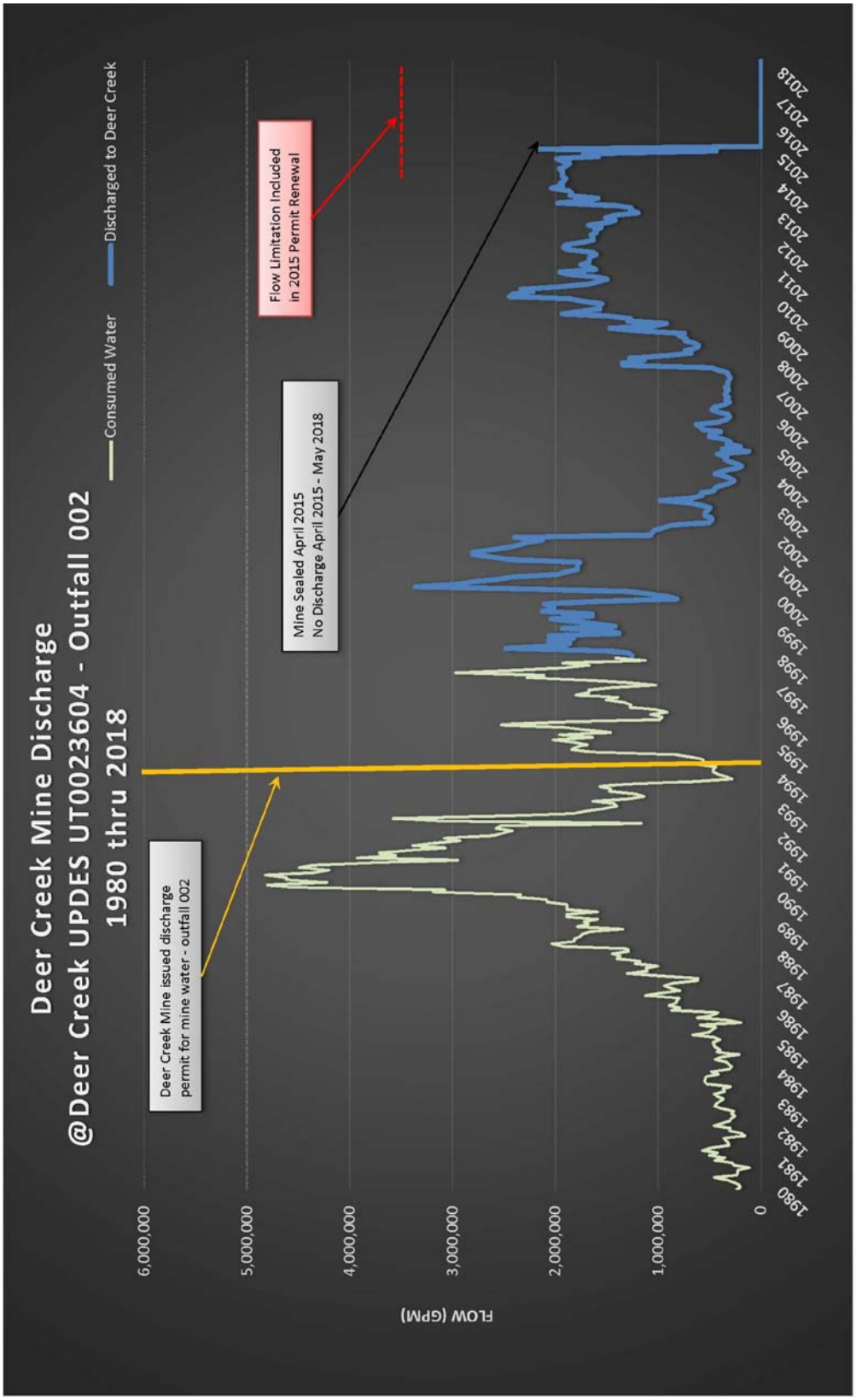
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



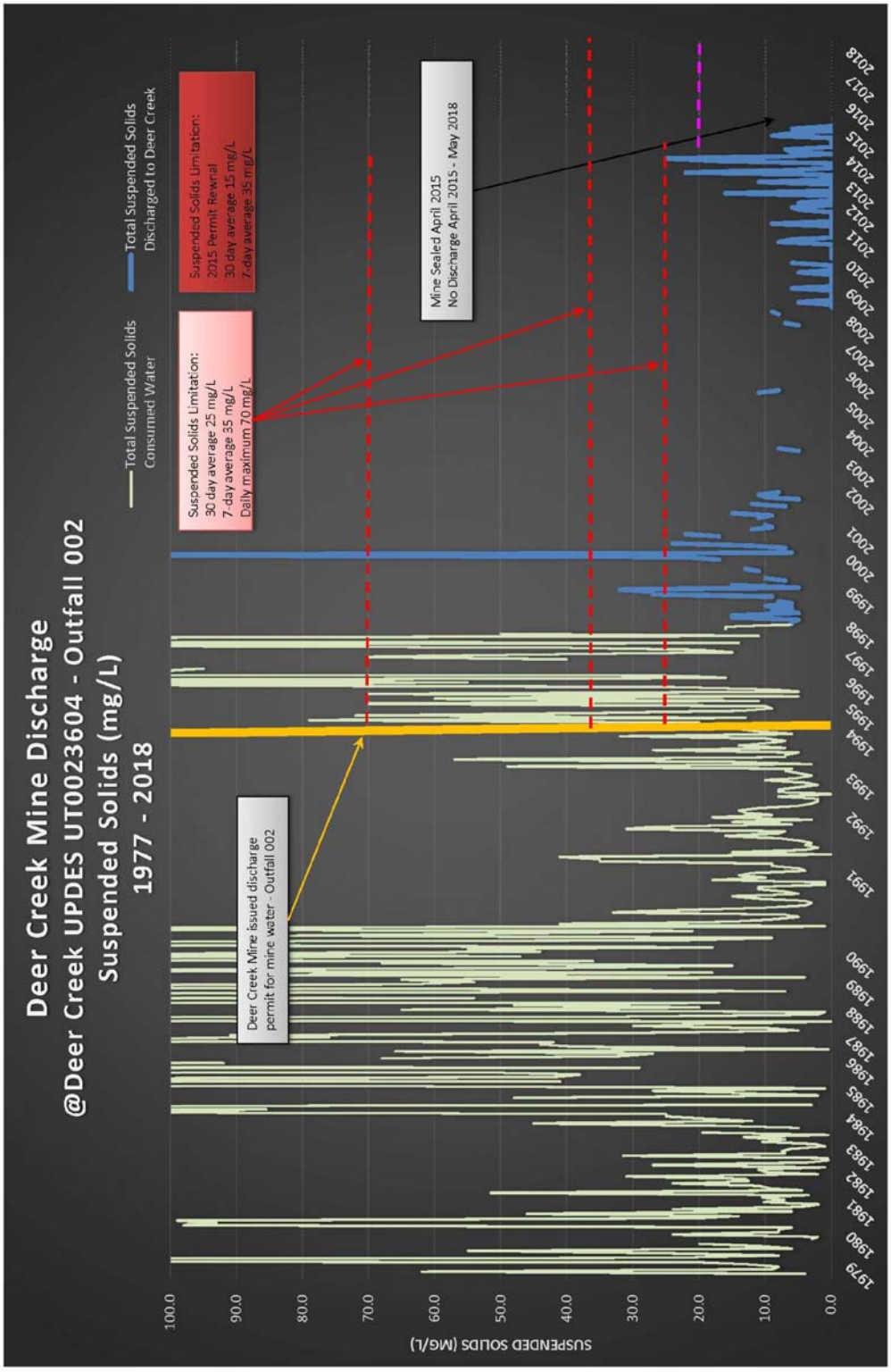
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



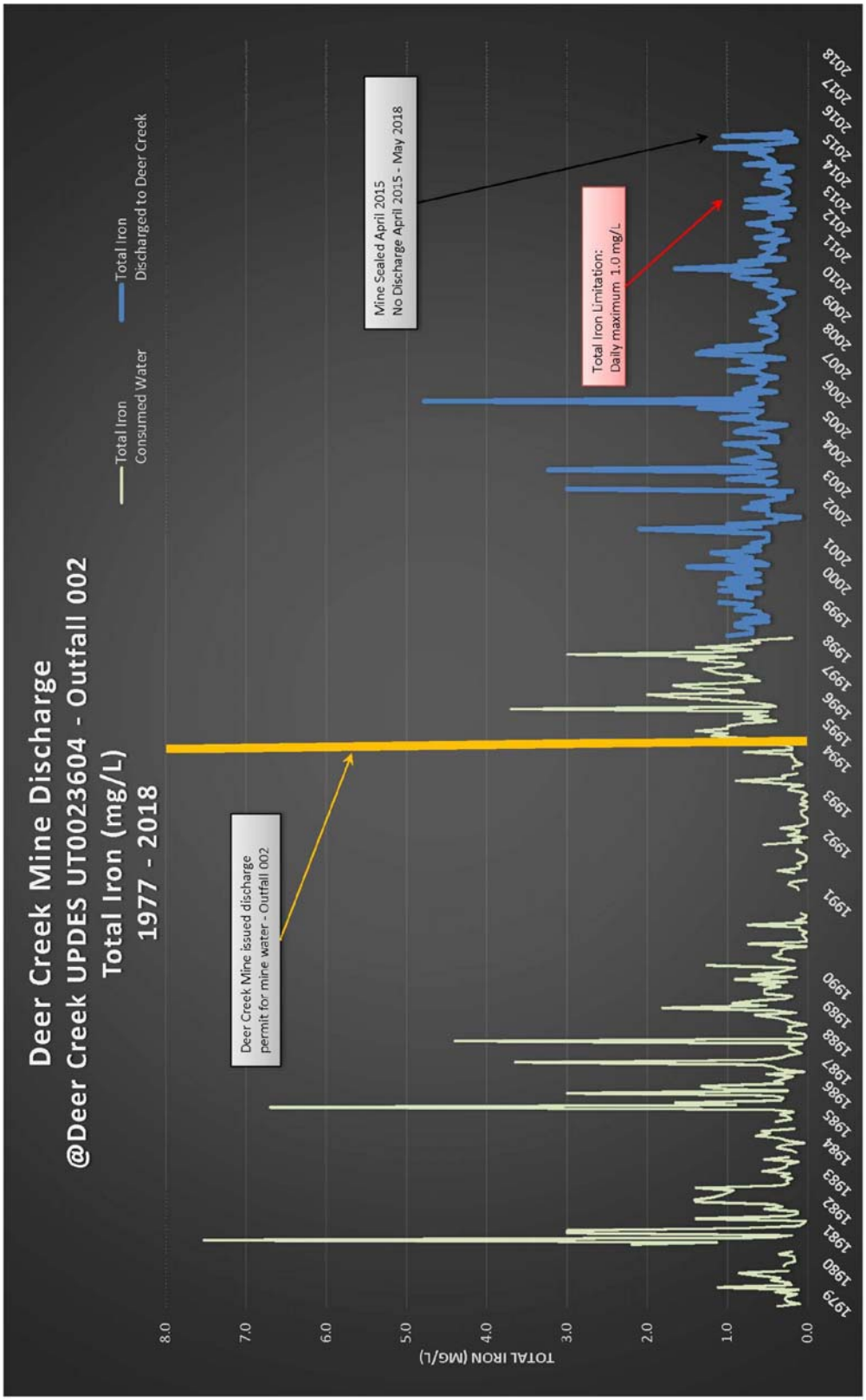
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



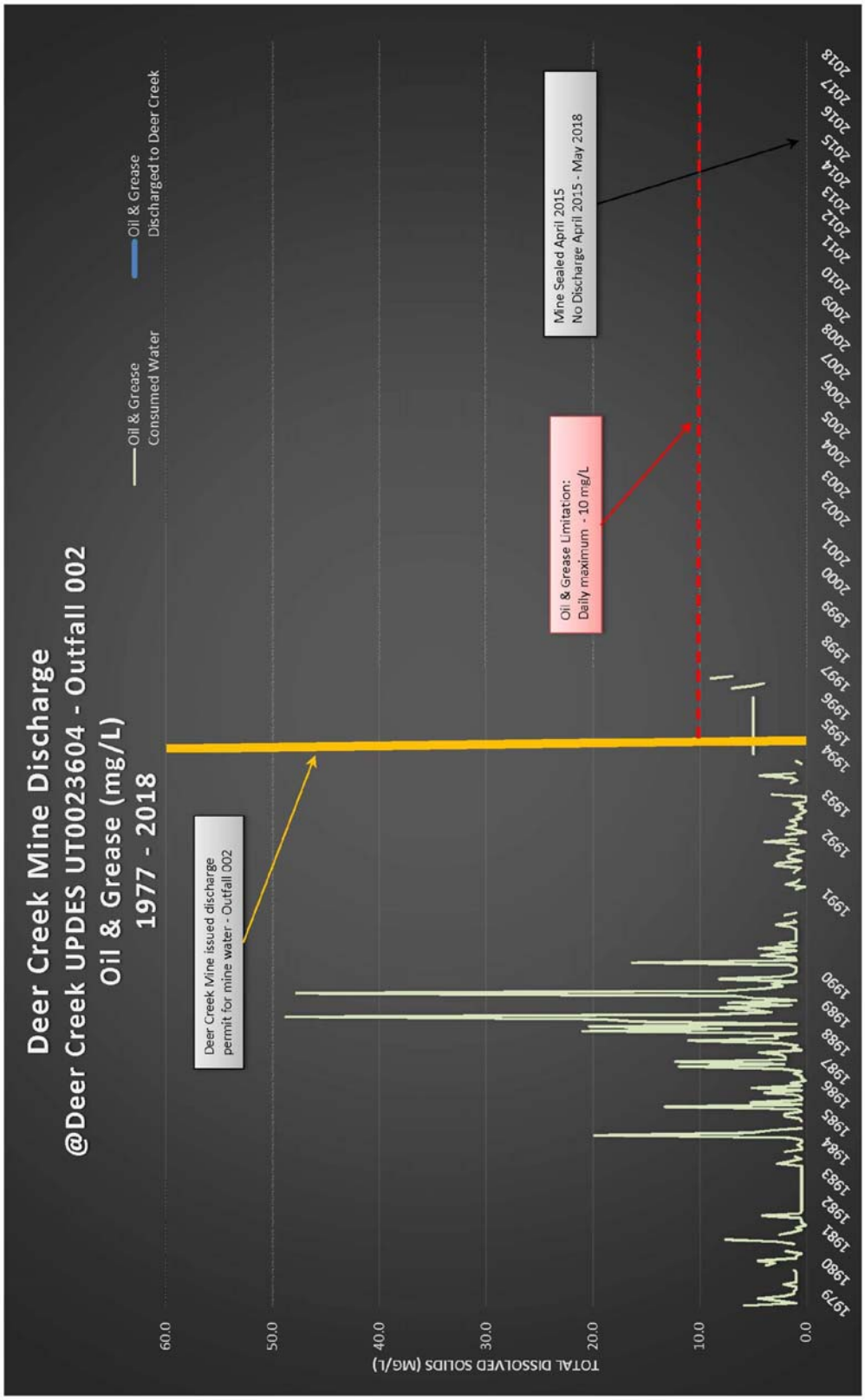
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



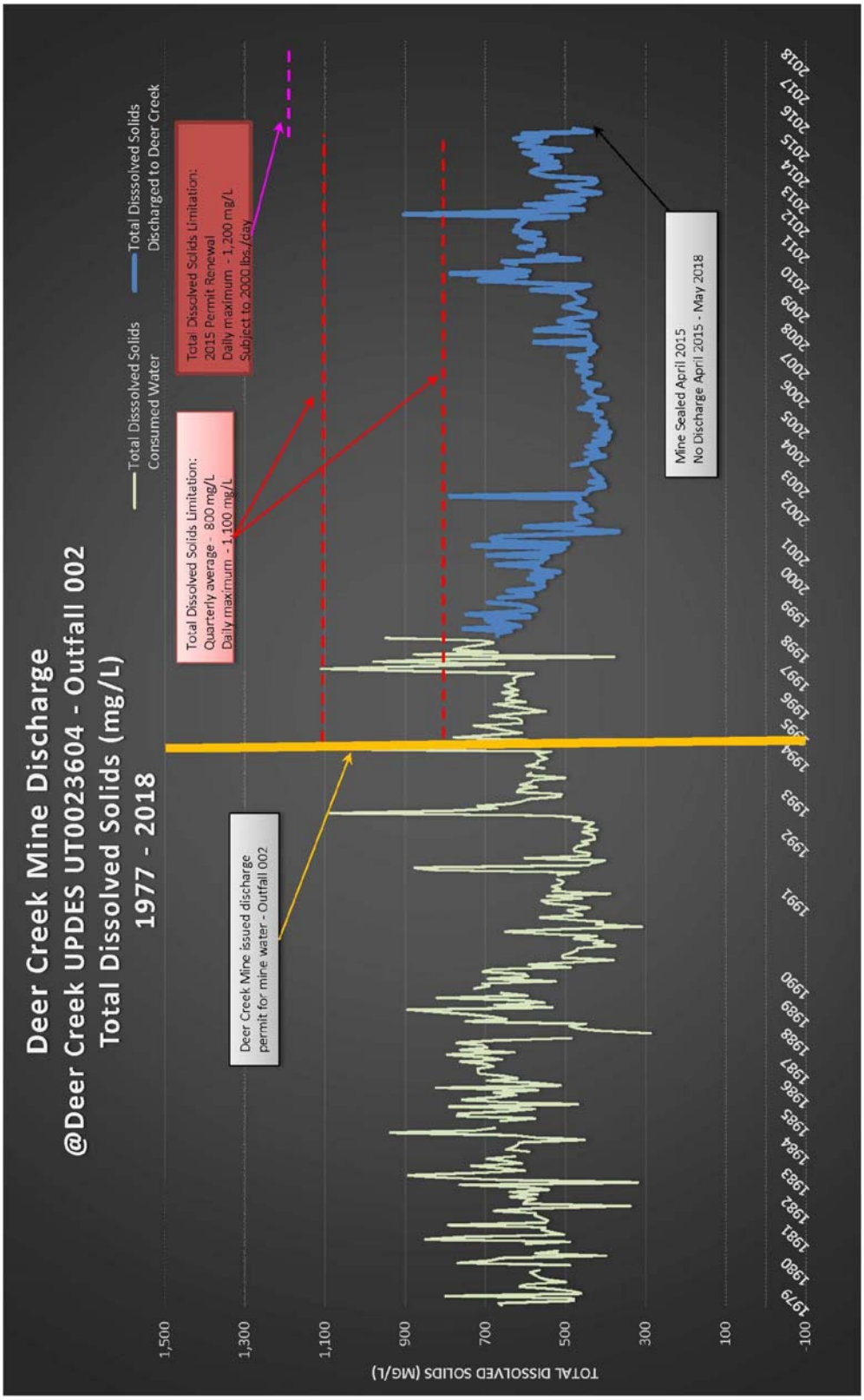
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



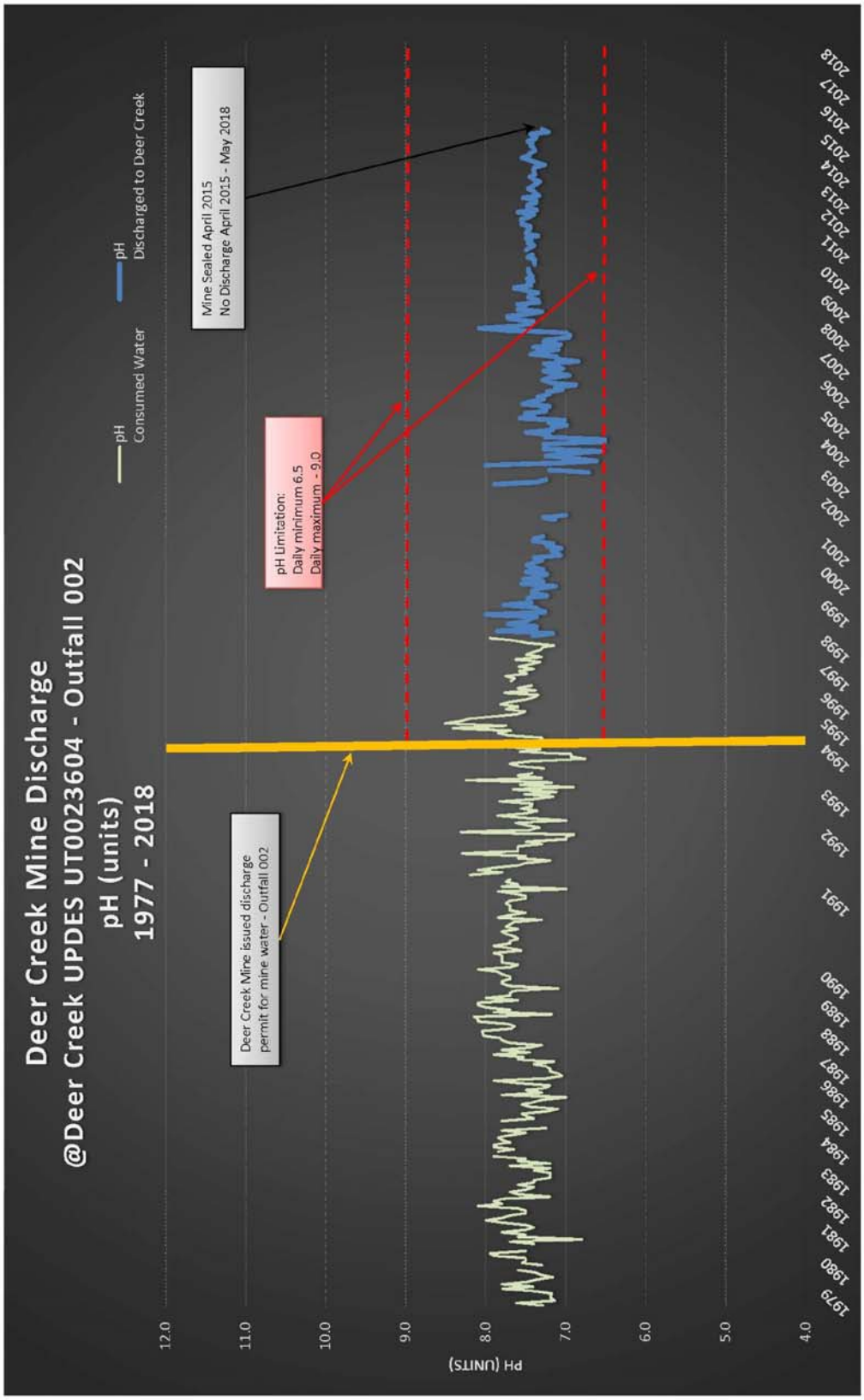
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTU-084923

November, 2018

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Prepared by:

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-084923, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-084923. The total acreage being surrendered is 1,802.42 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTU-084923 is described below:

Federal Coal Lease UTU-084923		
Lease Readjustment Effective Date:		8/1/2014 to 8/1/2024
Lessee of Record:		Armeda McKinnon Illiquid Assets Trust
Sublessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,802.42**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 4:	Lots 2-7, 10-12, NW¼SE¼, N½SW¼	395.14
Sec 5:	Lots 1-12, N½S½, SW¼SW¼	563.92
Sec 6:	Lots 1-11, SE¼,	436.69
Sec 7:	Lots 1-4, W½NW¼NE¼, NE¼NW¼NE¼	120.80
Sec 17:	W½NW¼	80.00
Sec 18:	Lots 1 and 2, NE¼	205.87
Total Lease Acres for Full Relinquishment:		**1,802.42**
Total Lease Acres Remaining:		**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of the Armeda McKinnon Illiquid Assets Trust (Trust) as the lessee of record and PacifiCorp as the sublessee of record. Consent to relinquishment is acknowledged by the accompanying Relinquishment and Consent signed by the Trust dated September 26, 2018, and as set forth below by PacifiCorp.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the sublessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

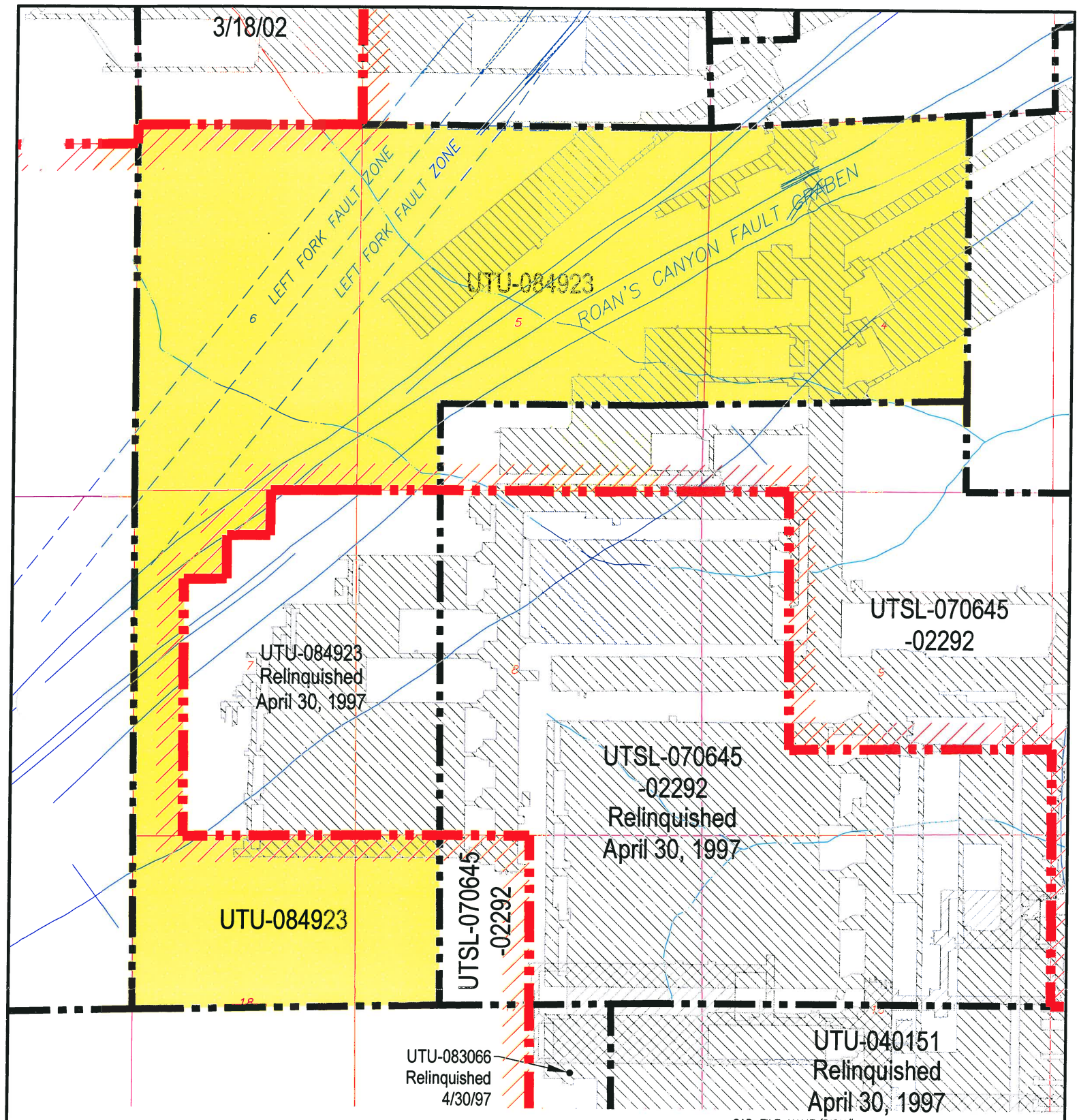
SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.



CAD FILE NAME/DISK#: UTU-084923

LEGEND

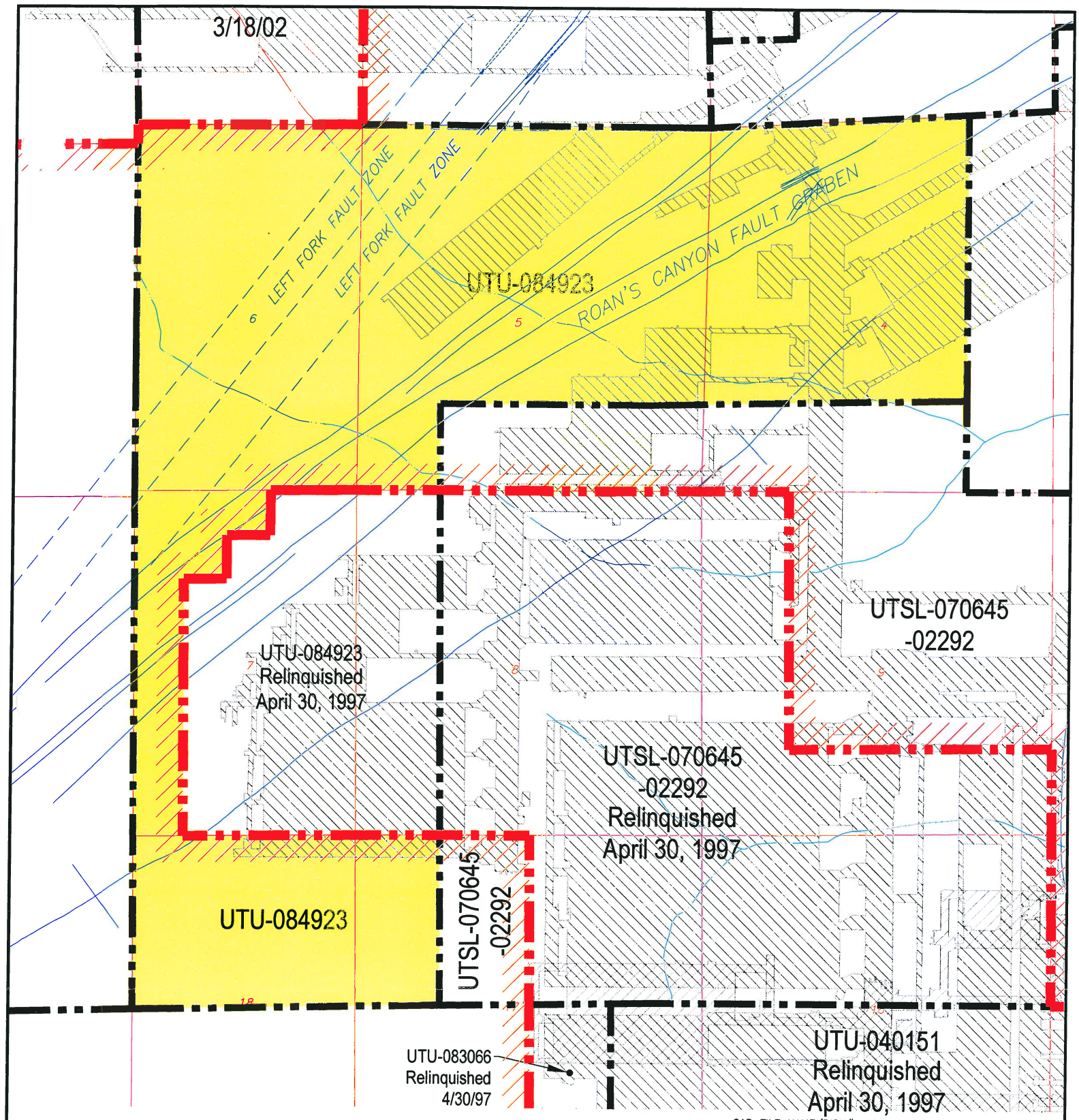
- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-084923 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084923

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___



CAD FILE NAME/DISK#: UTU-084923

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-084923 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084923

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

RELINQUISHMENT AND CONSENT
Federal Coal Lease UTU-084923

WHEREAS, the Armeda McKinnon Illiquid Assets Trust (successor-in-interest to the Malcolm N. McKinnon Trust)(the "***Trust***"), acting through Wealth & Fiduciary Service, a Division of ZB, N.A. Wealth Management, as trustee (the "***Trustee***") of the Trust, is the lessee of record of that certain coal lease, issued by the United States of America (the "***United States***"), acting through the Bureau of Land Management, identified by Serial Number UTU-084923 (the "***Lease***"), whereby, among other things, the Trust leased certain coal bearing property from the United States, which property is more specifically described in Exhibit A attached hereto;

WHEREAS, the Trust, through the Trustee, subleased the Lease to Peabody Coal Company, and Peabody Coal Company assigned the sublease (the "***Sublease***") to Utah Power and Light Company ("***UP&L***");

WHEREAS, PacifiCorp is the successor-in-interest by merger to UP&L and, as such, is the assignee and holder of the Sublease and all rights and obligations of UP&L in the Sublease and the Lease;

WHEREAS, PacifiCorp has represented to the Trustee that the entirety of the property covered by the Lease has been mined, and the coal resource extracted, to the extent economically feasible;

WHEREAS, PacifiCorp and the Trustee have determined and concluded, therefore, that the Lease should be fully relinquished and surrendered to the United States; and

WHEREAS, pursuant to the terms of the Lease and applicable regulations, PacifiCorp wishes to fully relinquish and surrender the Lease to the United States and, to the extent it has rights, title or interest in the Lease, the Trust wishes to fully relinquish and surrender the Lease to the United States, and consents to the relinquishment and surrender of the Lease to the United States by PacifiCorp.

AGREEMENT

NOW, THEREFORE, the Trust, through the Trustee, to the extent it has any right, title or interest in the Lease, hereby (1) fully relinquishes and surrenders the Lease to the United States, and (2) consents to the full relinquishment and surrender of the Lease to the United States by PacifiCorp.

FURTHERMORE, PacifiCorp shall comply with all Lease and Sublease terms and conditions and is responsible for any and all payments and fees due under the disposition and reclamation process. PacifiCorp is responsible for all reclamation processes.

FURTHERMORE, the Trust and Trustee provide no warranties or representations whatsoever.

WEALTH & FIDUCIARY SERVICES
A division of ZB, N.A. Wealth Management
Trustee of the Armeda McKinnon Illiquid Assets Trust

Jason Postma

By: Jason Postma

Its: Assistant Vice-President

STATE OF UTAH)
: ss.
COUNTY OF SALT LAKE)

On the 26th day of September, 2018, personally appeared before me Jason Postma, who being first duly sworn, did say that he/she is the Assistant Vice President of WEALTH & FIDUCIARY SERVICES, a division of ZB, N.A. Wealth Management, Trustee of the Armeda McKinnon Illiquid Assets Trust, that he/she signed the foregoing document on behalf of Zions First National Bank by authority of a resolution of its Board of Directors, and that Zions First National Bank duly executed the foregoing document.

Notary Public
Residing at: Salt Lake

My commission expires:
JUNE 23, 2022

NOTARY PUBLIC
Thais B.A Sharp
700809
My Commission Expires
06/23/2022
STATE OF UTAH

Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTU-084923 is described below:

Federal Coal Lease UTU-084923	
Lease Readjustment Effective Date:	8/1/2014 to 8/1/2024
Lessee of Record:	Armeda McKinnon Illiquid Assets Trust
Sublessee of Record:	PacifiCorp
Federal Coal Lease Acres:	**1,802.42**

Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 4:	Lots 2-7, 10-12, NW¼SE¼, N½SW¼	395.14
Sec 5:	Lots 1-12, N½S½, SW¼SW¼	563.92
Sec 6:	Lots 1-11, SE¼,	436.69
Sec 7:	Lots 1-4, W½NW¼NE¼, NE¼NW¼NE¼	120.80
Sec 17:	W½NW¼	80.00
Sec 18:	Lots 1 and 2, NE¼	205.87
Total Lease Acres for Full Relinquishment:		**1,802.42**
Total Lease Acres Remaining:		**0.00**

FEDERAL COAL LEASE UTU-084923
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-084923 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Blind Canyon seam. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam took place between 7/1983 and 1/2005.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In

steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the Trail Mountain Area were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

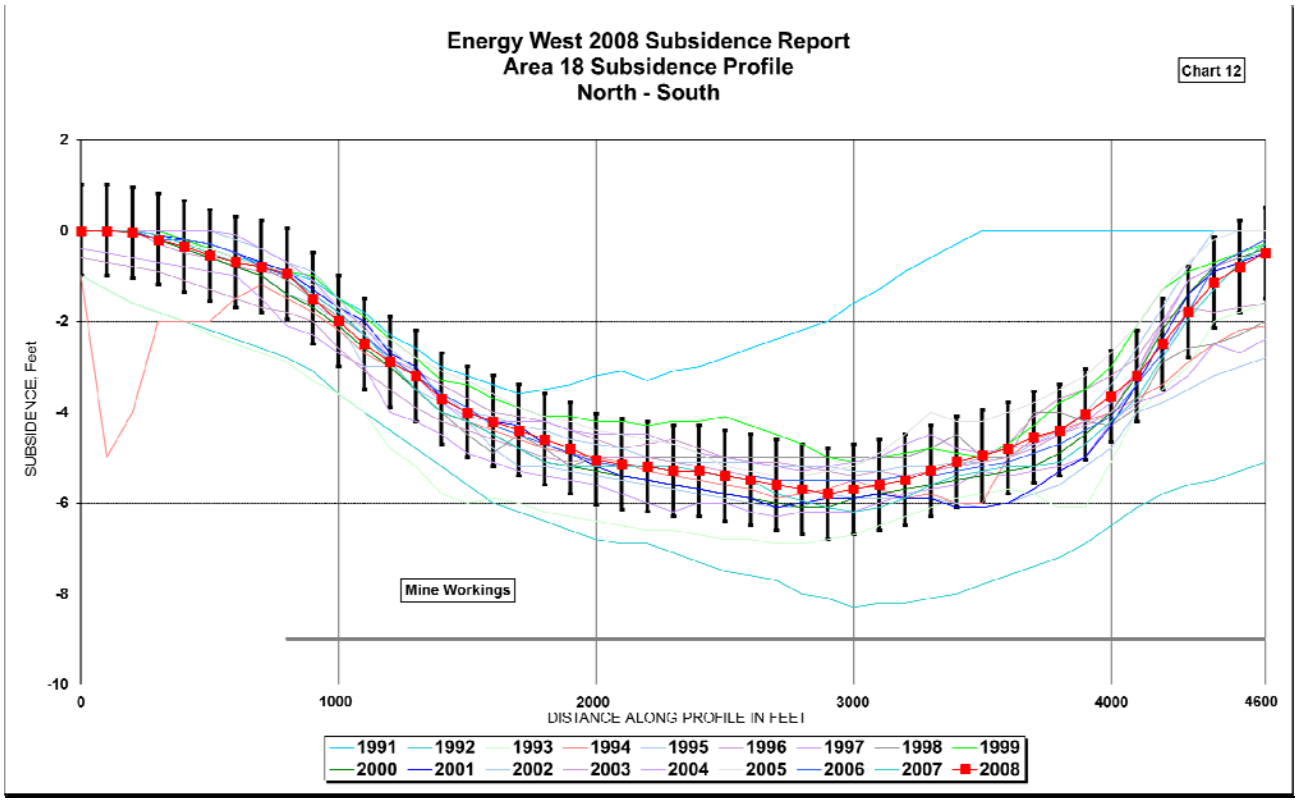
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

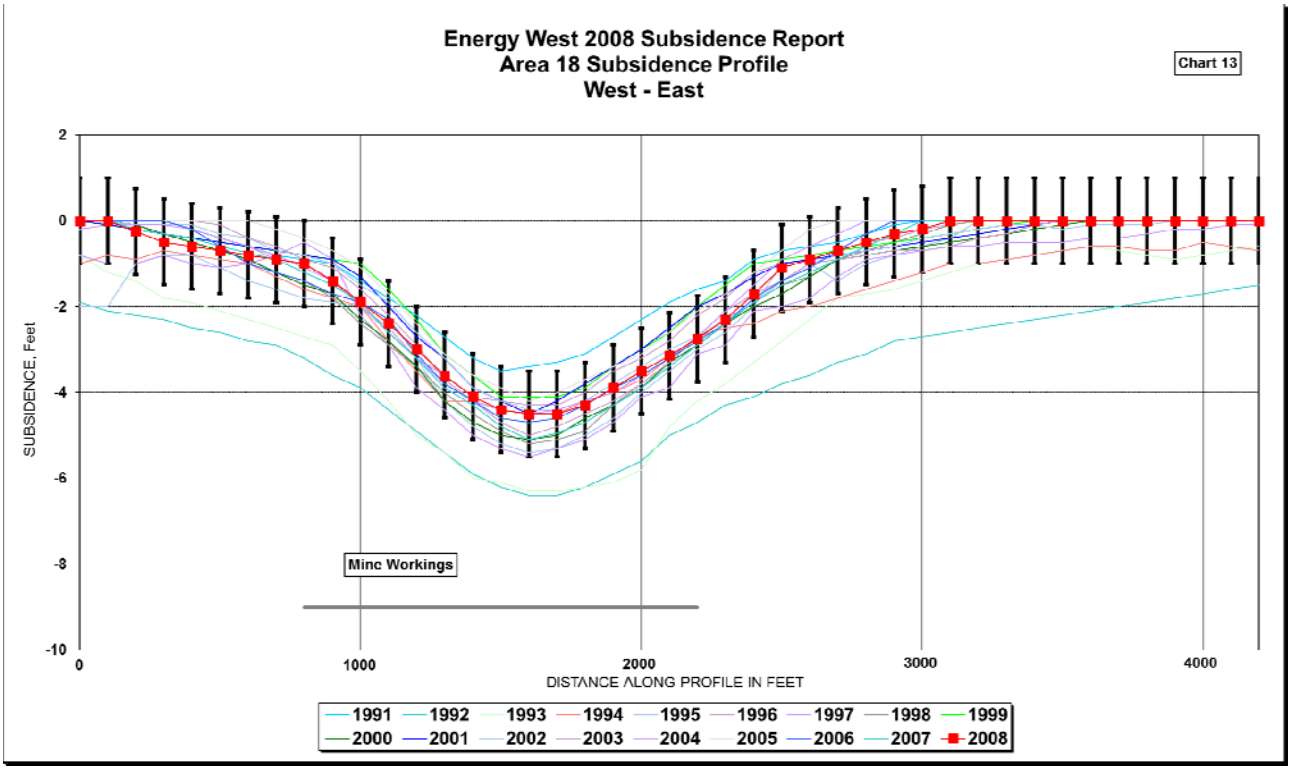
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

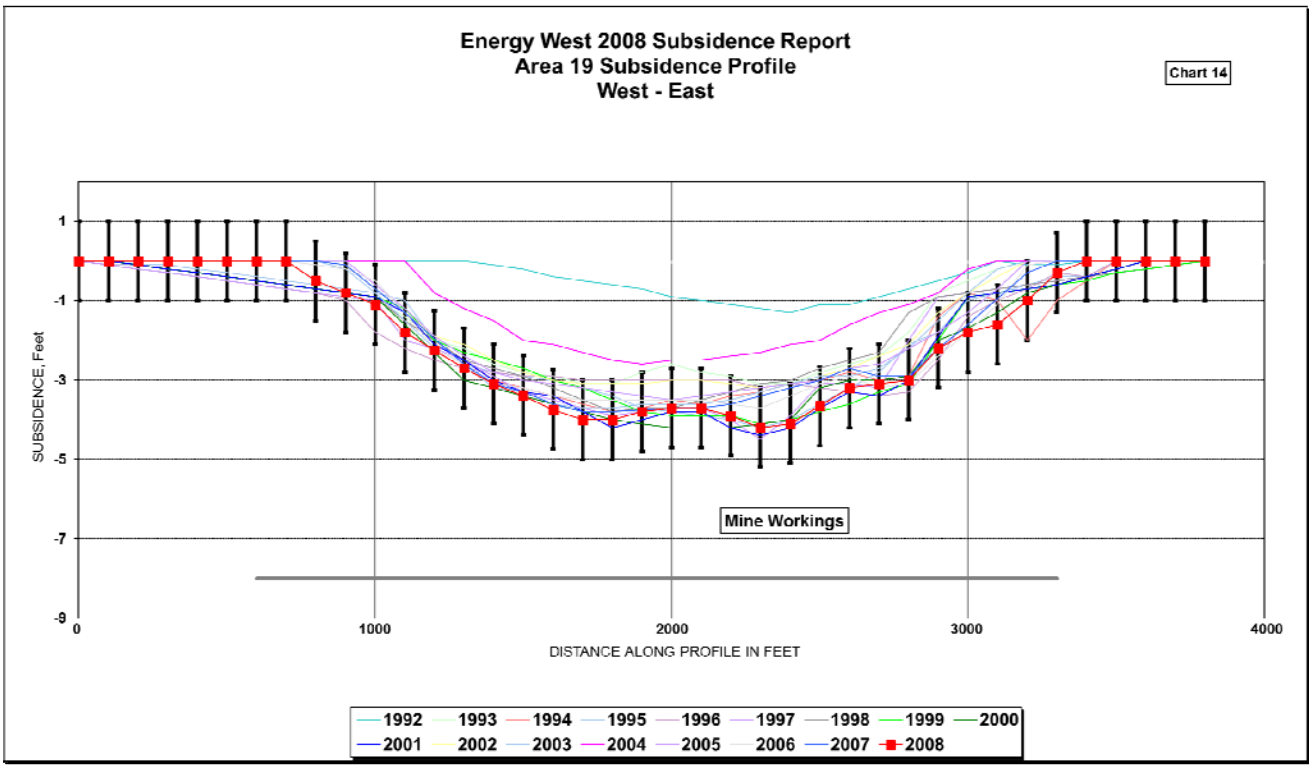
Federal Lease UTU-084923 Subsidence Data

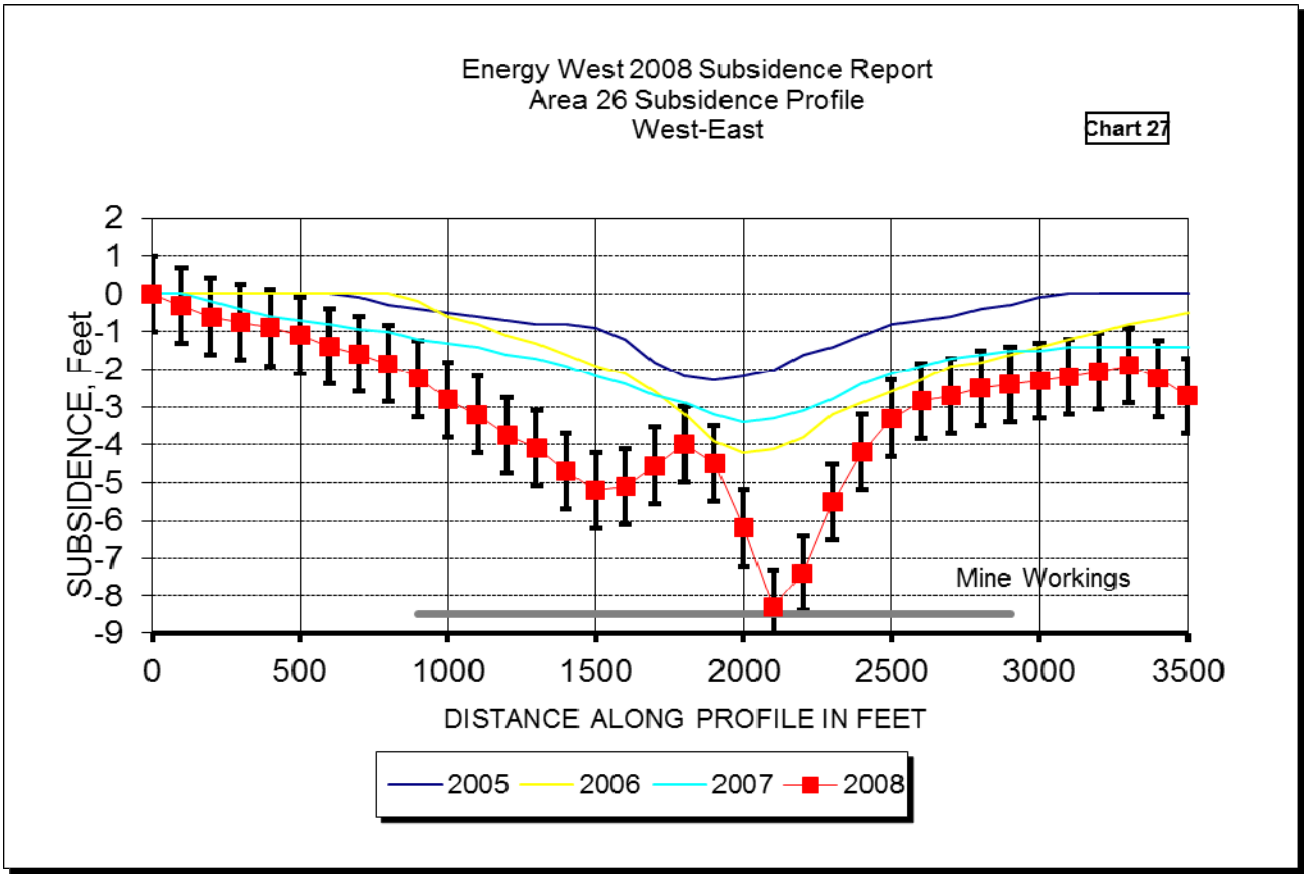
Subsidence in the lease UTU-084923 area was monitored from 1991 to 2008. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1991 and 2008. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

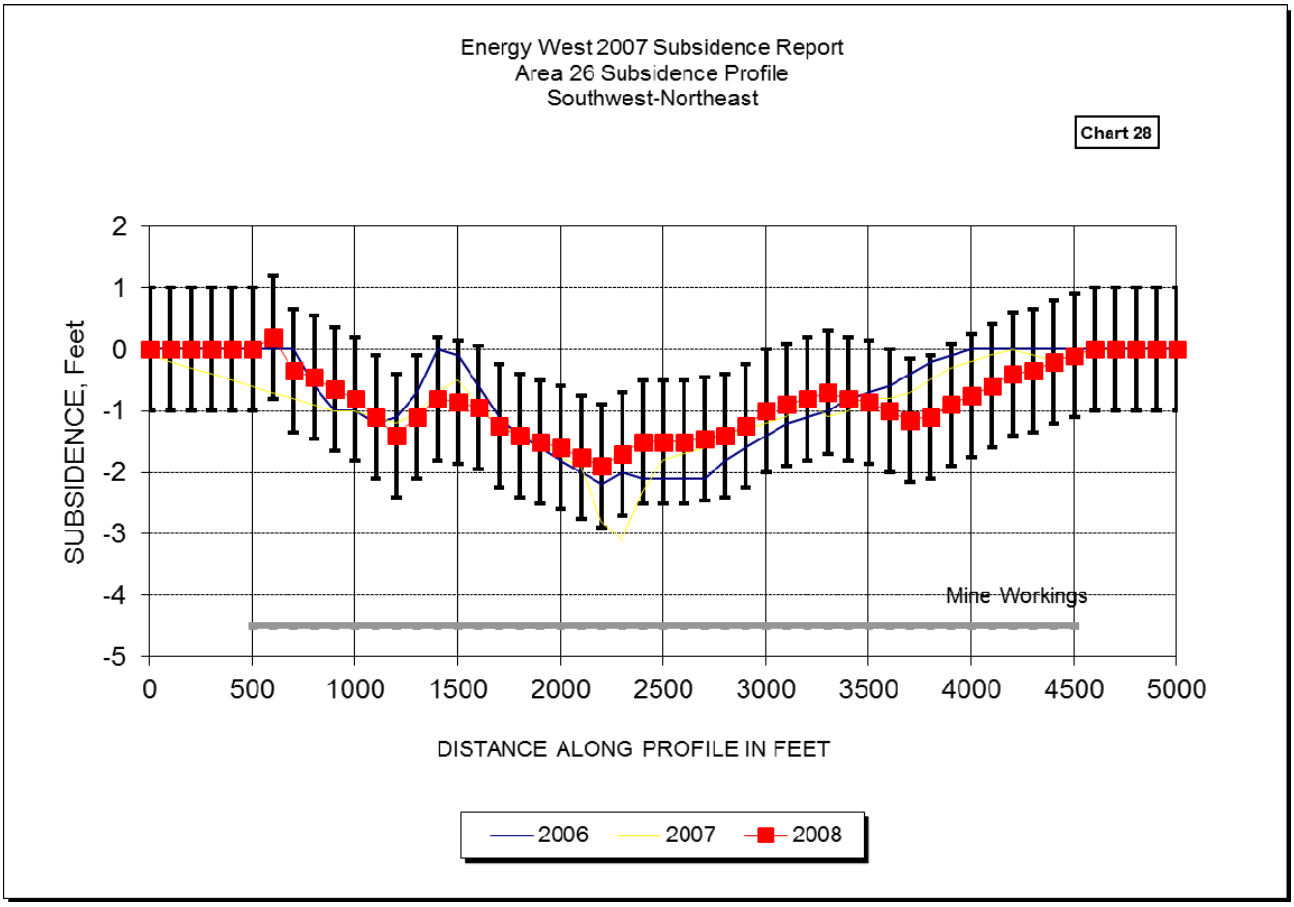
PacifiCorp delineated five profiles (in Areas 18, 19, 26) covering the main longwall panel districts in Lease UTU-084923, that are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 8 feet. Some minor cliff spalling of the Castlegate Sandstone occurred during undermining. Appropriate measures for protection of property and the public were taken during the subsidence of cliffs that were predicted to spall, including warning signs along the Rilda Canyon road to make the public aware of the potential hazards. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.




Energy West 2008 Subsidence Report
Area 18 Subsidence Profile
West - East
Chart 13
SUBSIDENCE, Feet
2
0
-2
-4
-6
-8
-10
0
1000
2000
3000
4000
DISTANCE ALONG PROFILE IN FEET
Mine Workings
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008

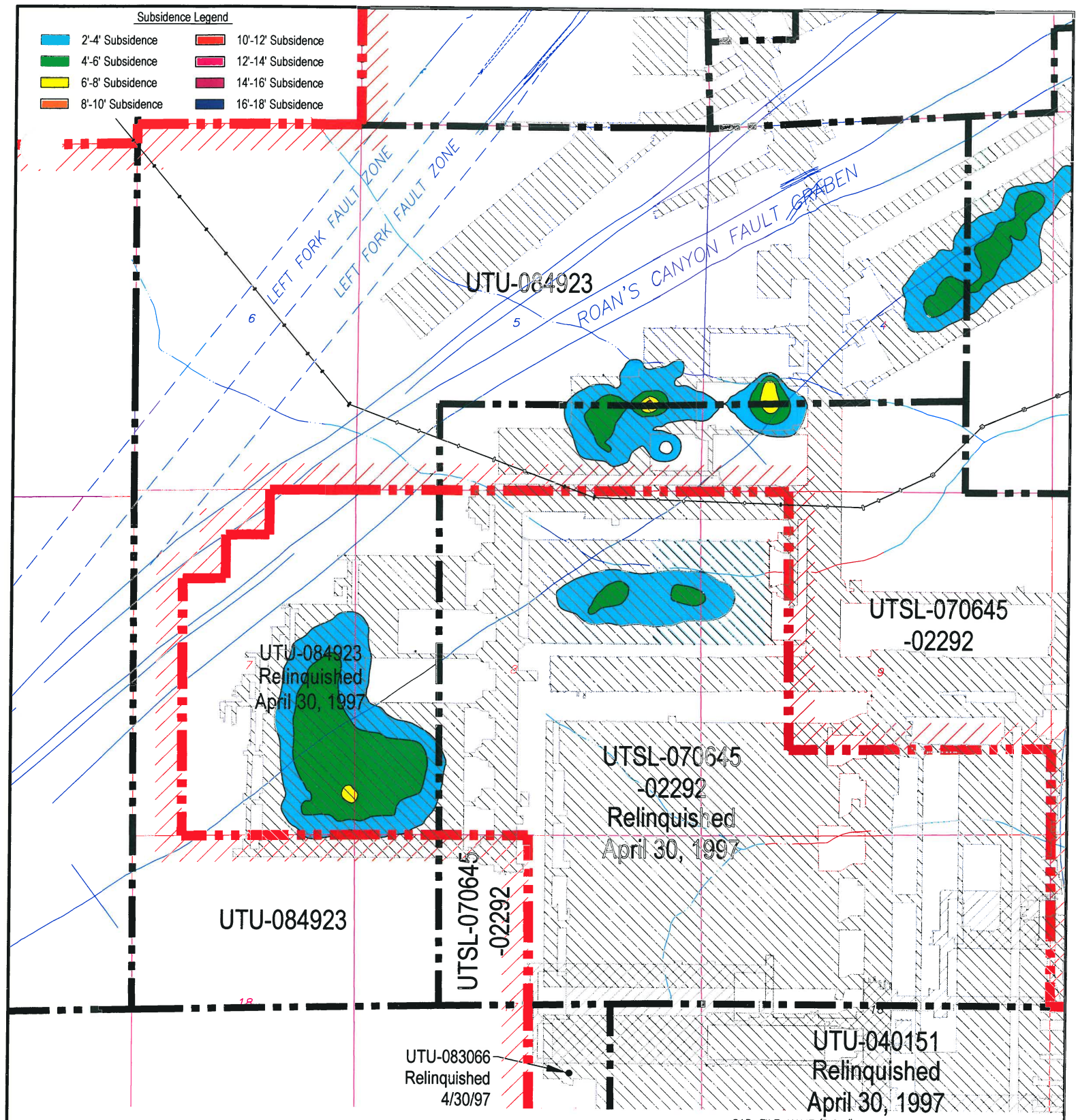

Energy West 2008 Subsidence Report
Area 19 Subsidence Profile
West - East
Chart 14
SUBSIDENCE, Feet
1
-1
-3
-5
-7
-9
0
1000
2000
3000
4000
DISTANCE ALONG PROFILE IN FEET
Mine Workings
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008


Energy West 2008 Subsidence Report
Area 26 Subsidence Profile
West-East
Chart 27
SUBSIDENCE, Feet
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
500
1000
1500
2000
2500
3000
3500
DISTANCE ALONG PROFILE IN FEET
Mine Workings
2005
2006
2007
2008



Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-084923.

The proposed relinquishment area of Lease UTU-084923 is stable and subsidence is substantially complete.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-084923 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-084923

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

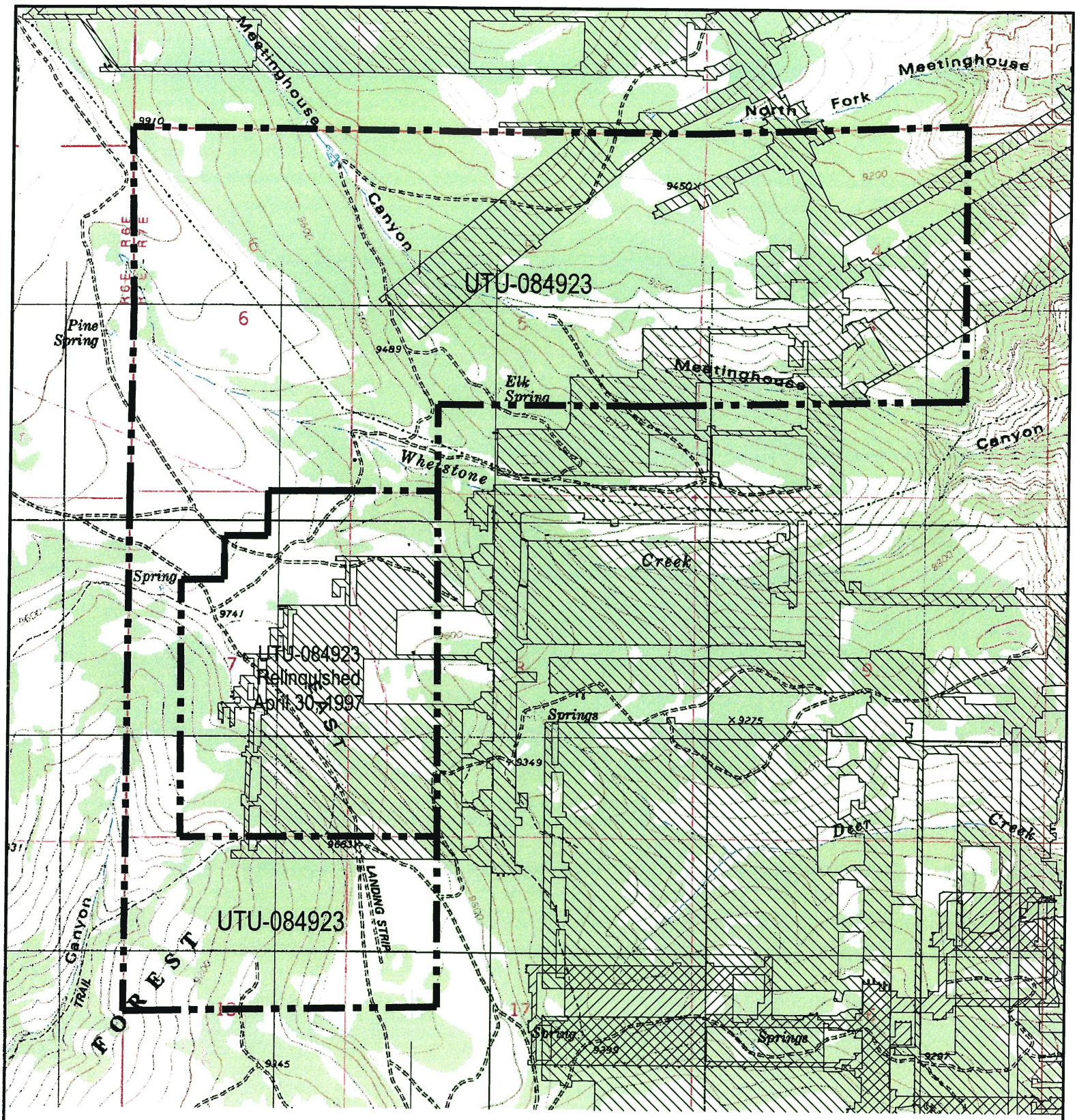
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084923
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" = 2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-084923 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-084923 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-084923. No restoration and/or mitigation efforts are required for Lease UTU-084923. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface and the mine workings.



CAD FILE NAME/DISK#: UTU-084923

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084923
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-084293 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 58 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over most of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTU-084293 and surrounding area.

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP).

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTU-084293.

Regional Groundwater Hydrology

The characteristics 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 PacifiCorp mining area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The East Mountain 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the East Mountain 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. 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 PacifiCorp mining area covers portions of East Mountain and Trail Mountain, which are between Huntington Canyon and Cottonwood Canyon, a deep, partially glaciated valley.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable

calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, but is not exposed in the Mill Fork Area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the Mill Fork Area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the Mill Fork Area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the PacifiCorp mining area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone are limited to the topmost ridges of the East Mountain plateau.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the water bearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks adequate recharge.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produced coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk	Ss, f	1,521	14	1.5x10-2	3.7x10-3
Formation	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point	Ss, m	2,466	17	3.1x10-2	1.1x10-2
Sandstone	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Wilberg/Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, partially within the UTU-084923 lease, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of

overburden in the area where the water producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the west of UTU-084923 and in Rilda Canyon located to the northeast of UTU-084923. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected has been reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas existed within the mine workings. Four types of occurrences have been recognized and were monitored by the applicant and included 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the East Mountain area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 East Mountain area.

Folding:

Strata in the UTU-084923 area are gently folded in two broad structural features. The Flat Canyon Anticline lies to the northwest of the lease 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 southeast, the south limb of the Flat Canyon Anticline becomes the north limb of the Straight Canyon Syncline, a flat-bottomed syncline. This syncline also trends southwest to northeast, plunging to the southwest. Dips on the northwest side are steeper than on the southeast side. The axis of the Straight Canyon Syncline passes through the southeast corners of the UTU-084923 relinquishment area.

Faulting:

A major fault feature, known as the Roans Canyon Fault Graben, passes through the UTU-084923 lease. This graben parallels the axis of the Straight Canyon Syncline, bearing N. 50° E. The down-dropped portion of the graben has a displacement of 150 to 200 feet. There are several sympathetic faults and fractures that parallel the graben on either side. A water bearing fracture on the southeast side of the graben produced large amounts of water when intercepted in 1990. Within the lease, the Deer Creek 3rd North Mains crossed the graben with rock slopes in 1990 to access reserves on the north side of the graben.

A smaller graben feature, known as the Left Fork Fault Zone, with a bearing of about N 30° E., and offsets of up to 15 feet, was intercepted in mine workings to the north of the lease and is suspected of crossing the northwest corner of the lease, possibly intercepting the Roans Canyon graben.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process.

Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

The mode of occurrence for each spring has been tabulated on the "Springs Geologic Conditions Inventory" sheets included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

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 (example: Elk Spring, Sheba Spring, Roans Spring). 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.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated is that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the water quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The $\delta 2H$ and $\delta 18O$ compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic

communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.

5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.
7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

   a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years
   b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
   c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.

10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its CO2(g) in the soil zone where the partial pressure of CO2 greatly exceeds atmospheric levels. This CO2 combines with water to form carbonic acid according to

$$CO2(g) + H2O = H2CO3 \quad (1)$$

Carbonic acid dissociates into H+ and HCO3- as

$$H2CO3 = HCO3^- + H+ \quad (2)$$

The H+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H+ + CaMg(CO3)2 = Ca2+ + Mg2+ + 2HCO3^-, \text{ and} \quad (3)$$
(dolomite)

$$H+ + CaCO3 = Ca2+ + HCO3^- \quad (4)$$
(calcite)

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$CaSO_4 \bullet 2H_2O = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$
(gypsum)

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + \text{Na-clay} = 2Na^+ + \text{Ca-clay} \quad (9)$$

$$Mg^{2+} + \text{Na-clay} = 2Na^+ + \text{Mg-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the East Mountain area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of

groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

There is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^{+} concentrations range from 14 to 550.6 mg/l and Cl^{-} concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^{+} are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^{+} concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} -HCO_3^{-} type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^{+} and Cl^{-} contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^{+} source.

δ^2H and δ^{18}O

The δ^2H and δ^{18}O composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and $\delta^{18}O$ composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the PacifiCorp and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork Spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^3H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^3H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number

of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^{3}H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^{3}H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

The coal bearing lower Blackhawk Formation and the Star Point Sandstone are not exposed at the surface in the UTU-084923 lease and are not part of the active zone. In Cottonwood Canyon, located southwest of UTU-084923, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the UTU-084923 area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active

groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the UTU-084923 area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the

saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the East Mountain area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term

climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- More than two-thirds of all non-alluvial springs in the East Mountain area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit

seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute significant groundwater to the discharge from the spring.

Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – MILL FORK AREA

A. GROUNDWATER

Groundwater within the Mill Fork Area was monitored according to the schedules in established in the Deer Creek MRP. PacifiCorp has conducted baseline and operational monitoring of spring sources in and adjacent to the lease area. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map); however, many springs share the same mode of occurrence and, in some cases, are related.

The ground water monitoring plan in Appendix A includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights

- Measurable flow based on historical surveys
- Reliable measuring point(s)

The following table outlines the rationale for springs selected for long term monitoring. Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency.

MILL FORK GROUNDWATER MONITORING PLAN - SPRINGS							
Spring	Stratigraphic Position	Projected Subsidence Zone	Regional Location	Water Rights	Historical Measurable Flow	Reliable Measuring Point	Comment
SP1-29	✓	✓	✓		✓	✓	
UJV-213	✓		✓	✓	✓	✓	
UJV-101	✓		✓		✓	✓	
JV-34	✓		✓			✓	Located outside projected zone of subsidence. Monitored to detect impacts to the Joes Valley alluvium
JV-9	✓		✓			✓	Located outside projected zone of subsidence. Monitored to detect impacts to the Joes Valley alluvium
UJV-206	✓	✓	✓	✓	✓	✓	
MF-219	✓	✓	✓	✓	✓	✓	
SP1-26	✓	✓	✓	✓	✓	✓	
MF-10	✓	✓	✓	✓	✓	✓	
MF-19B	✓		✓	✓	✓	✓	
RR-5	✓	✓	✓	✓	✓	✓	
EM-216	✓		✓	✓	✓	✓	Located outside projected zone of subsidence
GRANTS SPRING					✓	✓	Added to the spring monitoring program at the request of the USFS
RR-15	✓	✓	✓		✓	✓	
RR-23A	✓		✓		✓	✓	Large spring within a series of springs located downdip from projected mining
EM POND					✓	✓	Added to the spring monitoring program at the request of the USFS
MFR-30	✓	✓	✓		✓	✓	
MFR-10	✓	✓	✓		✓	✓	Large spring denoted by USGS
MF-7	✓		✓		✓	✓	Located outside projected zone of subsidence
MF-213	✓		✓	✓	✓	✓	Large spring located in the Blackhawk Formation downdip from projected mining
LITTLE BEAR SPRING	✓		✓	✓	✓	✓	Located outside projected zone of subsidence. Added to the spring monitoring program at the request of the DOGM

Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Statement concerning Hydrologic Monitoring Reduction Amendment, submitted May 03, 2013, and approved by UDOGM November 25, 2014 and previous reduction amendments and relinquishments.

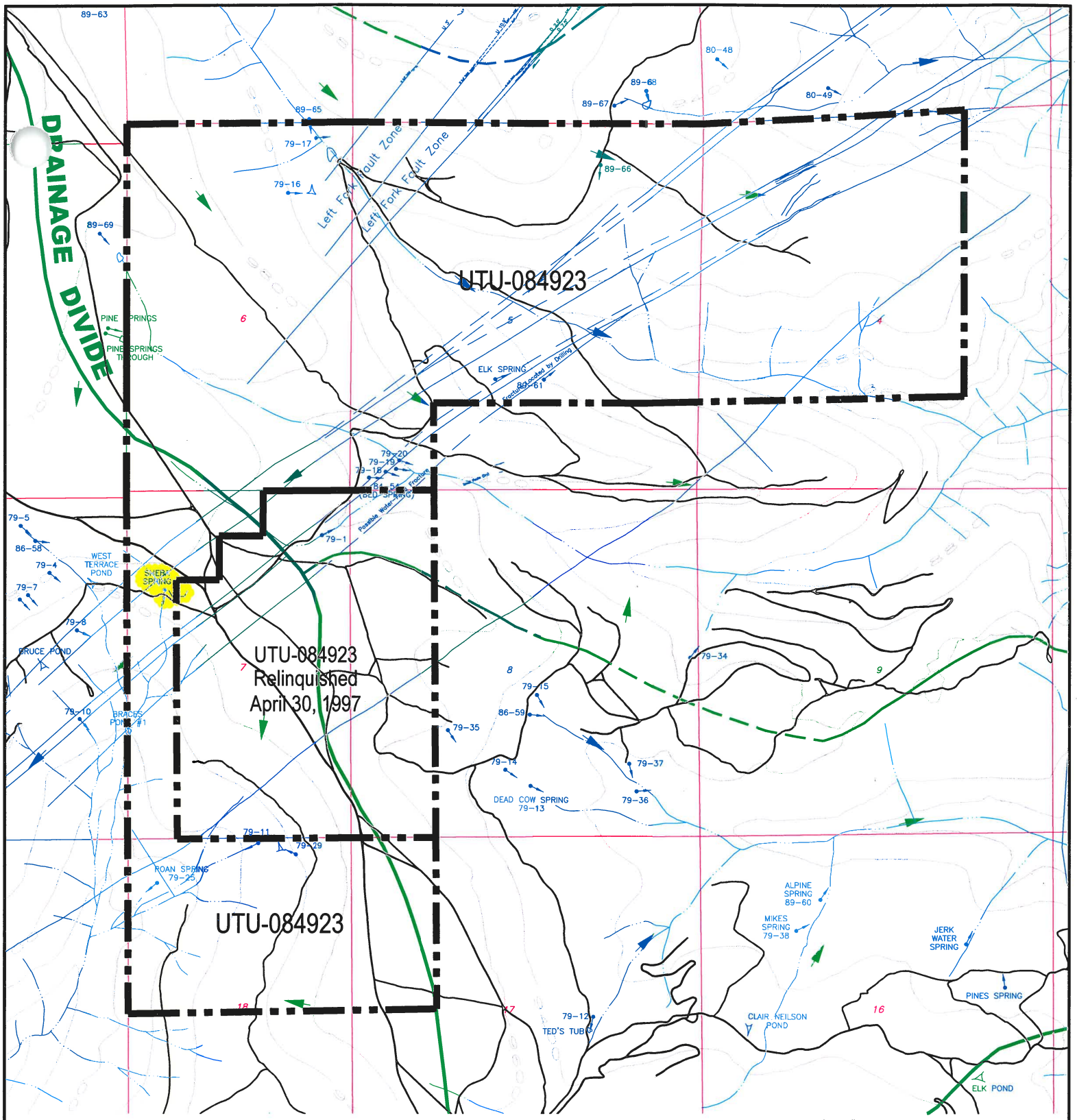
The purpose of this amendment was to reduce the hydrologic monitoring responsibilities of PacifiCorp for the following reasons:
To eliminate sites outside of existing permit boundaries,
To eliminate sites outside of federal lease boundaries,
To eliminate sites in areas that were mined out and stabilized,
To eliminate sites in areas that will not be mined.
Two investigations are referred to in the amendment which conclude that there is no significant relationship between underground mining and intercepted groundwater and changes in surface and groundwater quantity or quality.
PacifiCorp submitted the first of three phases of lease relinquishment to the BLM for areas in the southern part of the LMU that had been mined out and where subsidence was considered to be substantially complete, or would not be mined. These relinquishment phases were approved by BLM and its Memorandum Of Understanding (MOU) partners (UDOGM, USDA Forest Service) in 1992, 1997 (East Mountain LMU UTU-73336), and 2009 (Trail Mountain LMU). The approval of the monitoring reduction amendment by DOGM in 2014 is an indication of agreement by all parties involved that there have been no impacts to surface or groundwater from the mining in these leases. The fact that PacifiCorp is no longer required by the MOU participant agencies to monitor surface or groundwater in this area is sufficient documentation for the remainder of the leases to be relinquished.
Mining in the southern half of the East Mountain LMU has been essentially complete since the year 2001, when the Cottonwood Mine ceased production and the portals were closed. In the intervening years, as those areas have stabilized, monitoring of subsidence and hydrology were terminated as those areas were considered to be stable and not impacted by mining.

The only remaining spring in the monitoring program that is within Federal Lease UTU-084923 is Sheba Spring, near the top of East Mountain. Full documentation of the unaffected nature of this spring is included in this submittal. PacifiCorp has applied to the Utah Division of Oil, Gas, and Mining to remove this spring from the monitoring program since it has not been affected by mining.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTU-084923 forms parts of the Huntington Creek and Cottonwood Canyon drainages.

Most of the drainages in and adjacent to Lease UTU-084923 are ephemeral. The majority of the surface flow from the lease block drains to the east into the right and left forks of Meetinghouse Canyon and other un-named drainages which report to Huntington Creek. On the west side of the East Mountain drainage divide minor drainages report to the Roans Canyon / Cottonwood Creek drainage system. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



CAD FILE NAME/DISK#: UTU-084923

LEGEND

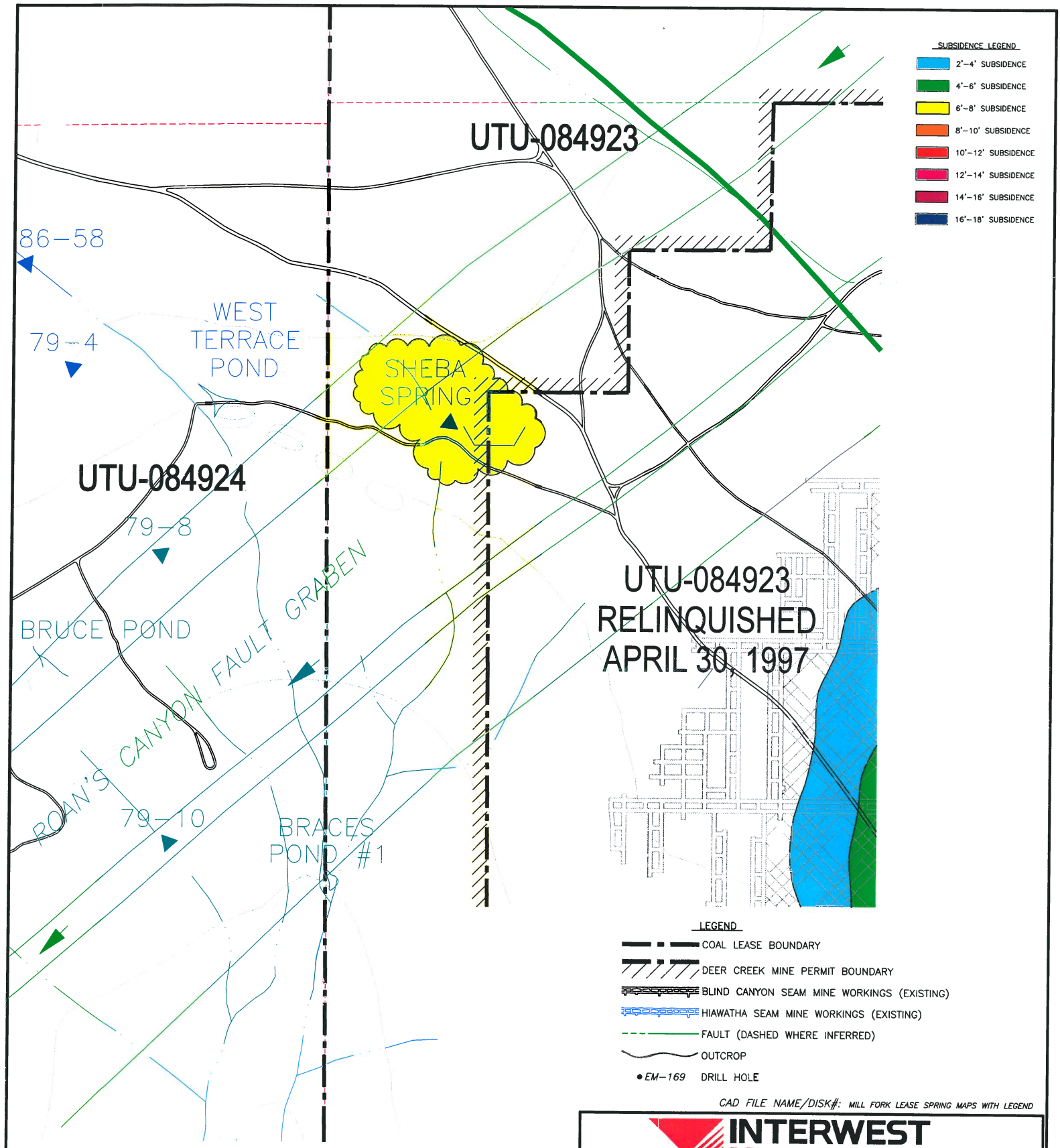
- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084923
HYDROLOGIC DRAINAGE MAP

DRAWN BY:	K. LARSEN	APPENDIX C	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV. ___



CAD FILE NAME/DISK#: MILL FORK LEASE SPRING MAPS WITH LEGEND

WATER MONITORING STATION WITH FLUME
WATER MONITORING STATION
MONITORING WELL
DRAINAGE DIVIDE
UPDES DISCHARGE LOCATION
UT-0022896-002
TYPICAL GROUND WATER MOVEMENT
WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084923
EAST MOUNTAIN SPRINGS DETAILED SUBSIDENCE DATA

DRAWN BY:	K. LARSEN	MAP 1	
SCALE:	1" =600'	DRAWING #:	
DATE:	MAY 25, 2018	SHEET 1 OF 1	REV. ___

EAST MOUNTAIN SPRING DATA
East Mountain Area

Federal Lease UTU-084923							
SPRING	**MINING HISTORY**		**STATUS**	**LOCATION**			**Approximate Subsidence (feet)**
	Type of Mining	**Date of Mining** (Pre/Post water quality analysis based on dates listed for each spring)		**Sec.**	**T.**	**R.**	
SHEBA SPRING	Not Undermined	NA Nearest second mining: 1890' Mar. 1991	Within Relinquishment	7	17S	7E	NA

Location: Section 7, Township 17 South, Range 7 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-084923.

Lease Association: Sheba Spring is located within Federal Coal lease UTU-084923. The lease was originally issued effective August 1, 1964. Room and pillar mining began in the Blind Canyon Seam in July 1983 with final production from the lease in June 2005. No mining occurred in vicinity of Sheba Spring.

Subsidence: No subsidence has been detected near Sheba Spring. The 2008 Annual Subsidence Report reported that the subsidence west of the spring has been stable since at least 2005. Sheba Spring is outside of the subsided area.

For additional data related to subsidence refer to the 2008 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring Sheba Spring. Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected from 1981 and has continued through 2018. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, and 5. The East Mountain weather station is located on the southern tip of East Mountain.
  - Sheba Spring is located on south facing hillside vegetated with mountain brush and grass. Spring collection box and trough located adjacent to USFS Forest Development Road #303. Flow from spring 80-50 generally ranges from 0 gpm/seep to a maximum of ~25 gpm.

Geologic Mode of Occurrence for spring Sheba Spring:

- Spring located along the northern fault of the Roan's Canyon fault graben. Water percolating down fractures along the fault within the Flagstaff Formation intersect the North Horn Formation and flows laterally to the surface.
- Geologic Formation: Flagstaff Limestone (refer to Geologic Occurrence sheet).
- Stratigraphic Position: at base.

Justification for removal from monitoring: Sheba Spring has been monitored by PacifiCorp from 1981 through 2018. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in the Deer Creek Mine (federal leases UTU-88554 and adjacent Federal Lease UTU-84285 [Mill Fork area]) ceased as of January 7, 2015 Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site Sheba Spring be removed from the monitoring program.

EAST MOUNTAIN

EAST MOUNTAIN & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **Sheba Spring**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
1540' S.	500' E.	NW	7	17S	7E	9740

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
Flagstaff	Spring box and trough	None	0' above bottom

Location Comments: Spring developed for livestock. Water flows through an underground pipe to a trough.

Probable Recharge Area: Areas of higher elevations to the northwest.

Relationship to Adjacent Springs: Located along the same fault as spring 79-10.

Geologic Occurrence of Spring:

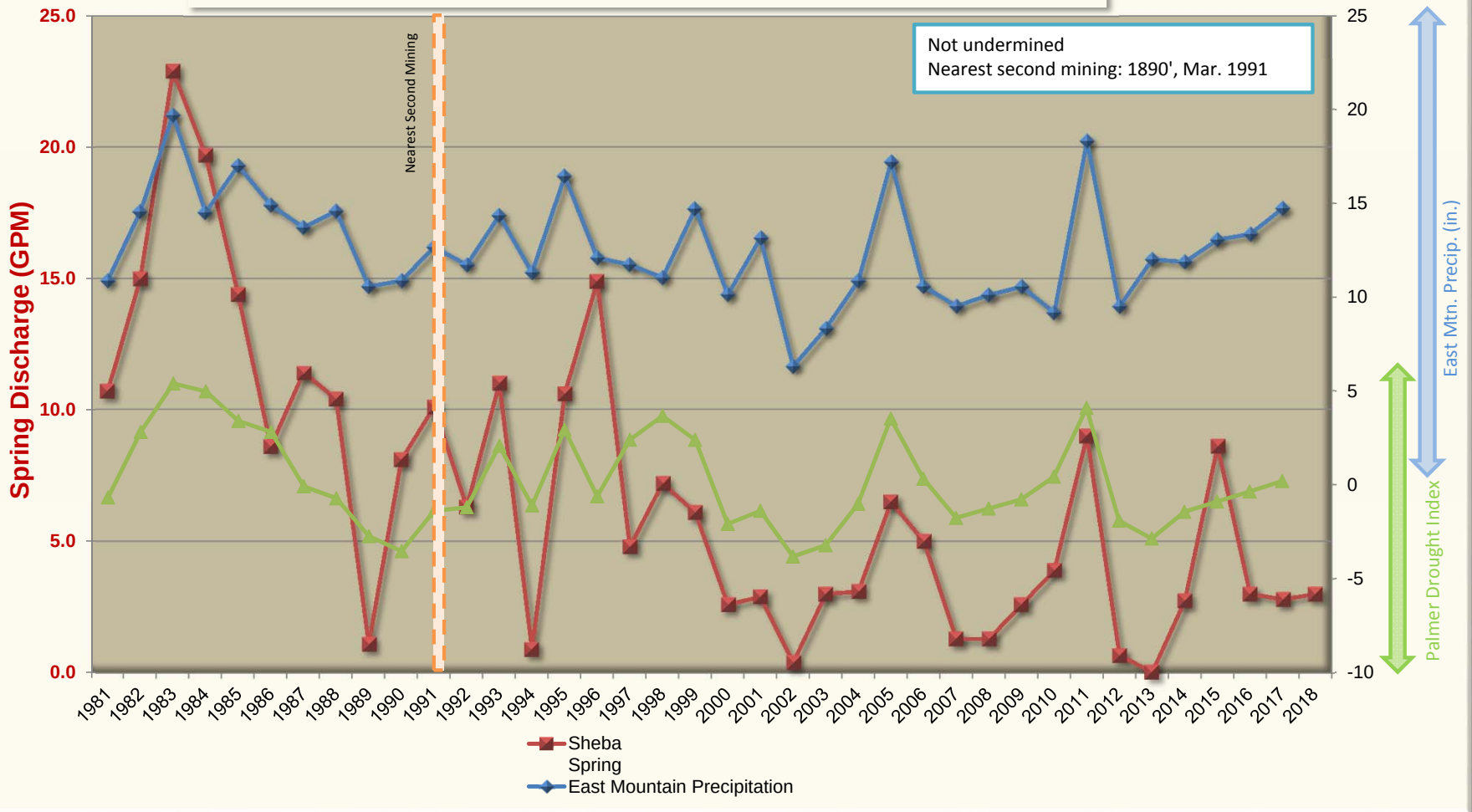
Spring located along the northern fault of the Roan's Canyon fault graben. Water percolating down fractures along the fault within the Flagstaff Formation intersect the North Horn Formation and flows laterally to the surface.

Sheba Spring, May 23, 2018

Sheba Spring Trough, May 23, 2018. Flow rate 3.0 gpm.

EAST MOUNTAIN SPRINGS - EAST MTN. SPRING: Sheba Spring vs. PRECIPITATION

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION AND PALMER DROUGHT INDEX



East Mountain Spring: Sheba Springs
Water Quality Data: Operational
Mine Association: Deer Creek Mine - East Mountain
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 1890'
Date of Nearest Mining: Mar-91

	Pre-Mining Data: 19770101 THROUGH 19910301				Post-Mining Data: 19910331 THROUGH 20171231				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	493	234	289.954	22	336	225	278.48	52	BICARBONATE
CALCIUM	137	64.3	89.8037	27	98.4	53.7	81.7456	57	CALCIUM
CARBONATE	1	1	1	18	5	0	0.81481	27	CARBONATE
CHLORIDE	15	2.1	5.15	20	25	0	3.56041	48	CHLORIDE
CONDUCTIVITY	700	230	434.518	27	556	304	467.771	57	CONDUCTIVITY
DISSOLVED OXYGEN	8.6	6.6	7.6625	8	11.6	5.6	8.25555	18	DISSOLVED OXYGEN
FLOW	19.8	0.09	5.23787	33	14.9	0.08	3.15927	55	FLOW
HARDNESS	314	191	250.944	18	296	198	251.803	56	HARDNESS
TOTAL IRON	0				0.36	0	7.7826	23	TOTAL IRON
DISSOLVED IRON	0.8	0.02	0.12454	22	0.2	0	4.23076	26	DISSOLVED IRON
MAGNESIUM	13.2	5.5	9.92074	27	23.16	7.5	11.2368	57	MAGNESIUM
DISSOLVED MANGANESE	0				0.025	0	3.7647	17	DISSOLVED MANGANESE
MANGANESE	0.02	0.01	1.17647	17	0.2	0	4.41612	31	MANGANESE
OIL AND GREASE	1	0.1	0.55	2	0				OIL AND GREASE
PH	8.4	6.95	7.58906	32	8.2	6.8	7.47267	56	PH
POTASSIUM	9	0.01	1.606	20	18	0	1.39296	27	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	14	1.61	5.562	20	5	0.64	3.25803	51	SODIUM
SULFATE	181	1	32.85	22	14	3	5.11176	51	SULFATE
SUSPENDED SOLIDS	15	0.1	4.36956	23	13	1	5.5	8	SUSPENDED SOLIDS
TEMPERATURE	49	3.3	24.3037	27	53.6	5.1	18.6762	54	TEMPERATURE
TOTAL DISSOLVED SOLIDS	392	212	265.217	23	320	204	264.647	51	TOTAL DISSOLVED SOLIDS

Deer Creek Mine
Federal Coal Lease UTU-084923 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 58 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over most of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface vegetation characteristics of the area.

Vegetation of Lease UTU-84923 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown by vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-084923:

Aspen	AS
Aspen/Conifer	AS/C
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Mountain Shrubland	MS
Pinyon-Juniper	PJ
Riparian Woody	RW
Silver Sagebrush	SSB
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires (such as the wildfire of June, 2018 that destroyed more than 60% of the vegetation on this lease), variation in precipitation from

year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. None of the land owners, stakeholders, or regulatory agencies in the area have reported vegetation effects that might have been caused by mining. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

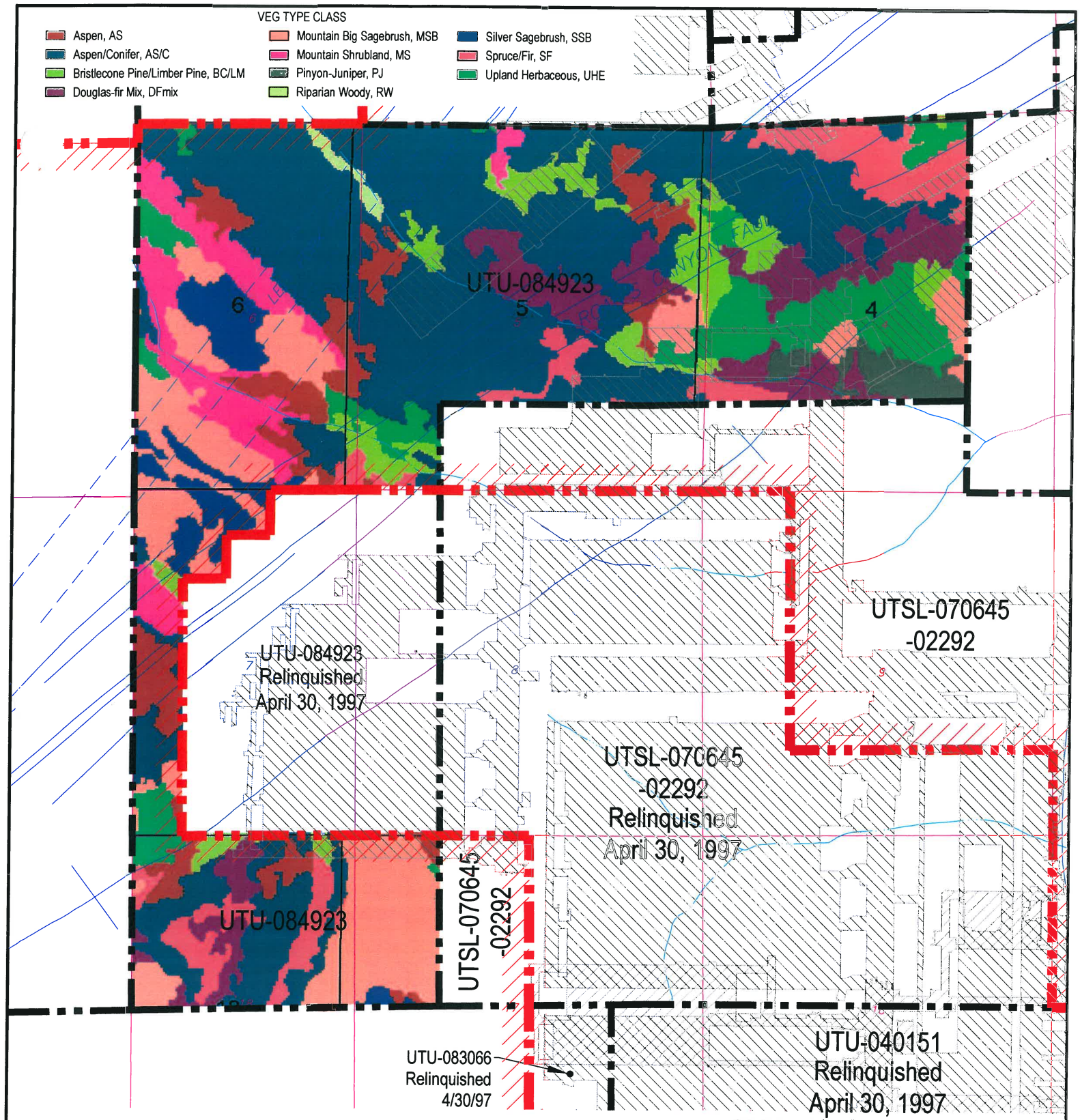
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-084923 area. There were no surface facilities or installations on this lease.



CAD FILE NAME/DISK#: UTU-084923

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-084923 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-084923
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTU-084923
Deer Creek Mine
Federal Coal Lease UTU-084923 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are private surface improvements in Lease UTU-084923. There are two private surface improvements in Lease UTU-070645-02292. The first of these is the 345 KV power transmission line that crosses the top of East Mountain within the boundaries of the lease. It is owned by PacifiCorp / Rocky Mountain Power. Two separate studies of the potential subsidence beneath this line were conducted in 1997 and 2004, with the 2004 study being directly related to this lease. The power line crosses the west side of the lease, where underground mining did not reach.

The second improvement is the Elk Spring development and associated water transfer pipeline that was constructed in 2009 – 2010. This pipeline crosses the 1st and 2nd Left longwall panel area in the left fork of Meetinghouse Canyon. The pipeline was constructed 5 years after these panels were extracted and subsidence was considered to be fully stabilized by that time. There have been no impacts to the spring, spring development or the pipeline itself due to mining.

To the best of the knowledge of the lessee through due inquiry including reconnaissance flights, subsidence surveys and periodic surface topography inspections, there are no mining-related impacts associated with the Deer Creek Mine to any private surface improvements on the lease area being relinquished.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-084923 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTU-084923 have taken place on March 21, 2005 (1st – 3rd Left Panels), June 15, 2005, and July 6, 2005 (2nd West Panel), March 19, 2015 (3rd North A & B Mains). CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV 7, 2018

Lease(s) # UTU-084923 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North Mains, 7th Right, 6th-9th East, 2nd Left, 3rd Left, 1st West, 2nd West HG & TG, 3rd North B Mains

Coal Bed: Blind Canyon Coal Seam

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-084923 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North Mains, 7th Right, 6th-9th East, 2nd Left, 3rd Left, 1st West, 2nd West HG & TG, 3rd North B Mains

Coal Bed: Blind Canyon Coal Seam

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-084923 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North Mains, 7th Right, 6th-9th East, 2nd Left, 3rd Left, 1st West, 2nd West HG & TG, 3rd North B Mains

Coal Bed: Blind Canyon Coal Seam

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

Dan Rich _____ 11/7/18 _____

(Officer of the Lessee) (Date)

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTU-084923 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North Mains, 7th Right, 6th-9th East, 2nd Left, 3rd Left, 1st West, 2nd West HG & TG, 3rd North B Mains

Coal Bed: Blind Canyon Coal Seam

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-084923 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North Mains, 7th Right, 6th-9th East, 2nd Left, 3rd Left, 1st West, 2nd West HG & TG, 3rd North B Mains

Coal Bed: Blind Canyon Coal Seam

Equipment name & model number	Date Inspected	Fluid types/batteries and amount	Final location (Cross-cut if known)
D-Box	**March 19, 2015**	**None**	**1st West Sump XC-1 Entry 3**
D-Box	**March 19, 2015**	**None**	**3rd North Mains XC-43 Entry 5**
D-Box	**March 19, 2015**	**None**	**3rd North Mains XC-56 Entry 5**
D-Box	**March 19, 2015**	**None**	**3rd North B Mains XC-70 Entry 5**
D-Box	**March 19, 2015**	**None**	**3rd North B Mains XC-73 Entry 3**

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-084923 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North Mains, 7th Right, 6th-9th East, 2nd Left, 3rd Left, 1st West, 2nd West HG & TG, 3rd North B Mains

Coal Bed: Blind Canyon Coal Seam

Dates: 01/83 – 04/15

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-089423
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 3rd North Mains, 7th Right, 6th-9th East, 2nd Left, 3rd Left, 1st West, 2nd West HG & TG, 3rd North B Mains

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (7/83 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	7/83 - 04/15	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	7/83 - 04/15	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	7/83 - 04/15	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	7/83 - 04/15	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	7/83 - 04/15	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	7/83 - 04/15	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	7/83 - 04/15	Naptha	40 - 50%	64742-94-5	All Sections
	7/83 - 04/15	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	7/83 - 04/15	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	7/83 - 04/15	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	7/83 - 04/15	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	7/83 - 04/15	Propane	14%	74-98-6	All Sections
	7/83 - 04/15	Butane	13%	106-97-8	All Sections
	7/83 - 04/15	Toluene	17%	108-88-3	All Sections
	7/83 - 04/15	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	7/83 - 04/15	Napthalene	0.40%	91-20-3	All Sections
	7/83 - 04/15	Acetone	41%	67-64-1	All Sections
	7/83 - 04/15	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	7/83 - 04/15	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	7/83 - 04/15	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	7/83 - 04/15	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	7/83 - 04/15	Mineral Oil	20 - 25%	8042-47-5	All Sections
	7/83 - 04/15	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	7/83 - 04/15	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	7/83 - 04/15	Methanol	<20%	67-56-1	All Sections
	7/83 - 04/15	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	7/83 - 04/15	Heptane	69 - 79%	142-82-5	All Sections
	7/83 - 04/15	Ethyl Ether	11 - 21%	60-29-7	All Sections
	7/83 - 04/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	7/83 - 04/15	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	7/83 - 04/15	Heptane	60 - 70%	142-82-5	All Sections
	7/83 - 04/15	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	7/83 - 04/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	7/83 - 04/15	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	7/83 - 04/15	None			All Sections
Cat Transmission and Drive Train Oil	7/83 - 04/15	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	7/83 - 04/15	Monoethanolamine	<10%	141-41-3	All Sections
	7/83 - 04/15	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	7/83 - 04/15	Mineral Oil	70 - 95%	Mixture	All Sections
	7/83 - 04/15	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	7/83 - 04/15	Lubricant base oil	87 - 91%	Various	All Sections
	7/83 - 04/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	7/83 - 04/15	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	7/83 - 04/15	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	7/83 - 04/15	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	7/83 - 04/15	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	7/83 - 04/15	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	7/83 - 04/15	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	7/83 - 04/15	Trichloroethylene	95 - 99%	79-01-6	All Sections
	7/83 - 04/15	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	7/83 - 04/15	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	7/83 - 04/15	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	7/83 - 04/15	Deionized Water	1 - 3%	7732-18-5	All Sections
	7/83 - 04/15	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-089423
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 3rd North Mains, 7th Right, 6th-9th East, 2nd Left, 3rd Left, 1st West, 2nd West HG & TG, 3rd North B Mains

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (7/83 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	7/83 - 04/15	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	7/83 - 04/15	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	7/83 - 04/15	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	7/83 - 04/15	Calcium sulfate	2 - 10%		All Sections
	7/83 - 04/15	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	7/83 - 04/15	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	7/83 - 04/15	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	7/83 - 04/15	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	7/83 - 04/15	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	7/83 - 04/15	Lead	34%	7439-92-1	All Sections
	7/83 - 04/15	Lead Dioxide	31%	1309-60-0	All Sections
	7/83 - 04/15	Lead Sulfate	<1%	7446-14-2	All Sections
	7/83 - 04/15	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	7/83 - 04/15	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	7/83 - 04/15	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	7/83 - 04/15	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	7/83 - 04/15	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	7/83 - 04/15	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	7/83 - 04/15	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	7/83 - 04/15	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	7/83 - 04/15	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	7/83 - 04/15	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	7/83 - 04/15	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	7/83 - 04/15	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	7/83 - 04/15	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	7/83 - 04/15	Portland Cement		65997-15-1	All Sections
	7/83 - 04/15	Crystalline Silicon Dioxide		13397-24-5	All Sections
	7/83 - 04/15	Calcium Hydroxide		001-305-620	All Sections
	7/83 - 04/15	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	7/83 - 04/15	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	7/83 - 04/15	Polyglycols	60 - 100%	Mixture (2)	15 W
	7/83 - 04/15	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	7/83 - 04/15	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	7/83 - 04/15	Polyester Resin	5 - 15%	Not Reported	All Sections
	7/83 - 04/15	Styrene Monomer	3 - 7%	100-42-5	All Sections
	7/83 - 04/15	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	7/83 - 04/15	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	7/83 - 04/15	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	7/83 - 04/15	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	7/83 - 04/15	Isobutane	2 - 10%	75-28-5	All Sections
	7/83 - 04/15	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	7/83 - 04/15	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	7/83 - 04/15	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	7/83 - 04/15			64742-48-9	All Sections
	7/83 - 04/15			64742-88-7	All Sections
	7/83 - 04/15	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	7/83 - 04/15	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	7/83 - 04/15	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	7/83 - 04/15	Lubricant base oil	>99	Various	All Sections
	7/83 - 04/15	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	7/83 - 04/15	Lubricant base oil	87 - 91%	Various	All Sections
	7/83 - 04/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	7/83 - 04/15	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	7/83 - 04/15	Mineral Oil	>95%	Proprietary	All Sections

Deer Creek Mine

Federal Lease UTU-084923

Equipment Remaining In Mine or Projected to Remain as of March25, 2015

Additional Equipment Remaining In Mine or Projected to Remain as of May 5, 2015 (After Deer Creek Portal seals and 3NB XC-138 seals construction)

Pumps, D-Boxes and Other, Grouped by Location

Description	**HP**	**Location**
3rd North B		
D/Box		XC-70 #5
1st West		
D/Box		XC-1 #3
3rd North		
D/Box		XC-56 #5
D/Box		XC-43 #5

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-88554 and UTU-84258
Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
- **Quantity - Historical Data**
- **Quality - Historical Data (UPDES Parameters)**
  - **Total Suspended Solids**
  - **Iron (Total & Dissolved)**
  - **Oil & Grease**
  - **Total Dissolved Solids**
  - **Ph**

UPDES Permit Data:

Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

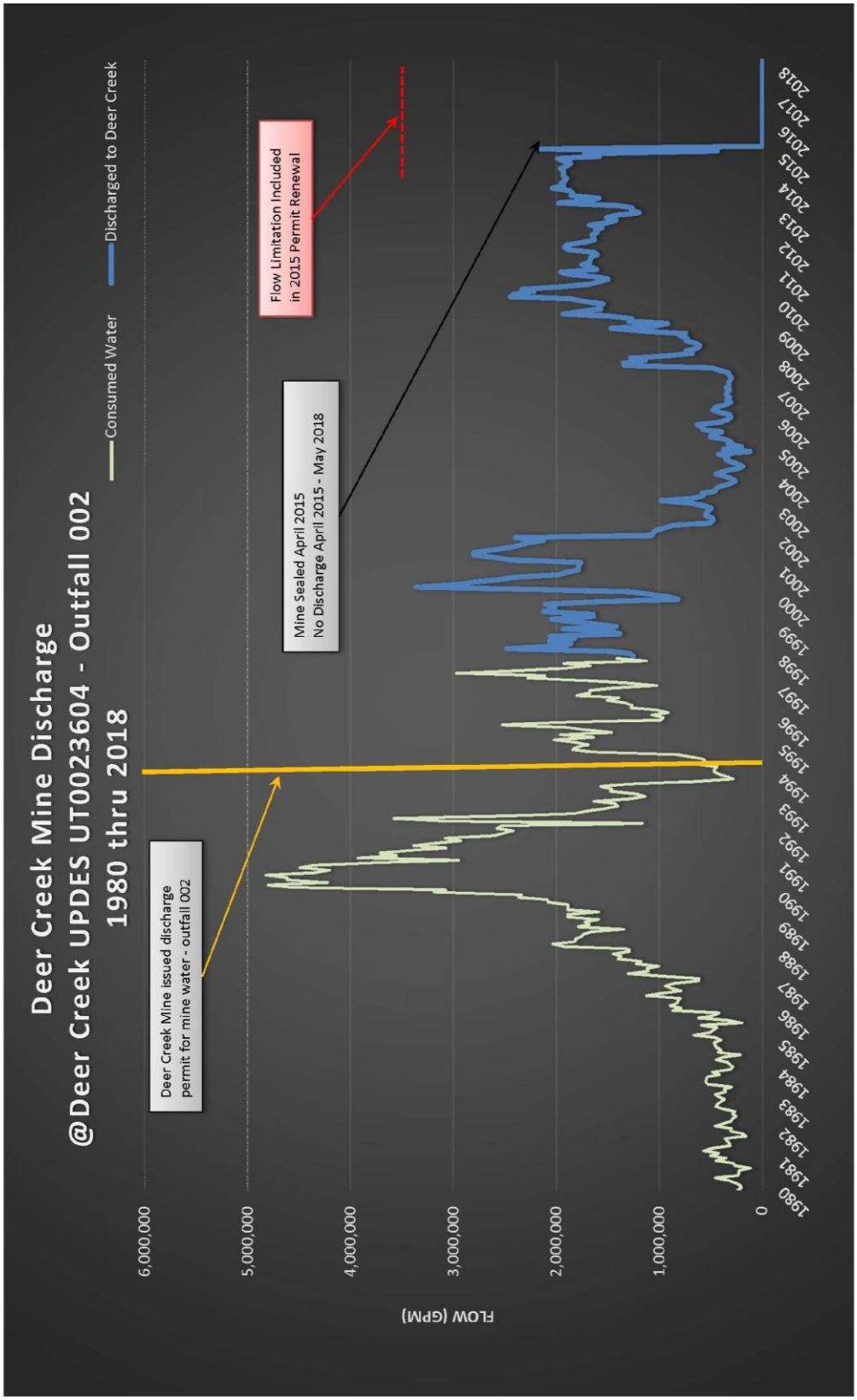
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



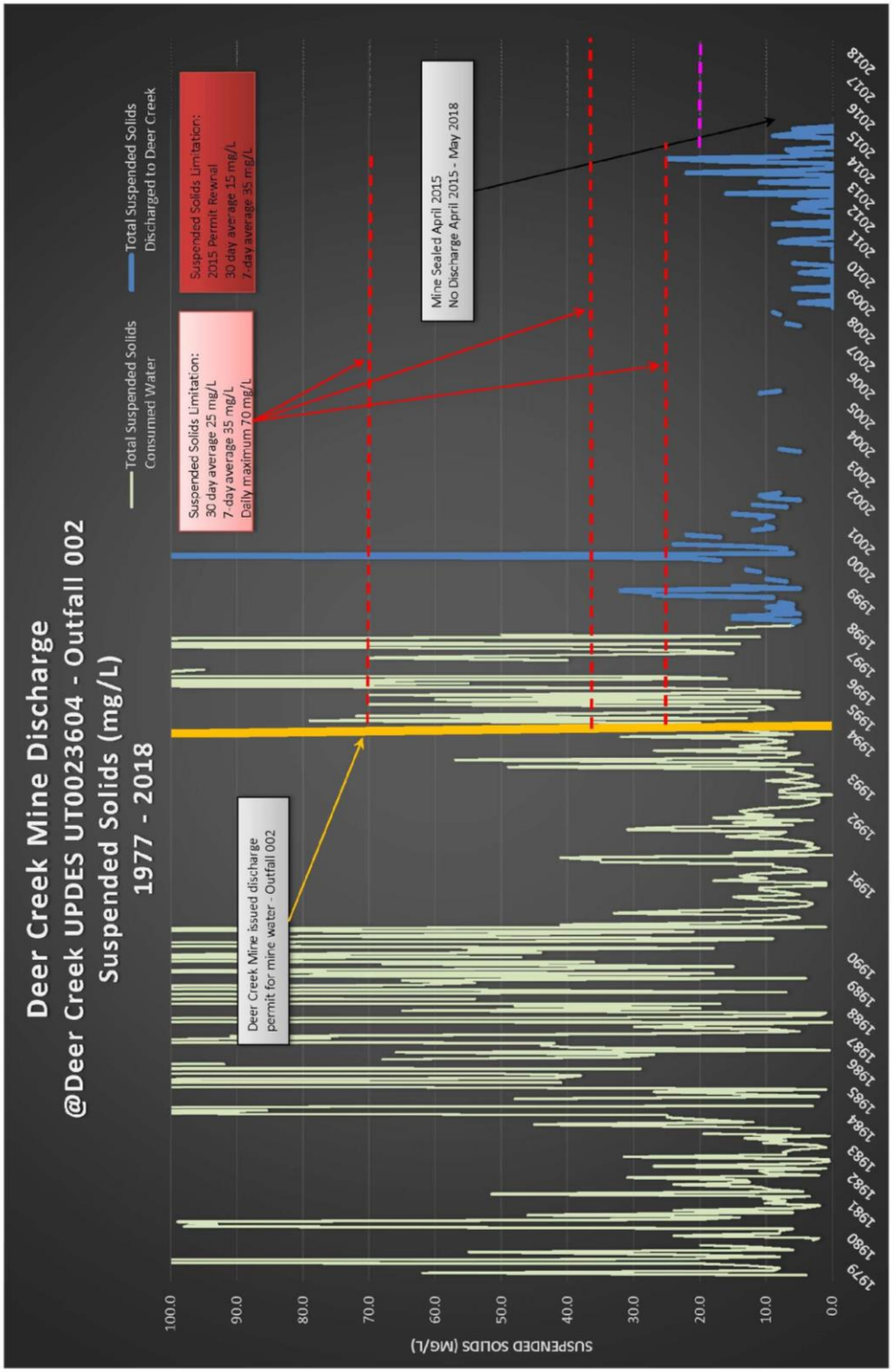
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



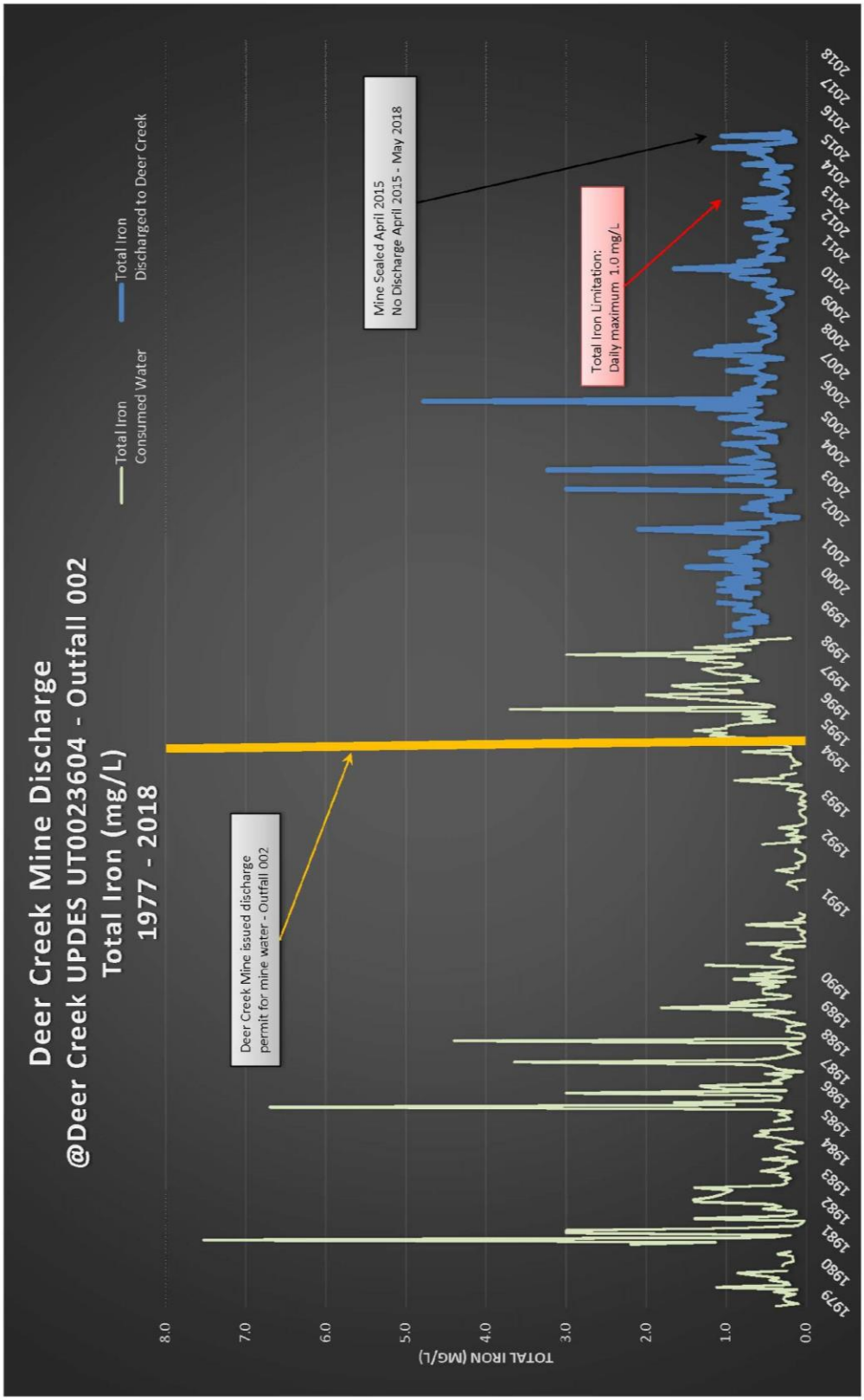
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



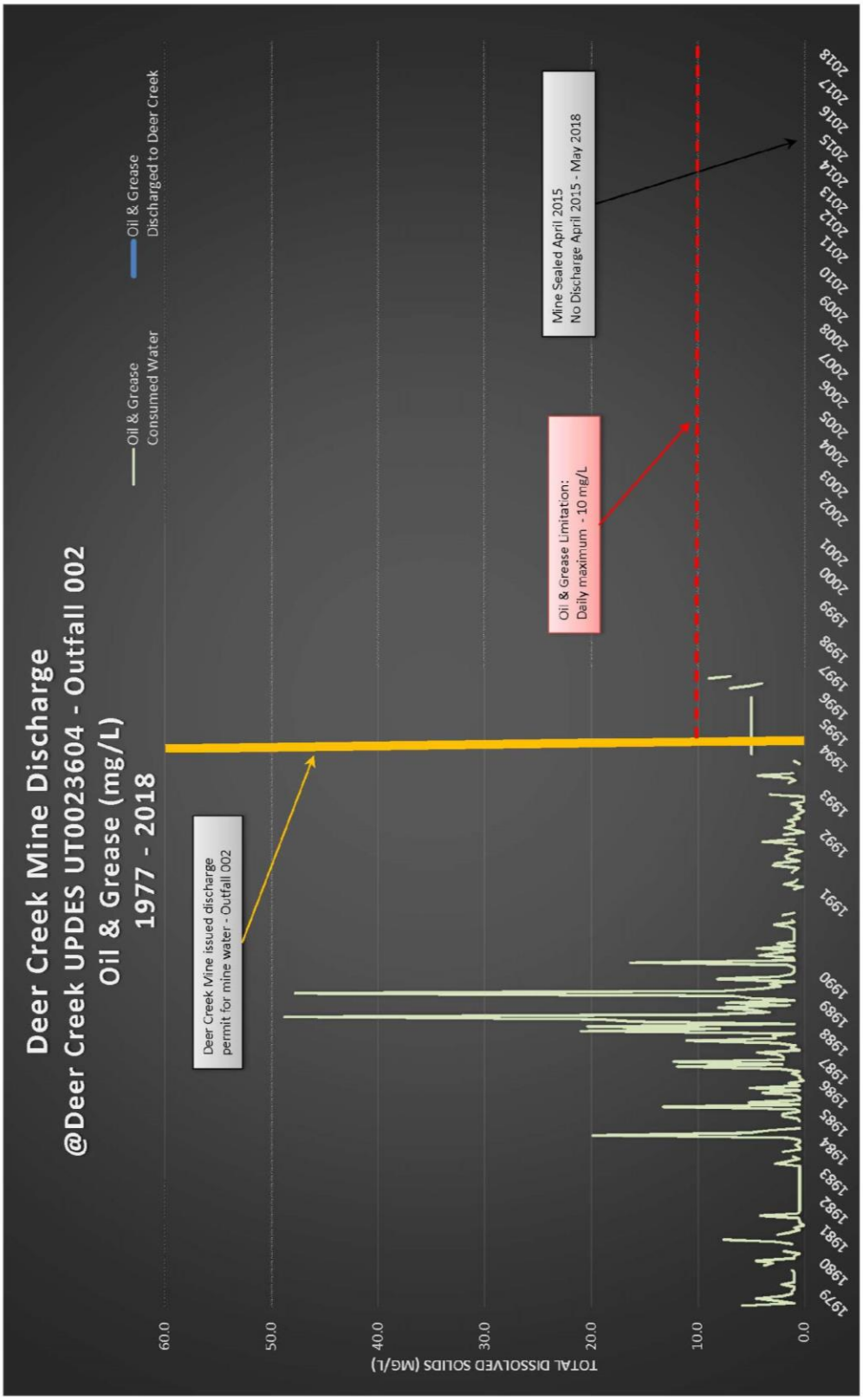
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



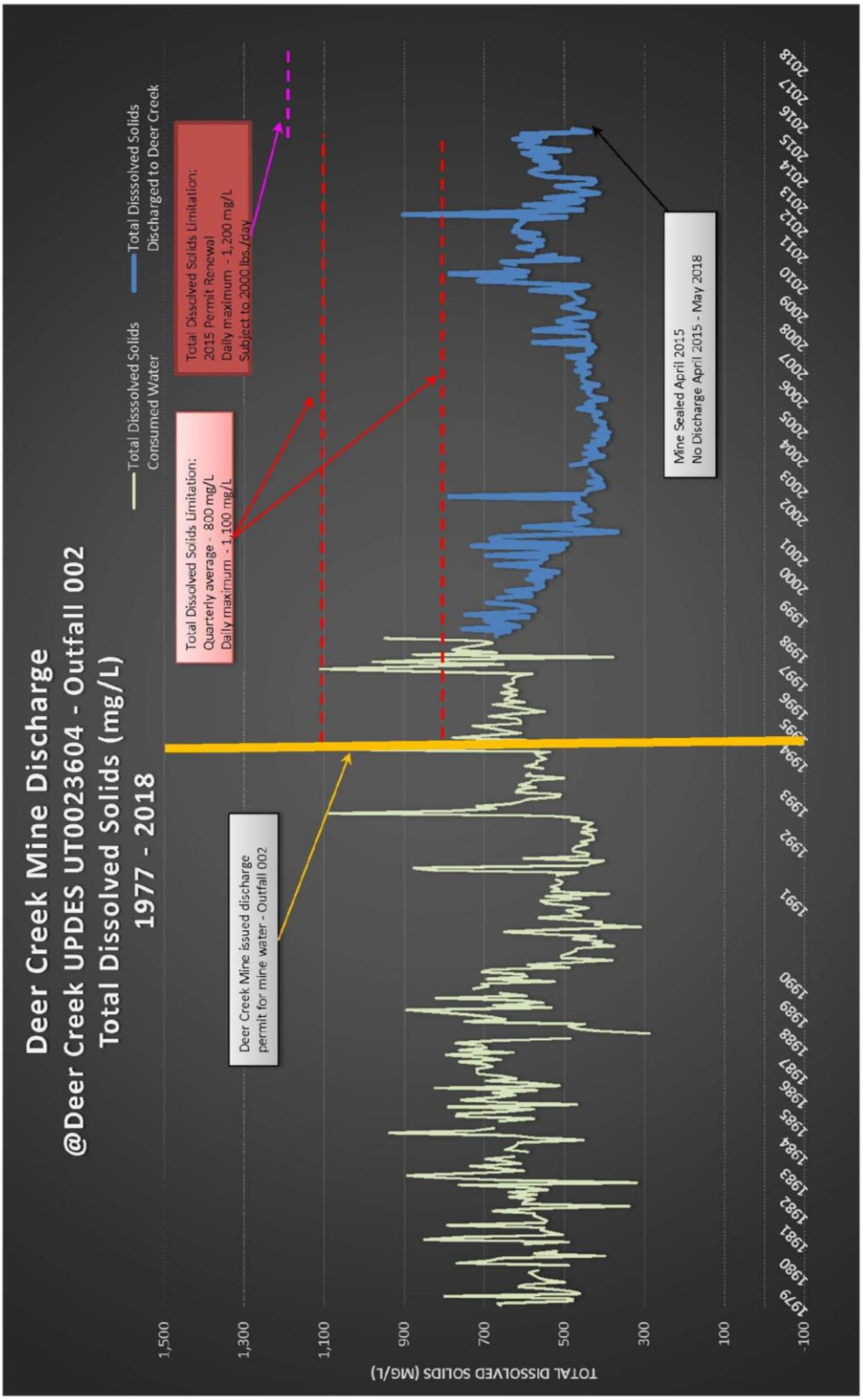
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



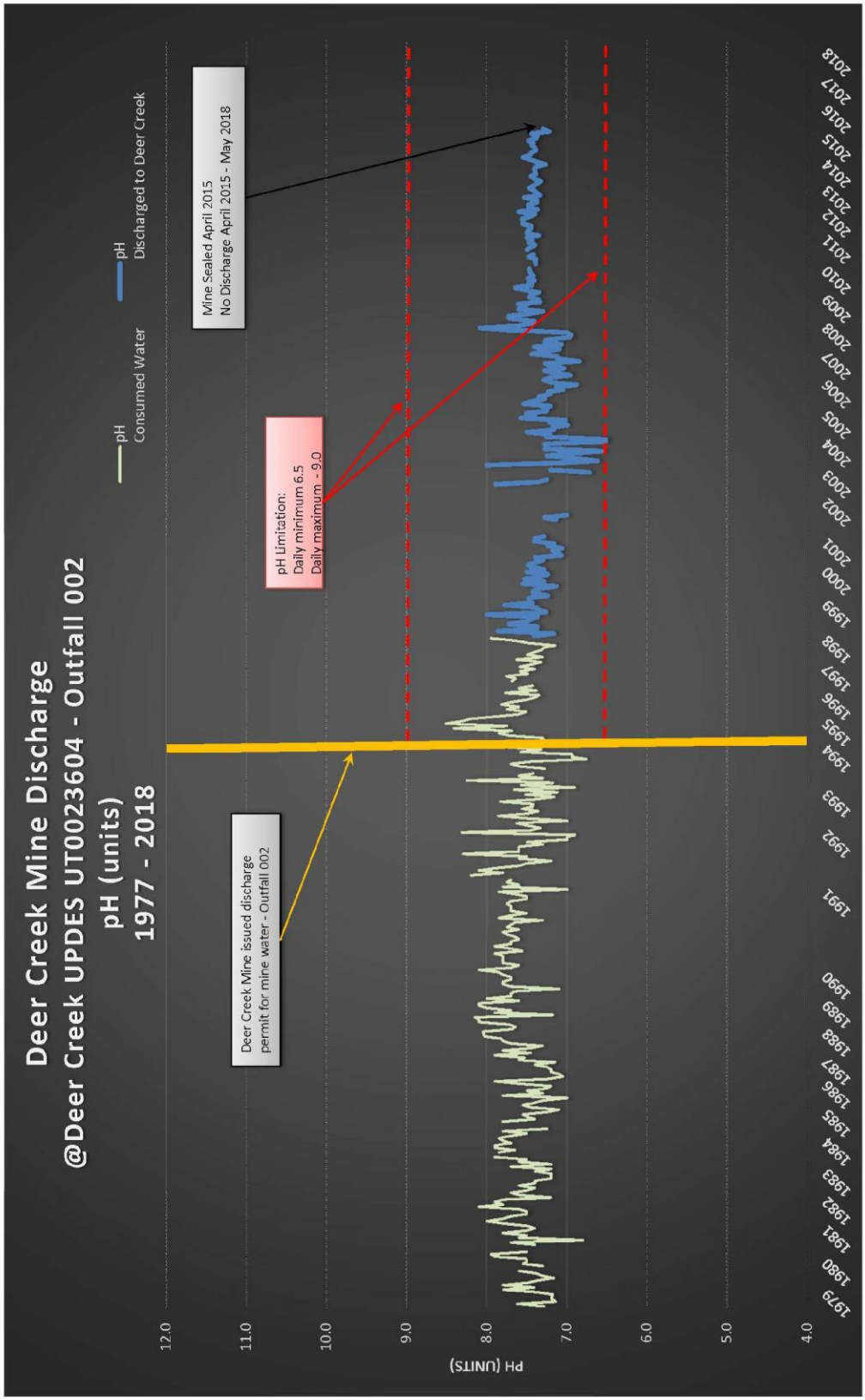
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTU-47979

November, 2018

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Prepared by:

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-47979, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-47979. The total acreage being surrendered is 883.38 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government.

Full Relinquishment

The legal description for full relinquishment of UTU-47979 is described below:

Federal Coal Lease UTU-47979		
Lease Readjustment Effective Date:		10/1/2011 to 10/1/2021
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**883.38**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 34:	W½NE¼SW¼, S½S½	180.00
T17S, R7E, SLB&M Emery County, UT		
Sec 3:	Lots 1-8, 10-12, SW¼, SW¼SE¼	531.20
Sec 4:	Lots 1, 8, 9, E½SE¼	172.18
	Total Lease Acres for Full Relinquishment:	**883.38**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47979

LEASE ACTIVITIES

1) Coal Lease Number: UTU-47979 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 883.38; Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of acreage relinquished. No areas retained. See also Figure 1 (a map depicting the areas to be relinquished in its entirety.*

Original Lease Acreage: 1,063.38 Relinquished to date: 180.00 acres Remaining: 883.38 acres

- *Partial relinquishment: 180.00 acres – Accepted effective 4/24/1992*

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)? YES ☒ NO ☐ (If "YES", describe: *Ventilation breakout portals in Meetinghouse Canyon were sealed and reclaimed in accordance with DOGM mine permit C/015/0018. The Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils in Meetinghouse Canyon including this location.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47979

11) Date of initial mining: September 1985; last mining: January 1993.

12) Number of coal beds mined: 1 coal seam (Blind Canyon)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: __)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to explanation of spring monitoring reductions*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47979

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D?
YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *No improvements were affected.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F?
YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
- *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities?
YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐
(If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

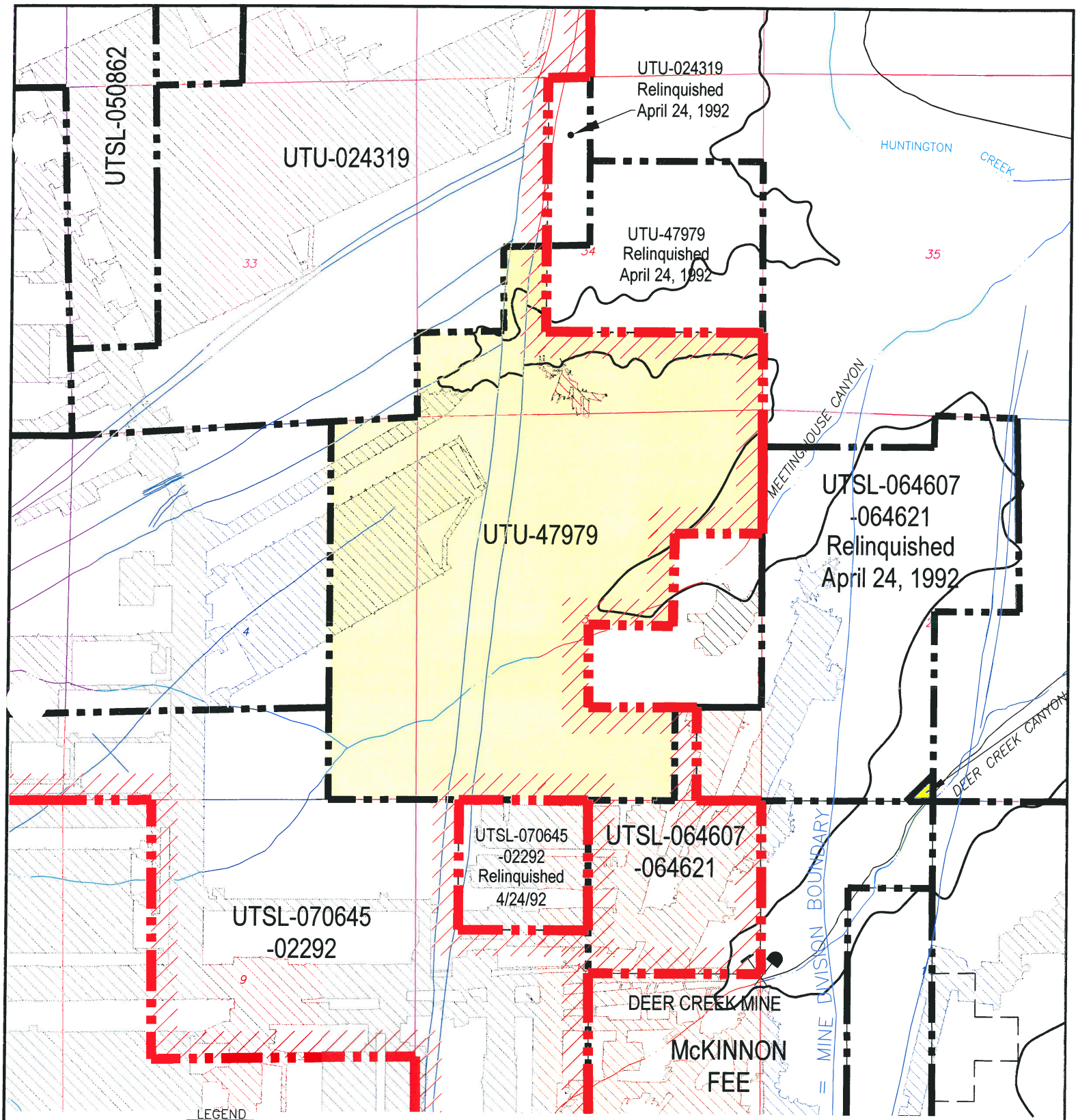
Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47979

Exhibit A

Partial Relinquishment

The legal description for full relinquishment of UTU-47979 is described below:

Federal Coal Lease UTU-47979		
Lease Readjustment Effective Date:		10/1/2011 to 10/1/2021
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**883.38**
Description of Lease Acreage to be Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 34:	W½NE¼SW¼, S½S½	180.00
T17S, R7E, SLB&M Emery County, UT		
Sec 3:	Lots 1-8, 10-12, SW¼, SW¼SE¼	531.20
Sec 4:	Lots 1, 8, 9, E½SE¼	172.18
	Total Lease Acres for Full Relinquishment:	**883.38**
	Total Lease Acres Remaining:	**0.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-47979 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

CAD FILE NAME/DISK#: UTU-47979

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47979

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTU-47979
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-47979 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Blind Canyon seam. Coal reserves were recovered by longwall methods. In the portion to be relinquished, mining in the Blind Canyon seam took place between 9/1985 and 1/1986.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In

steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the Trail Mountain Area were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

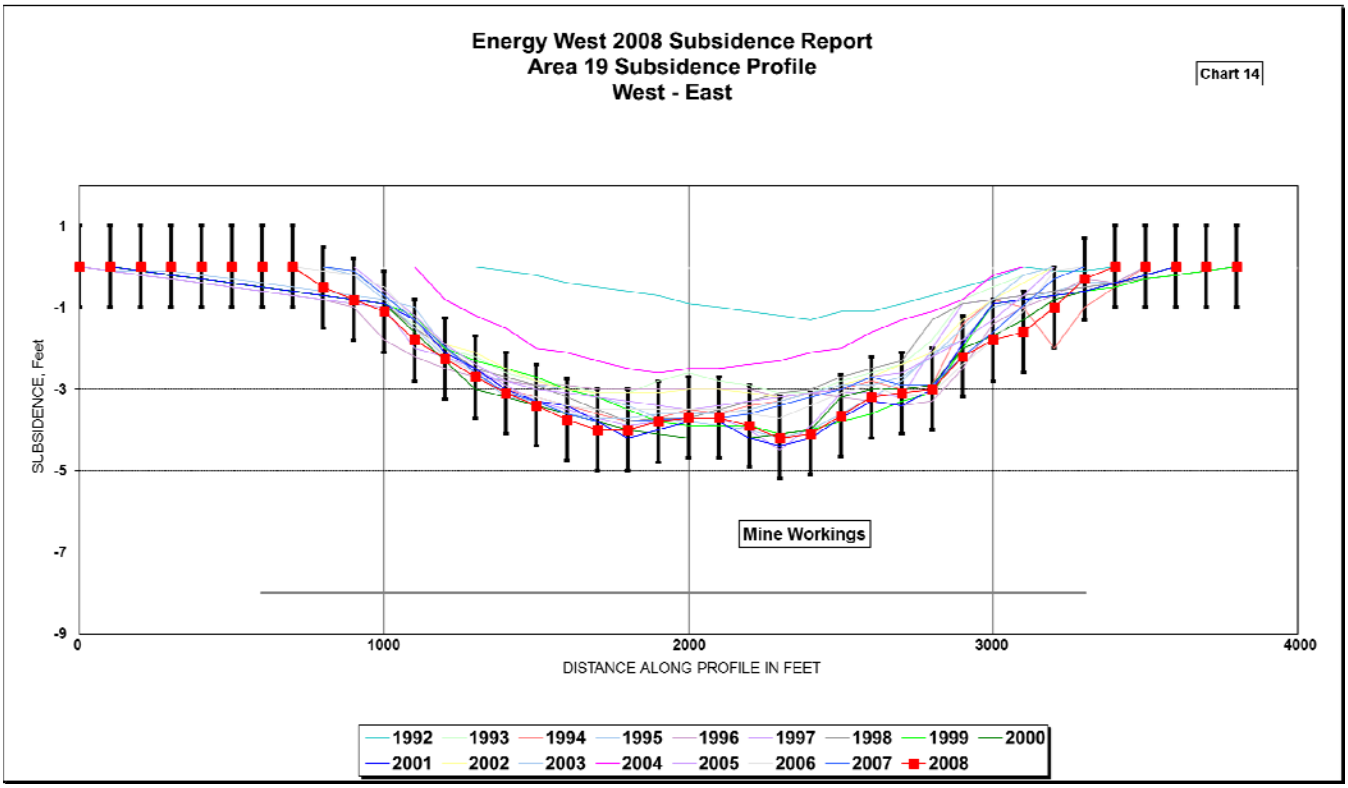
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-47979 Subsidence Data

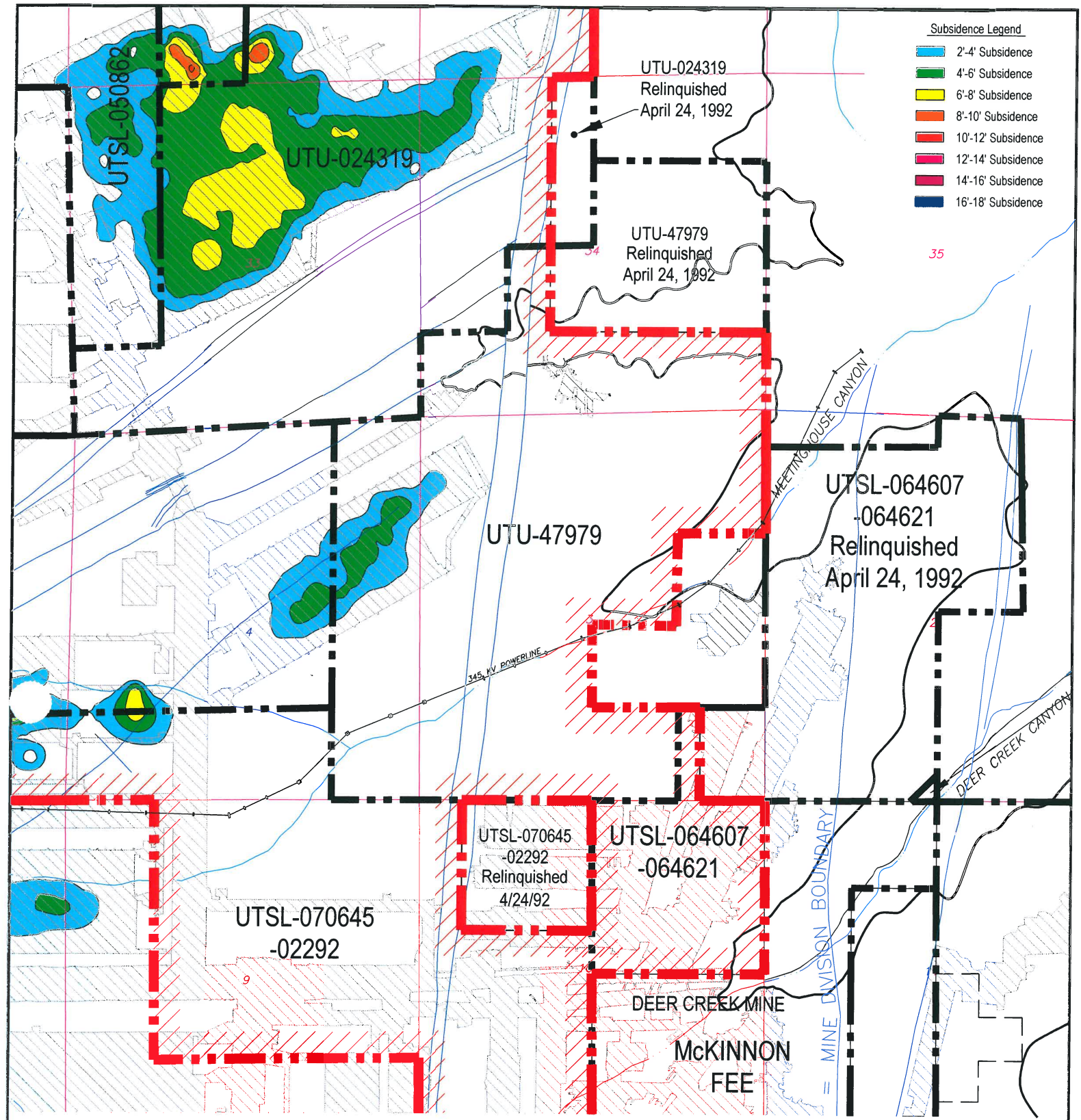
Subsidence in the lease UTU-47979 area was monitored from 1999 to 2009. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1992 and 2008. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

PacifiCorp delineated a profile (Area 19) covering the main longwall panel district in Lease UTU-47979, shown on the following figure and accompany maps. Subsidence within this area has reached a maximum of just over 6 feet. No change in subsidence has occurred since 2008, and the area is stable (see following figure and maps).



Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-47979.

The proposed relinquishment area of Lease UTU-47979 is stable and subsidence is substantially complete.



CAD FILE NAME/DISK#: UTU-47979

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-47979 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

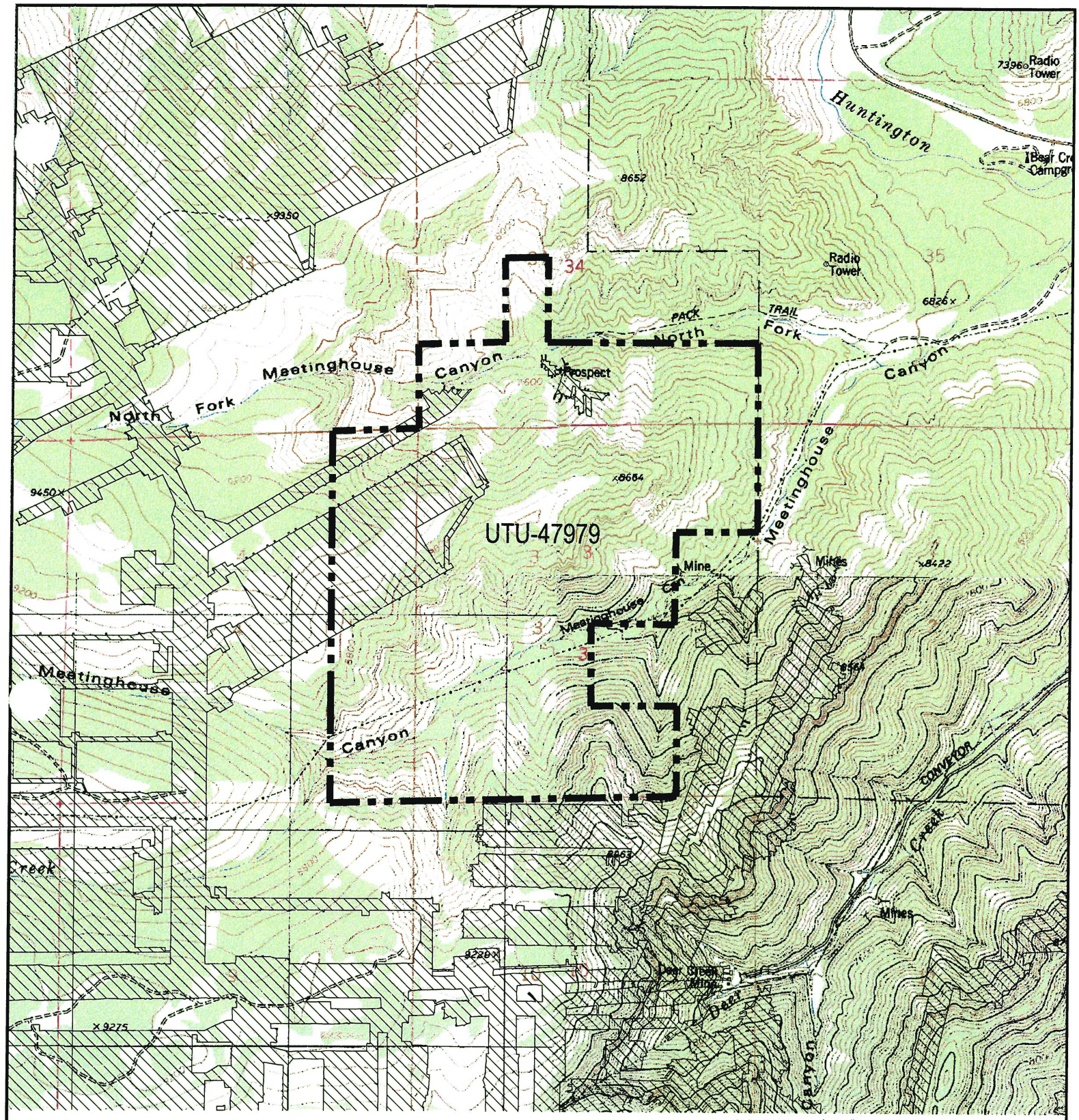
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47979
SUBSIDENCE BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX A	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-47979 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-47979 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-47979. No restoration and/or mitigation efforts are required for the portion of Lease UTU-47979 to be relinquished. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-47979 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTU-47979

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

FEDERAL LEASE ACREAGE RETAINED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47979
TOPOGRAPHIC BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX B	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-47979 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 95 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTU-47979 and surrounding area.

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP).

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTU-47979.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The Mill Fork 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the Mill Fork 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. 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 PacifiCorp mining area covers portions of East Mountain and Trail Mountain, which are separated by Cottonwood Canyon, a deep, partially glaciated valley.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable

calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, but is not exposed in the Mill Fork Area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the Mill Fork Area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the Mill Fork Area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the Mill Fork Area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone

are limited to a narrow north-south trending ridge located in the western half of the Mill Fork Area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the waterbearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 Area.

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 lease 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 fault within the Mill Fork Area is the Joes Valley Fault, which forms the western limit of the coal reserves in this area. The Joes Valley Fault is the largest and most prominent of several north south trending fault zones within the Wasatch Plateau coal field. Displacement of the fault is approximately 1,500 feet, downthrown on the western side. The fault creates a continuous north-south escarpment on the east side of Joes Valley. Several side canyons are cut into this escarpment on the western side of the lease area, all of which drain into Joes Valley. The fault zone itself is not visible along this escarpment, but the fault has been intercepted underground in the Genwal Mine to the north. Where the fault has been intercepted in the Genwal mine workings, a drag fold is present, indicated by a gentle downward folding of the strata along the fault zone, extending for a few hundred feet to the east of the fault.

The nearest known faulting outside of the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes to the southeast of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in

the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area (including lease UTU-47979) and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow

variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk
Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated is that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-

Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The $\delta 2H$ and $\delta 18O$ compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.

7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years
    b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
    c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The

radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its $CO_2(g)$ in the soil zone where the partial pressure of CO_2 greatly exceeds atmospheric levels. This CO_2 combines with water to form carbonic acid according to

$$CO_2(g) + H_2O = H_2CO_3 \quad (1)$$

Carbonic acid dissociates into H^+ and HCO_3^- as

$$H_2CO_3 = HCO_3^- + H^+ \quad (2)$$

The H^+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H^+ + \underset{\text{(dolomite)}}{CaMg(CO_3)_2} = Ca^{2+} + Mg^{2+} + 2HCO_3^-, \text{ and} \quad (3)$$

$$H^+ + \underset{\text{(calcite)}}{CaCO_3} = Ca^{2+} + HCO_3^- \quad (4)$$

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$CaSO_4 \bullet 2H_2O = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$

(gypsum)

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-clay} = 2Na^+ + Ca\text{-clay} \quad (9)$$

$$Mg^{2+} + Na\text{-clay} = 2Na^+ + Mg\text{-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is

supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Because the Mill Fork State Lease (now UTU-88554) was a new lease area that did not have existing underground workings, the solute compositions of in-mine groundwater can only be inferred from compositions of in-mine waters in nearby mines. Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This

condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} -HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and δ^{18}O

The δ^2H and δ^{18}O composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and δ^{18}O composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Energy West and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork Spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^{3}H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^{3}H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^{3}H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^{3}H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 “age” dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep

groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the

shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that

groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute significant groundwater to the discharge from the spring.

  Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – MILL FORK AREA

A. GROUNDWATER

Groundwater within the Mill Fork Area was monitored according to the schedules in established in the Deer Creek MRP. PacifiCorp has conducted baseline and operational monitoring of spring sources in and adjacent to the lease area. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.

The ground water monitoring plan in Appendix C includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights
- Measurable flow based on historical surveys
- Reliable measuring point(s)

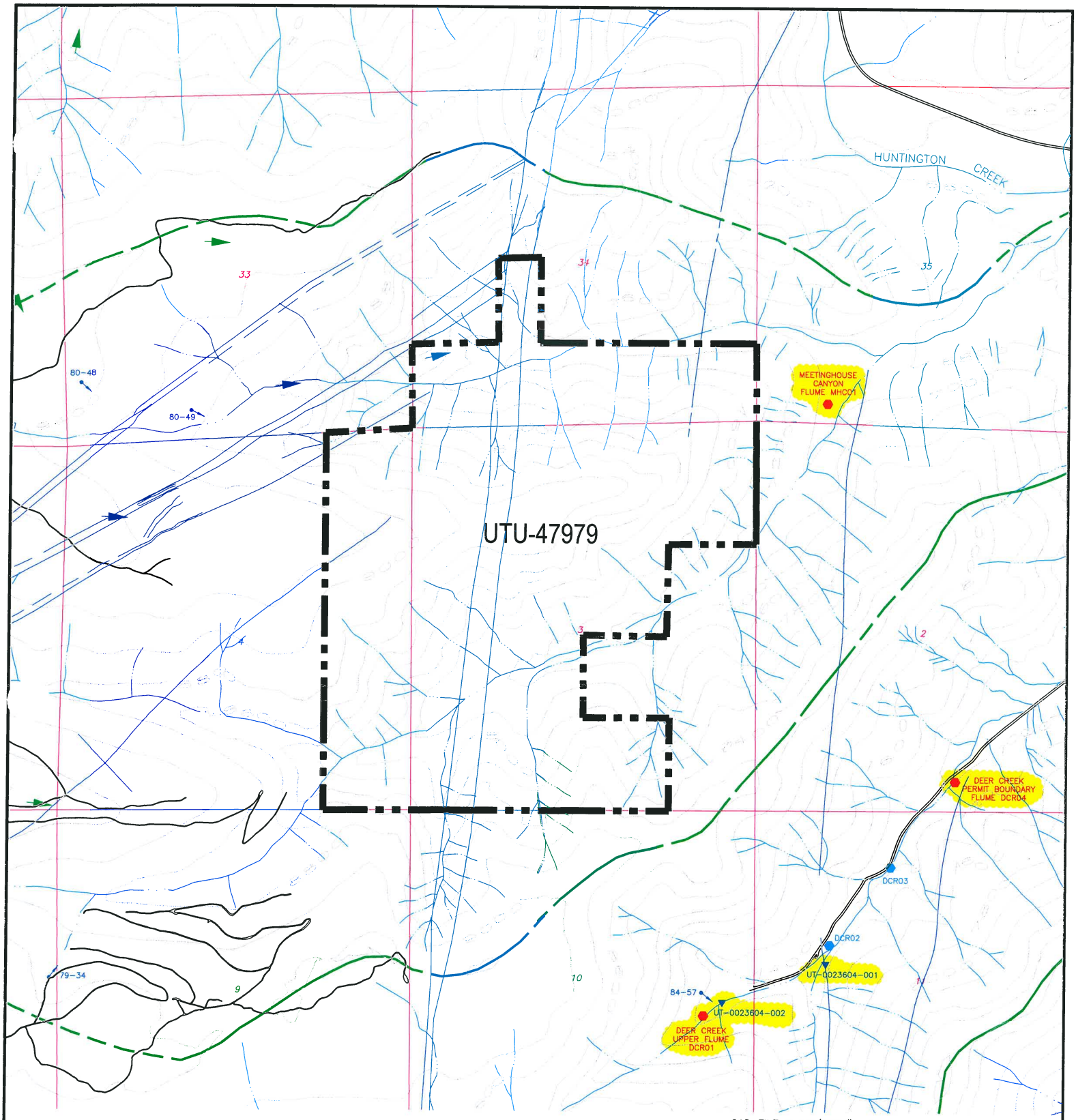
There are no monitored springs within the lease area. Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency.

Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTU-47979 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTU-47979 are ephemeral. The majority of the surface flow from the lease block drains to the east in Meetinghouse Canyon and un-named drainages which report to Huntington Creek. Flow and quality data related to surface flow monitoring point MHC01 is included in Appendix C. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



CAD FILE NAME/DISK#: UTU-47979

LEGEND

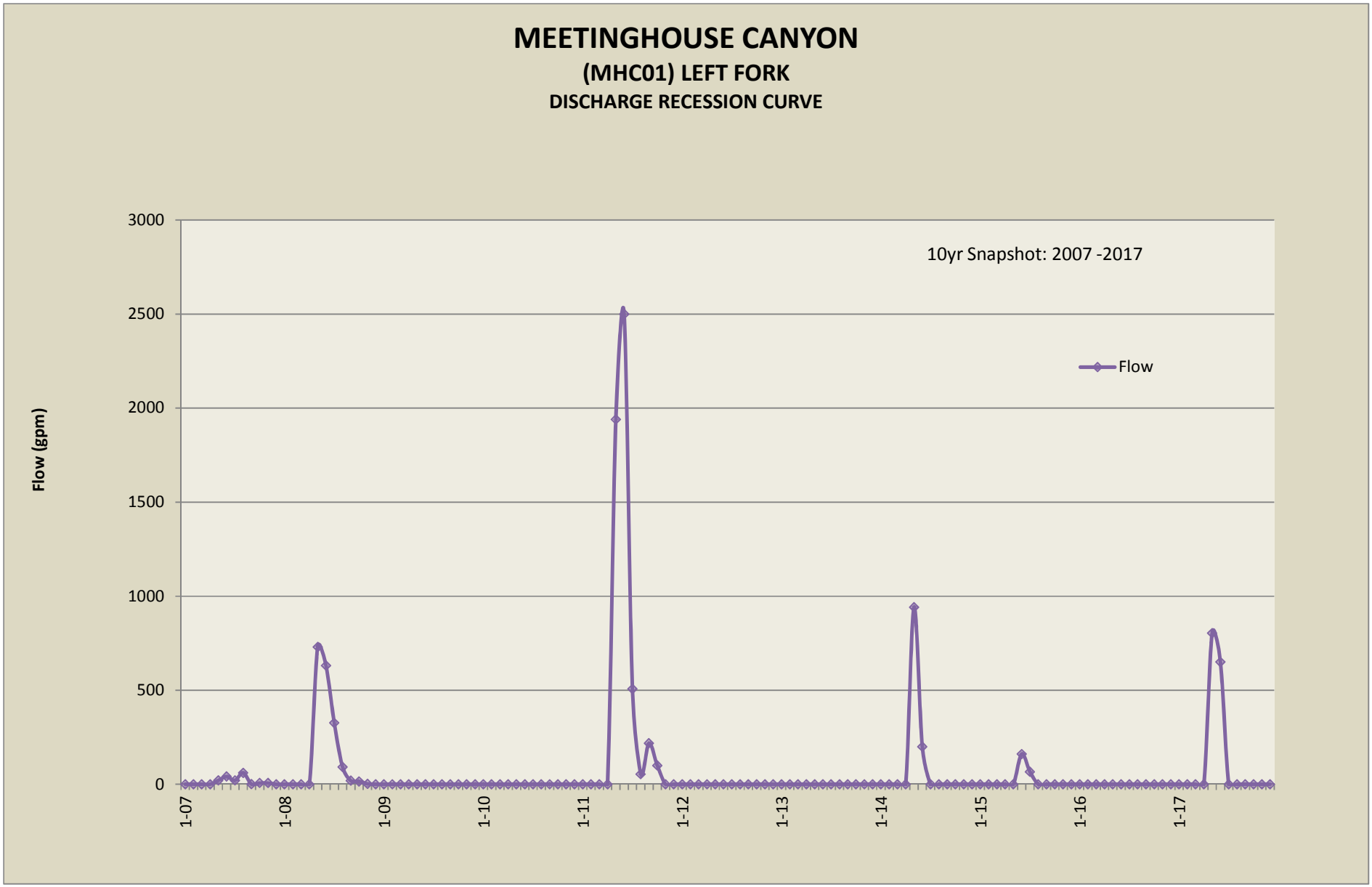
- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47979
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___


MEETINGHOUSE CANYON
(MHC01) LEFT FORK
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow
Flow (gpm)
3000
2500
2000
1500
1000
500
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17

MEETINGHOUSE CANYON WATER QUALITY *

MHC01 - LEFT FORK

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170606		209	50.3	0.0	3.0	437	218.00	0.6	0.00	22.57	0.00	0.0	8.4	1.12	6.47	28	73	239
No. of Analysis	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
2017																		
MIN	0	209	50	0	3	437	218	1	0	23	0	0	8	1	6	28	73	239
MAX	0	209	50	0	3	437	218	1	0	23	0	0	8	1	6	28	73	239
MEAN	0.00	209.00	50.25	0.00	3.00	437.00	218.00	0.62	0.00	22.57	0.00	0.00	8.40	1.12	6.47	28.00	73.00	239.00
2016**	NO FLOW DURING 2016																	
2015**	0	196	46.7	0.0	3.0	426	214	0.16	0.00	23.77	0.00	0.0	8.50	0.89	6.09	24.0	43.0	261
2014**	NO FLOW DURING 2014																	
2013**	NO FLOW DURING 2013																	
2012**	NO FLOW DURING 2012																	
2011**																		
MIN	0	207	43	0	4	487	250	0	0	24	0	0	9	1	8	33	17	266
MAX	0	225	60	0	4	502	253	1	0	35	0	0	9	1	11	42	72	281
MEAN	0	216	52	0	4	495	252	0	0	29	0	0	9	1	10	38	45	274
2010**	NO FLOW DURING 2010																	
2009**	NO FLOW DURING 2009																	
2008**		183	36.18		3.0	451	208	0.72		28.53			8.62	1.13	9.8	22	25	249
2007**		191	37		4.0	485	221	0.33		31.60			8.39	0.90	10.0	28	31	223
2006**																		
MIN		199	42		5.0	437	219	0.07		27.40			8.37	0.93	8.2	26	22	222
MAX		207	43		5.0	498	229	0.14		29.41			8.59	1.05	10.5	30	22	262
MEAN		203	43		5.0	468	224	0.11		28.41			8.48	0.99	9.4	28	22	242
HISTORICAL 1986-2016																		
MIN	0.0	183.0	2.2	0.0	1.0	300.0	175.0	0.0	0.0	17.2	0.0	0.0	7.0	0.0	3.8	8.0	0.1	183
MAX	49.0	307.0	80.4	34.0	47.5	557.0	350.0	1.2	0.3	36.5	0.1	10.9	8.8	1.6	14.0	100.0	175.0	304
MEAN	5.55	232.80	45.14	5.38	6.50	428.04	229.74	0.28	0.07	27.23	0.02	1.34	8.29	0.94	8.57	30.98	31.64	247.39
COUNT	26	46	46	38	46	46	46	43	27	46	28	26	46	37	46	46	43	46

*** Quality parameters are reported as mg/l unless otherwise noted.**

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTU-47979 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 94 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the vegetation characteristics of the area.

Vegetation of Lease UTU-47979 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-47979:

Barren/Sparse Vegetation	BR/SV
Black Sagebrush	BLSB
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Pinyon-Juniper	PJ
Ponderosa Pine Mix	PPmix
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

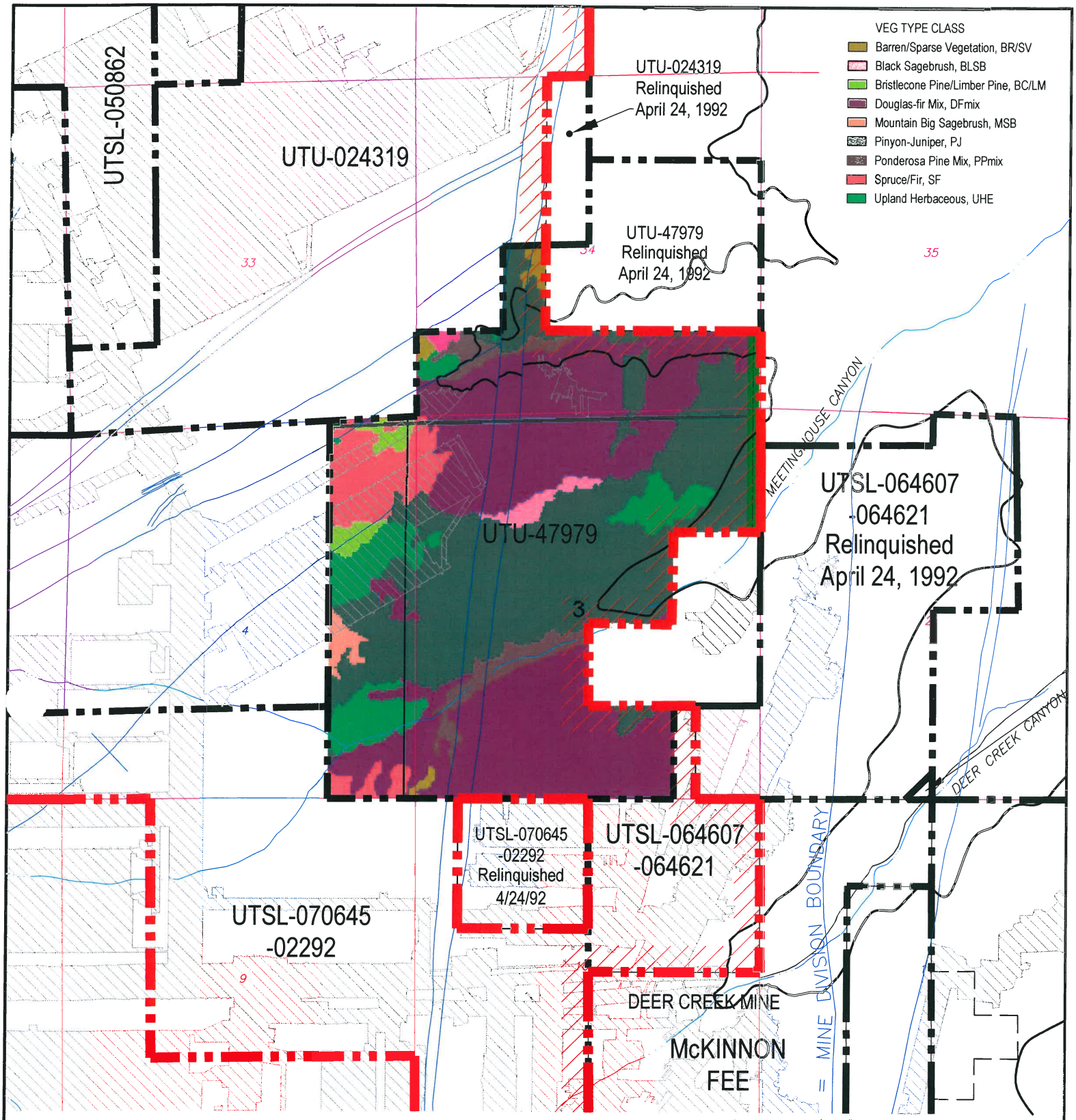
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-47979 area. There were no surface facilities or installations on this lease.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-47979 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-47979

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47979
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1"=2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-47979 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are two private surface improvements in Lease UTU-47979. The first of these is the 345 KV power transmission line that crosses the top of East Mountain within the boundaries of the lease. It is owned by PacifiCorp / Rocky Mountain Power. The power line was not undermined.

The second improvement is the Elk Spring development and associated water transfer pipeline that was constructed in 2009 – 2010. This pipeline is buried alongside the road in the Left Fork of Meetinghouse Canyon. The pipeline was not undermined.

To the best of the knowledge of the lessee through due inquiry including reconnaissance flights, subsidence surveys and periodic surface topography inspections, there are no mining-related impacts associated with the Deer Creek Mine to any private surface improvements on the lease area being relinquished.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-47979 lease have been submitted when those districts were sealed. The 6th – 7th – 8th East panel district was sealed in January, 1993. CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV 7, 2018

Lease(s) # UTU-047979 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th – 9th East Sections, 7th – 8th East Longwall Panels, Remainder of Mine Workings

Coal Bed: Blind Canyon Seam

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7 2018

Lease(s) # UTU-047979 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th – 9th East Sections, 7th – 8th East Longwall Panels, Remainder of Mine Workings

Coal Bed: Blind Canyon Seam

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-047979 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th – 9th East Sections, 7th – 8th East Longwall Panels, Remainder of Mine Workings

Coal Bed: Blind Canyon Seam

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTU-047979 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th – 9th East Sections, 7th – 8th East Longwall Panels, Remainder of Mine Workings

Coal Bed: Blind Canyon Seam

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-047979 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th – 9th East Sections, 7th – 8th East Longwall Panels, Remainder of Mine Workings

Coal Bed: Blind Canyon Seam

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
None			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-047979 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th – 9th East Sections, 7th – 8th East Longwall Panels, Remainder of Mine Workings

Coal Bed: Blind Canyon Seams

Dates: 09/85 – 01/93

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-47979
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 6th – 9th East Sections, 7th – 8th East Longwall Panels, and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (09/85 - 01/93) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	09/85 - 01/93	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	09/85 - 01/93	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	09/85 - 01/93	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	09/85 - 01/93	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	09/85 - 01/93	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	09/85 - 01/93	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	09/85 - 01/93	Naptha	40 - 50%	64742-94-5	All Sections
	09/85 - 01/93	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	09/85 - 01/93	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	09/85 - 01/93	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	09/85 - 01/93	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	09/85 - 01/93	Propane	14%	74-98-6	All Sections
	09/85 - 01/93	Butane	13%	106-97-8	All Sections
	09/85 - 01/93	Toluene	17%	108-88-3	All Sections
	09/85 - 01/93	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	09/85 - 01/93	Napthalene	0.40%	91-20-3	All Sections
	09/85 - 01/93	Acetone	41%	67-64-1	All Sections
	09/85 - 01/93	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	09/85 - 01/93	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	09/85 - 01/93	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	09/85 - 01/93	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	09/85 - 01/93	Mineral Oil	20 - 25%	8042-47-5	All Sections
	09/85 - 01/93	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	09/85 - 01/93	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	09/85 - 01/93	Methanol	<20%	67-56-1	All Sections
	09/85 - 01/93	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	09/85 - 01/93	Heptane	69 - 79%	142-82-5	All Sections
	09/85 - 01/93	Ethyl Ether	11 - 21%	60-29-7	All Sections
	09/85 - 01/93	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	09/85 - 01/93	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	09/85 - 01/93	Heptane	60 - 70%	142-82-5	All Sections
	09/85 - 01/93	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	09/85 - 01/93	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	09/85 - 01/93	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	09/85 - 01/93	None			All Sections
Cat Transmission and Drive Train Oil	09/85 - 01/93	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	09/85 - 01/93	Monoethanolamine	<10%	141-41-3	All Sections
	09/85 - 01/93	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	09/85 - 01/93	Mineral Oil	70 - 95%	Mixture	All Sections
	09/85 - 01/93	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	09/85 - 01/93	Lubricant base oil	87 - 91%	Various	All Sections
	09/85 - 01/93	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	09/85 - 01/93	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	09/85 - 01/93	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	09/85 - 01/93	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	09/85 - 01/93	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	09/85 - 01/93	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	09/85 - 01/93	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	09/85 - 01/93	Trichloroethylene	95 - 99%	79-01-6	All Sections
	09/85 - 01/93	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	09/85 - 01/93	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	09/85 - 01/93	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	09/85 - 01/93	Deionized Water	1 - 3%	7732-18-5	All Sections
	09/85 - 01/93	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-47979
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 6th – 9th East Sections, 7th – 8th East Longwall Panels, and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (09/85 - 01/93) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	09/85 - 01/93	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	09/85 - 01/93	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	09/85 - 01/93	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	09/85 - 01/93	Calcium sulfate	2 - 10%		All Sections
	09/85 - 01/93	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	09/85 - 01/93	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	09/85 - 01/93	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	09/85 - 01/93	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	09/85 - 01/93	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	09/85 - 01/93	Lead	34%	7439-92-1	All Sections
	09/85 - 01/93	Lead Dioxide	31%	1309-60-0	All Sections
	09/85 - 01/93	Lead Sulfate	<1%	7446-14-2	All Sections
	09/85 - 01/93	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	09/85 - 01/93	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	09/85 - 01/93	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	09/85 - 01/93	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	09/85 - 01/93	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	09/85 - 01/93	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	09/85 - 01/93	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	09/85 - 01/93	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	09/85 - 01/93	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	09/85 - 01/93	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	09/85 - 01/93	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	09/85 - 01/93	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	09/85 - 01/93	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	09/85 - 01/93	Portland Cement		65997-15-1	All Sections
	09/85 - 01/93	Crystalline Silicon Dioxide		13397-24-5	All Sections
	09/85 - 01/93	Calcium Hydroxide		001-305-620	All Sections
	09/85 - 01/93	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	09/85 - 01/93	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	09/85 - 01/93	Polyglycols	60 - 100%	Mixture (2)	15 W
	09/85 - 01/93	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	09/85 - 01/93	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	09/85 - 01/93	Polyester Resin	5 - 15%	Not Reported	All Sections
	09/85 - 01/93	Styrene Monomer	3 - 7%	100-42-5	All Sections
	09/85 - 01/93	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	09/85 - 01/93	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	09/85 - 01/93	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	09/85 - 01/93	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	09/85 - 01/93	Isobutane	2 - 10%	75-28-5	All Sections
	09/85 - 01/93	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	09/85 - 01/93	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	09/85 - 01/93	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	09/85 - 01/93			64742-48-9	All Sections
	09/85 - 01/93			64742-88-7	All Sections
	09/85 - 01/93	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	09/85 - 01/93	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	09/85 - 01/93	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	09/85 - 01/93	Lubricant base oil	>99	Various	All Sections
	09/85 - 01/93	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	09/85 - 01/93	Lubricant base oil	87 - 91%	Various	All Sections
	09/85 - 01/93	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	09/85 - 01/93	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	09/85 - 01/93	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-47979
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
- **Quantity - Historical Data**
- **Quality - Historical Data (UPDES Parameters)**
  - **Total Suspended Solids**
  - **Iron (Total & Dissolved)**
  - **Oil & Grease**
  - **Total Dissolved Solids**
  - **Ph**

UPDES Permit Data:

Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

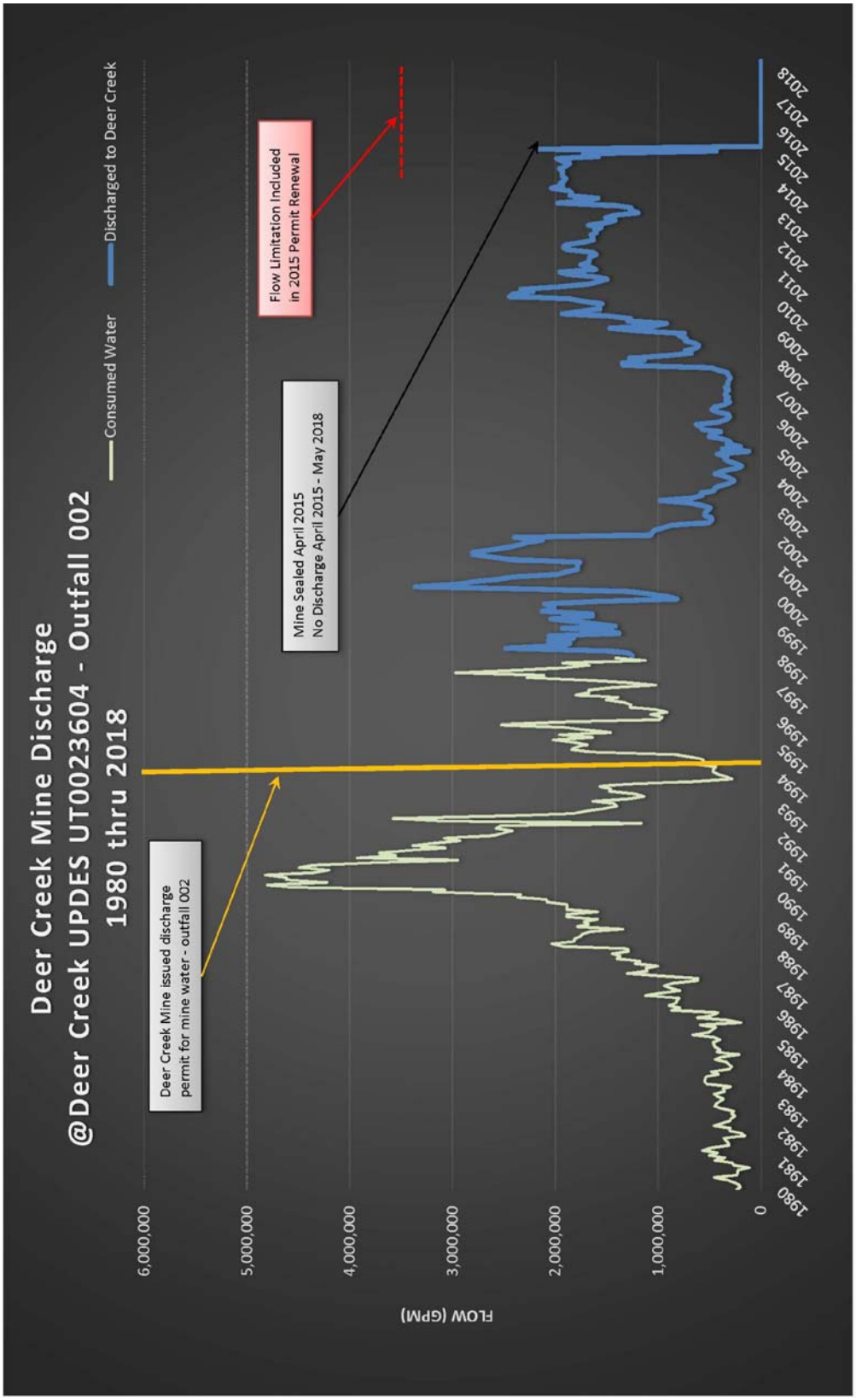
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



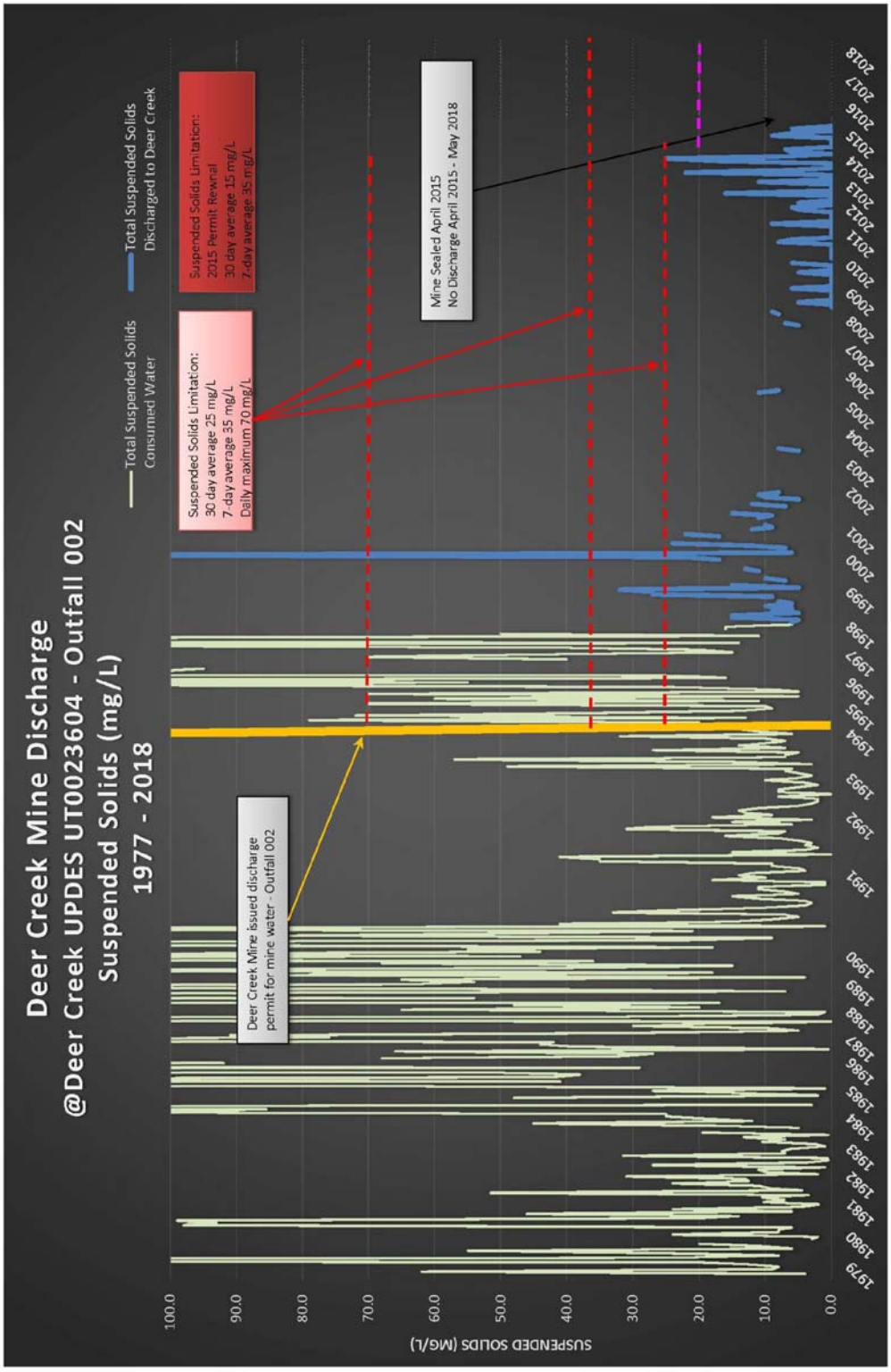
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



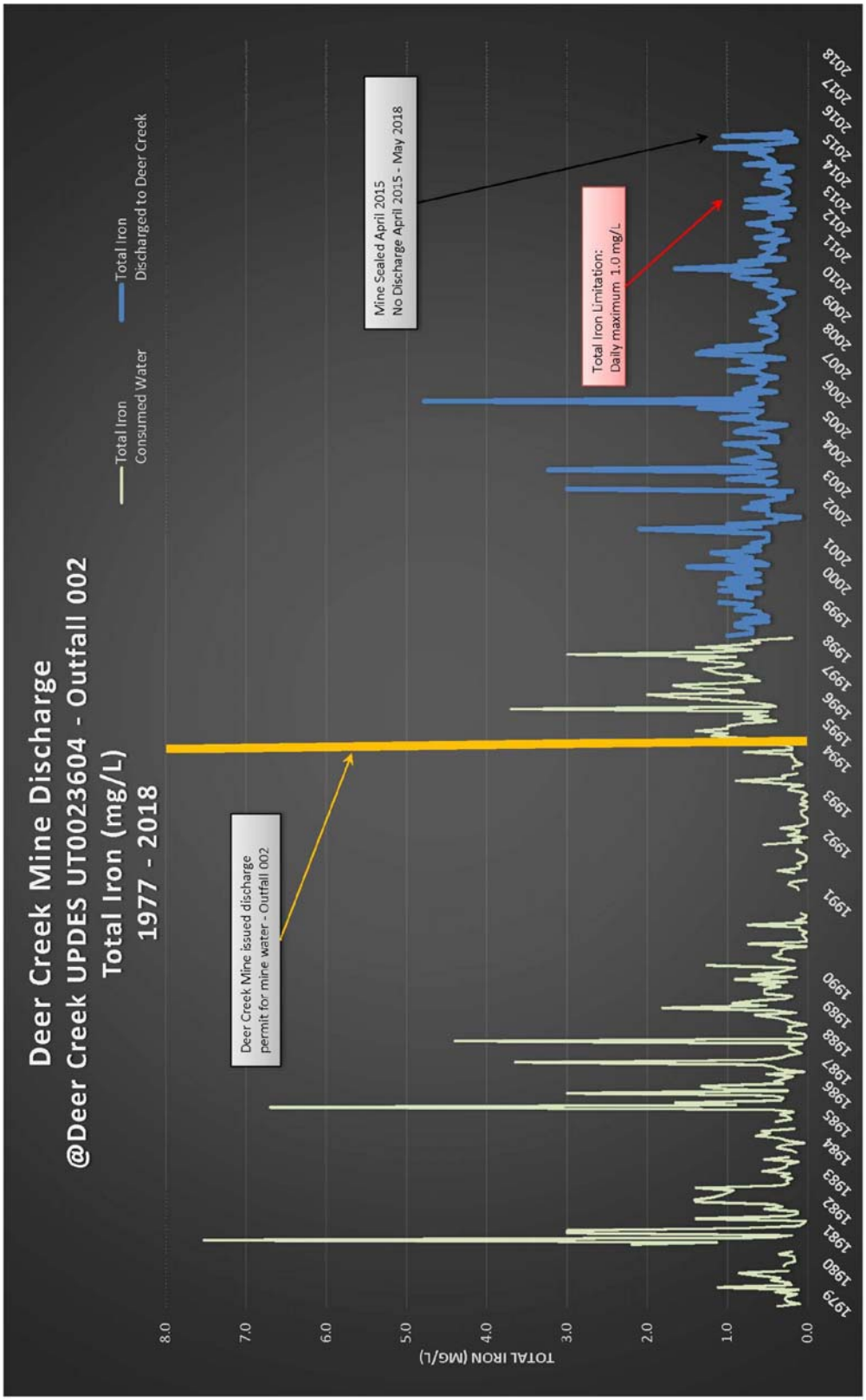
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



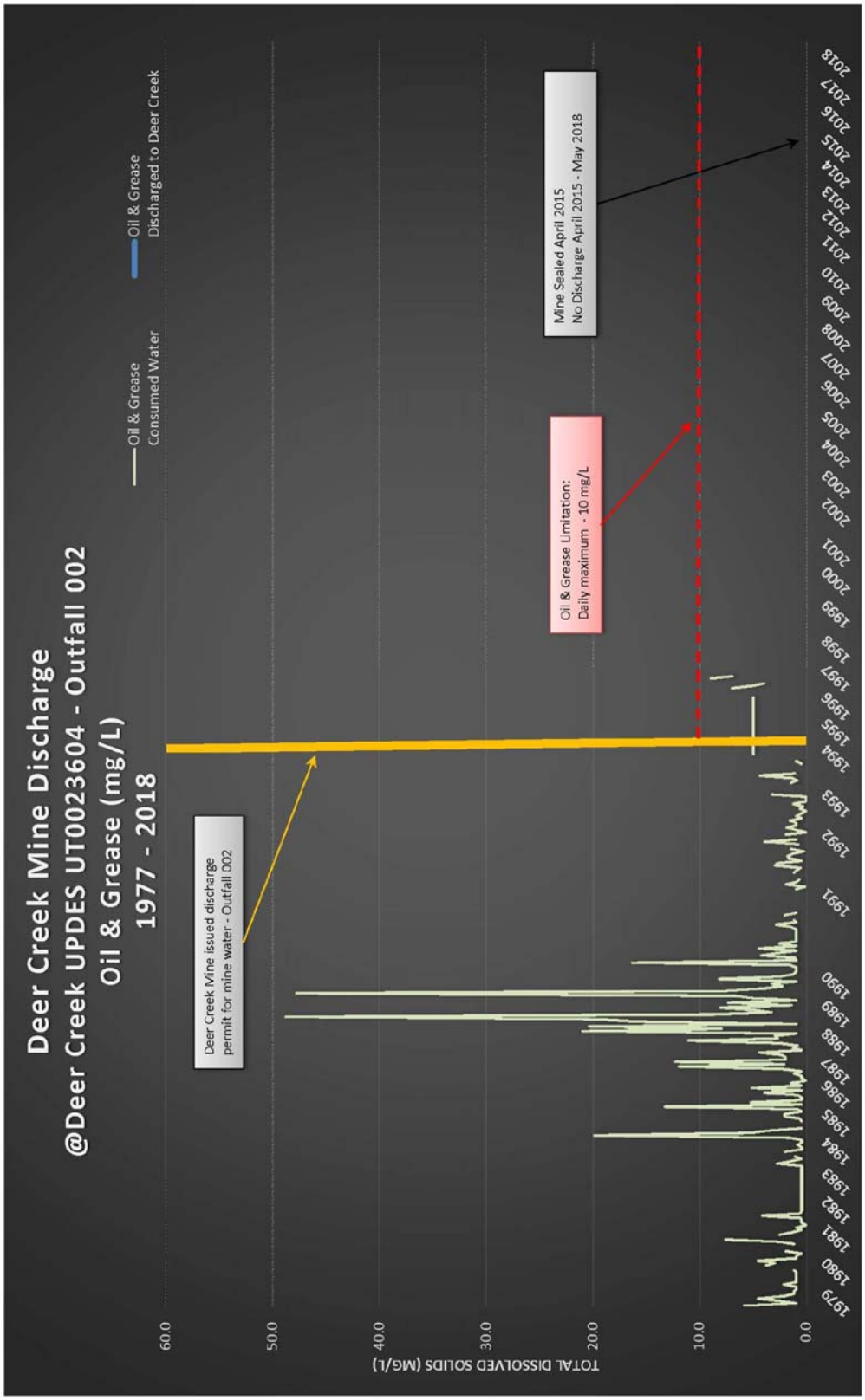
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



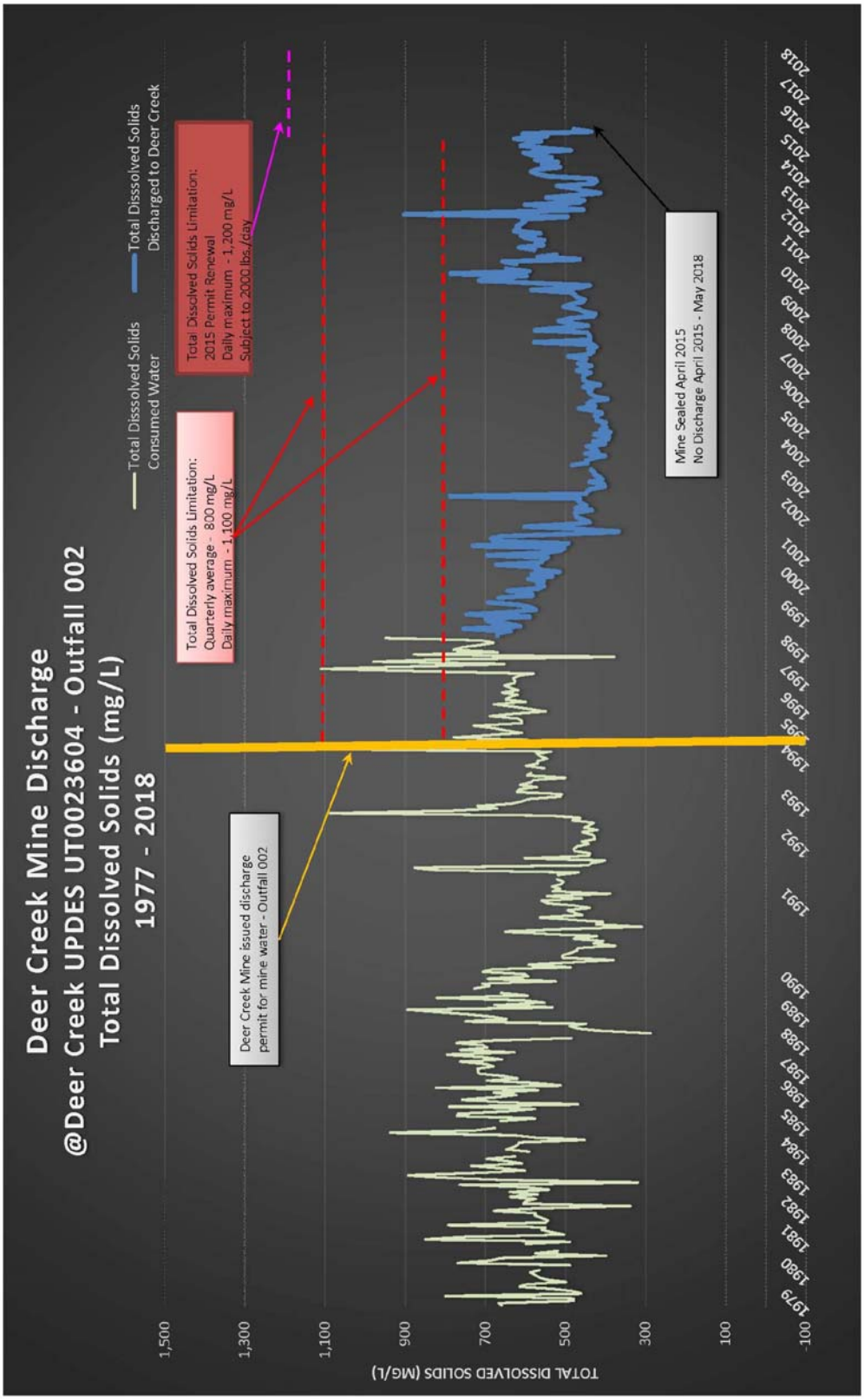
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



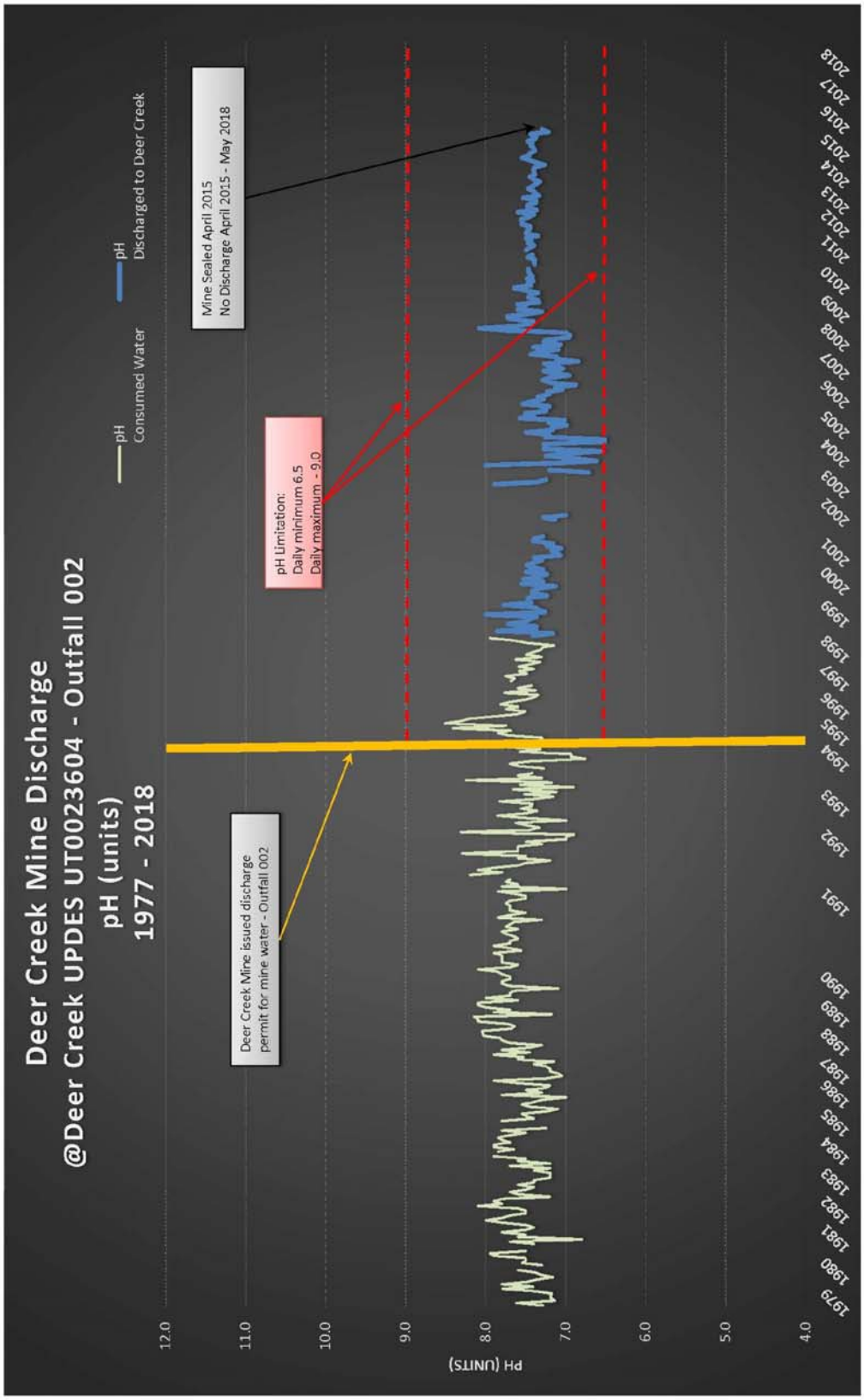
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Partial Relinquishment
Federal Coal Lease
UTSL-064607-064621

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTSL-070645/U-02292, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTSL-070645/U-02292. The total acreage being surrendered is 1,070.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTSL-070645/U-02292 is described below:

Federal Coal Lease UTSL-070645/U-02292		
Lease Readjustment Effective Date:		4/1/2012 to 4/1/2022
Lessee of Record:		Armeda McKinnon Illiquid Assets Trust
Sublessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,070.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 4:	S½SW¼, SW¼SE¼	120.00
Sec 5:	SE¼SW¼, S½SE¼	120.00
Sec 9:	NE¼, E½NW¼, NE¼SW¼, N½SE¼	360.00
Sec 10:	W½W½NW¼, SE¼SW¼NW¼, S½SE¼NW¼, SW¼	230.00
Sec 15:	NW¼	160.00
Sec 17:	E½NW¼	80.00
Total Lease Acres for Full Relinquishment:		**1,070.00**
Total Lease Acres Remaining:		**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of the Armeda McKinnon Illiquid Assets Trust (Trust) as the lessee of record and PacifiCorp as the sublessee of record. Consent to relinquishment is acknowledged by the accompanying Relinquishment and Consent signed by the Trust dated September 26, 2018, and as set forth below by PacifiCorp.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7TH of NOV, 2018 by PacifiCorp, the sublessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-064607-064621

LEASE ACTIVITIES

1) Coal Lease Number: UTSL-064607-064621 *(Partial Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 150.00; Entire lease? YES ☐ NO ☒ (See attached map.) Comments: *This is a partial relinquishment. Refer to Exhibit A for the legal descriptions of acreage relinquished and acreage retained. See also Figures 1 and 2 (a map depicting the areas to be relinquised and retained). Lease acreage to be retained: 20.00.*

Original Lease Acreage: 613.92 Relinquished to date: 443.92 acres Remaining: 170.00 ac.
- *Partial relinquishment: 150.00 acres – Accepted effective 4/24/1992*
- *Partial relinquishment: 293.92 acres – Accepted effective 12/14/1995*

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☐, Room & Pillar ☒, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)?
YES ☒ NO ☐ If "YES", describe: *A portion of surface land on leased area will be retained for reclamtion purposes near the main Deer Creek Mine portals. All surface facilites have been removed. Reclamation of the disturbed lands will take place during 2018-2019. The Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-064607-064621

11) Date of initial mining: 1970; last mining: July 1979.

12) Number of coal beds mined: 1 coal seam (Blind Canyon)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain LMU with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to explanation of spring monitoring reduction*

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-064607-064621

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
   - *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities? YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐ (If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-064607-064621

Exhibit A

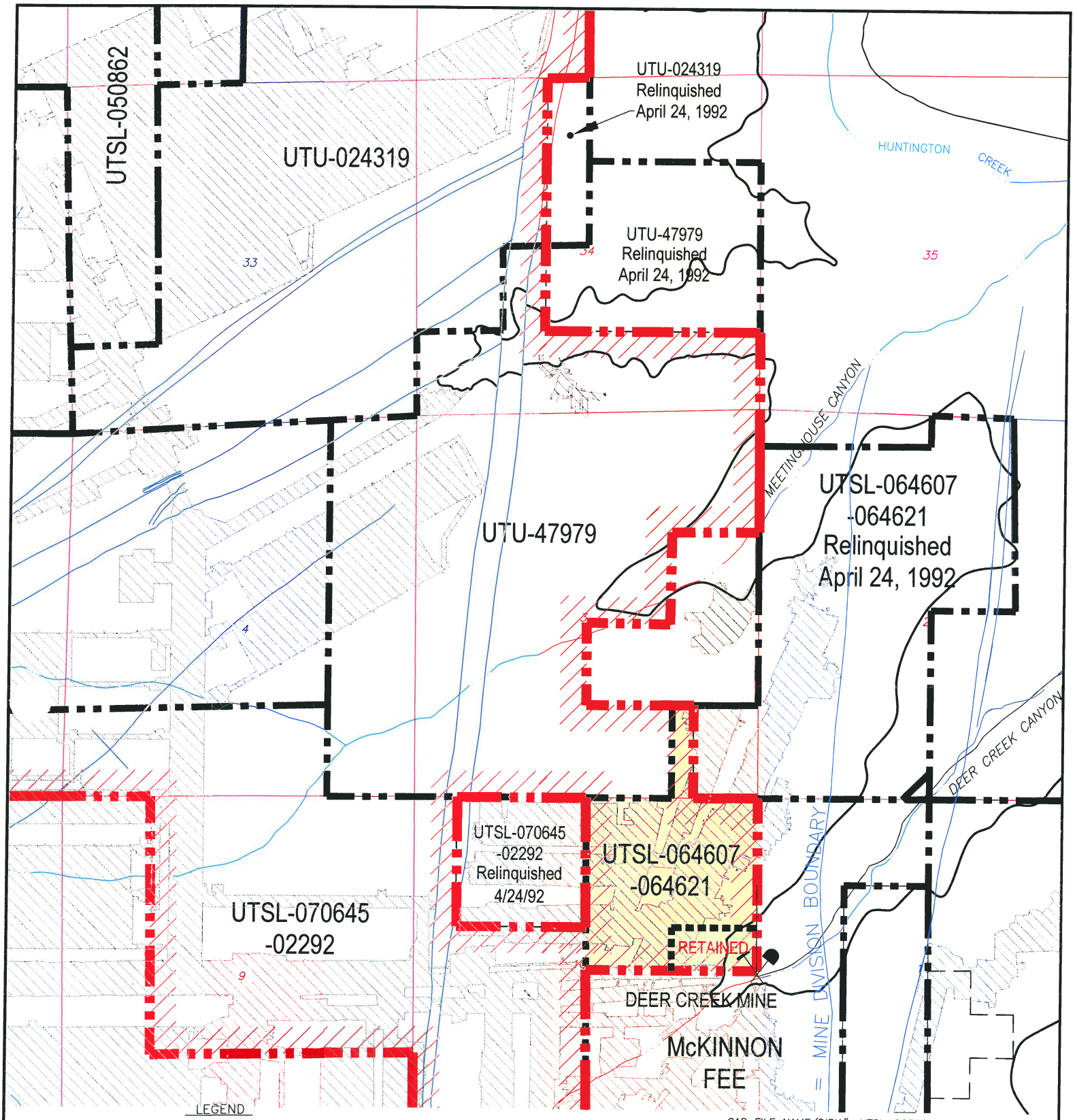
Partial Relinquishment

The legal description for partial relinquishment of UTSL-064607-064621 is described below:

Federal Coal Lease UTSL-064607/064621		
Lease Readjustment Effective Date:		10/4/2016 to 10/4/2026
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**170.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 3:	W½W½SE¼SE¼	10.00
Sec 10:	NE¼NE¼, W½NE¼, N½SE¼NE¼	140.00
	Total Lease Acreage Being Relinquished:	**150.00**
	Total Lease Acres Remaining:	**20.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec. 10	S½SE¼NE¼	**20.00**
	Total Lease Acreage Being Retained:	**20.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- SL-064607-064621 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA
- FEDERAL COAL LEASE RETAINMENT AREA

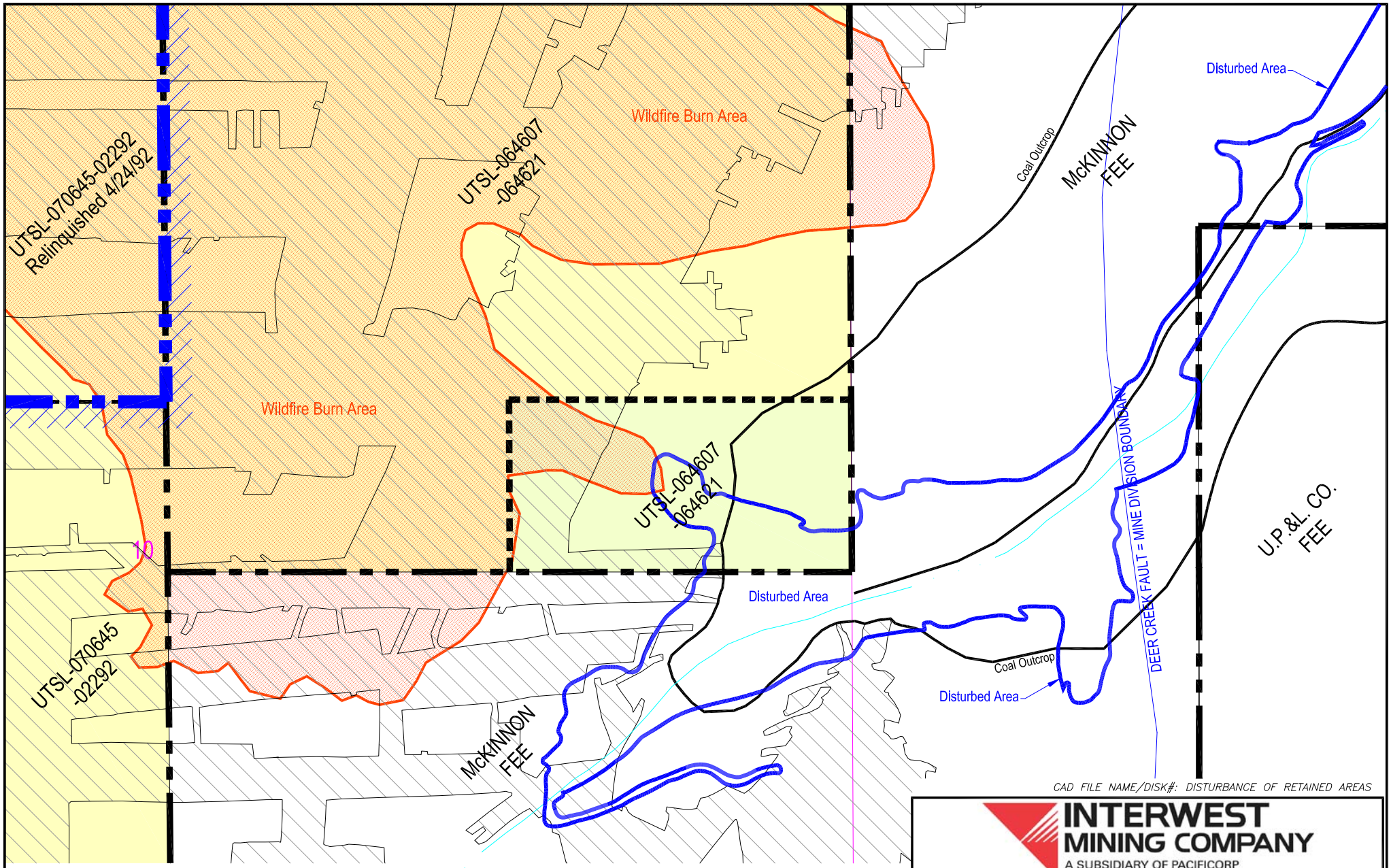
N

CAD FILE NAME/DISK#: UTSL-067607-064621

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064607/064621

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___



CAD FILE NAME/DISK#: DISTURBANCE OF RETAINED AREAS

LEGEND

DISTURBED AREA TO BE RECLAIMED	
COAL OUTCROP	
HIAWATHA SEAM MINE WORKINGS	
BLIND CANYON SEAM MINE WORKINGS	
UTSL-064607	FEDERAL LEASE NUMBER
	FEDERAL LEASE LINE
	FEDERAL COAL LEASE ACREAGE RETAINED
	FEDERAL COAL LEASE ACREAGE RELINQUISHED
	WILDFIRE BURN AREA - JUNE 2018

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

DEER CREEK MINE
FEDERAL COAL LEASE ACREAGE RETAINED
WITH DISTURBED AREA

DRAWN BY:	K. LARSEN	FIGURE 2	
SCALE:	1" =500'	DRAWING #:	
DATE:	OCTOBER 1, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTSL-064607-064621
Checklist and Data Documentation for
Federal Coal Partial Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTSL-064607-064621 Partial Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

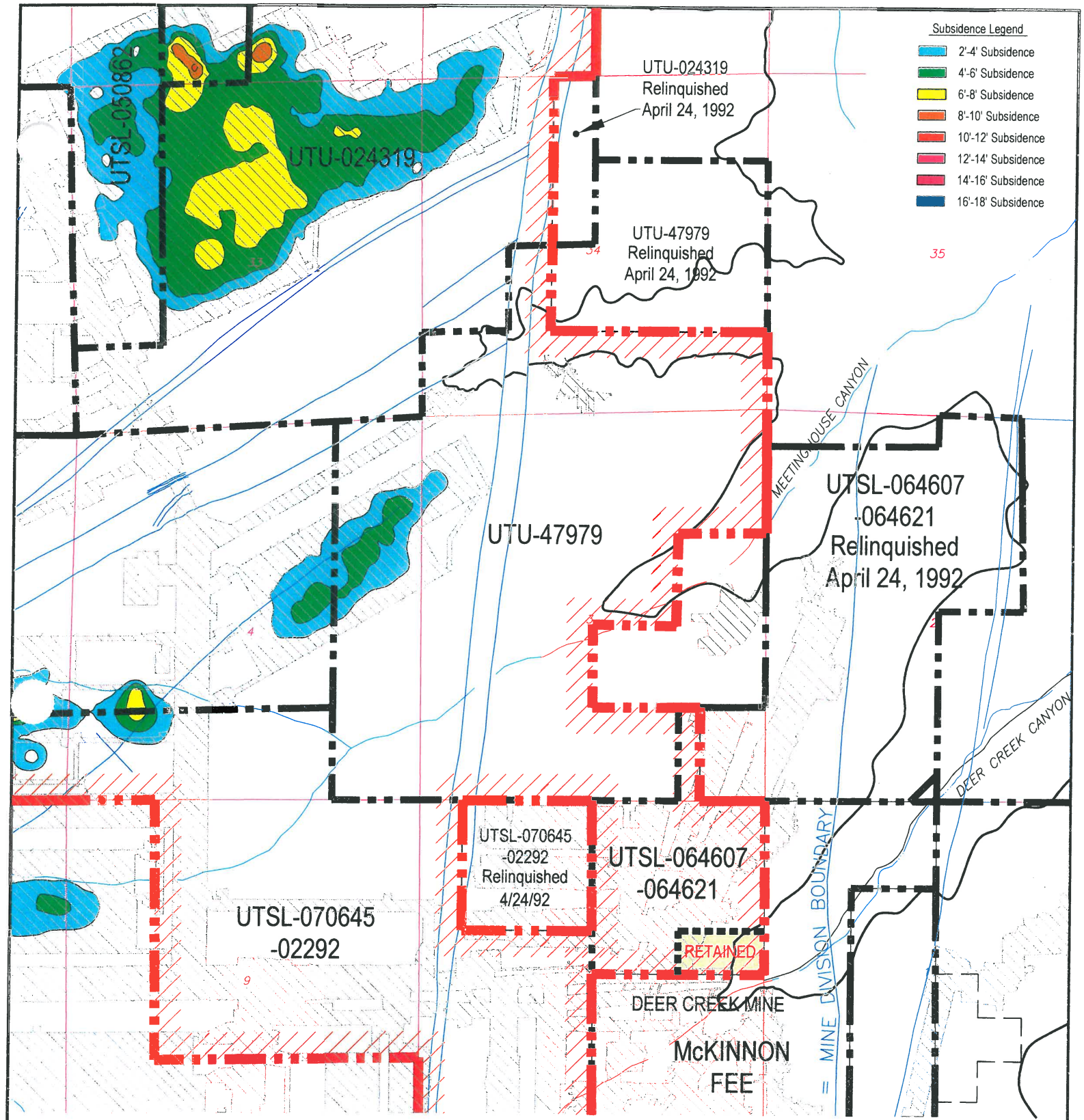
Mining History

This lease is comprised of a single contiguous block of coal reserves in the Blind Canyon seam. Coal reserves were recovered by continuous miner methods only. Mining in the Blind Canyon seam took place prior to 1970 and up to 7/1979.

Since the mined area within Lease UTSL-064607-064621 was already mined prior to implementation of any subsidence monitoring programs, subsidence is considered to be complete.

Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no subsidence-related effects on the surface in UTSL-064607-064621.

The proposed relinquishment area of Lease UTSL-064607-064621 is stable and subsidence is substantially complete.



CAD FILE NAME/DISK#: UTSL-064607-064621

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- SL-064607-064621 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

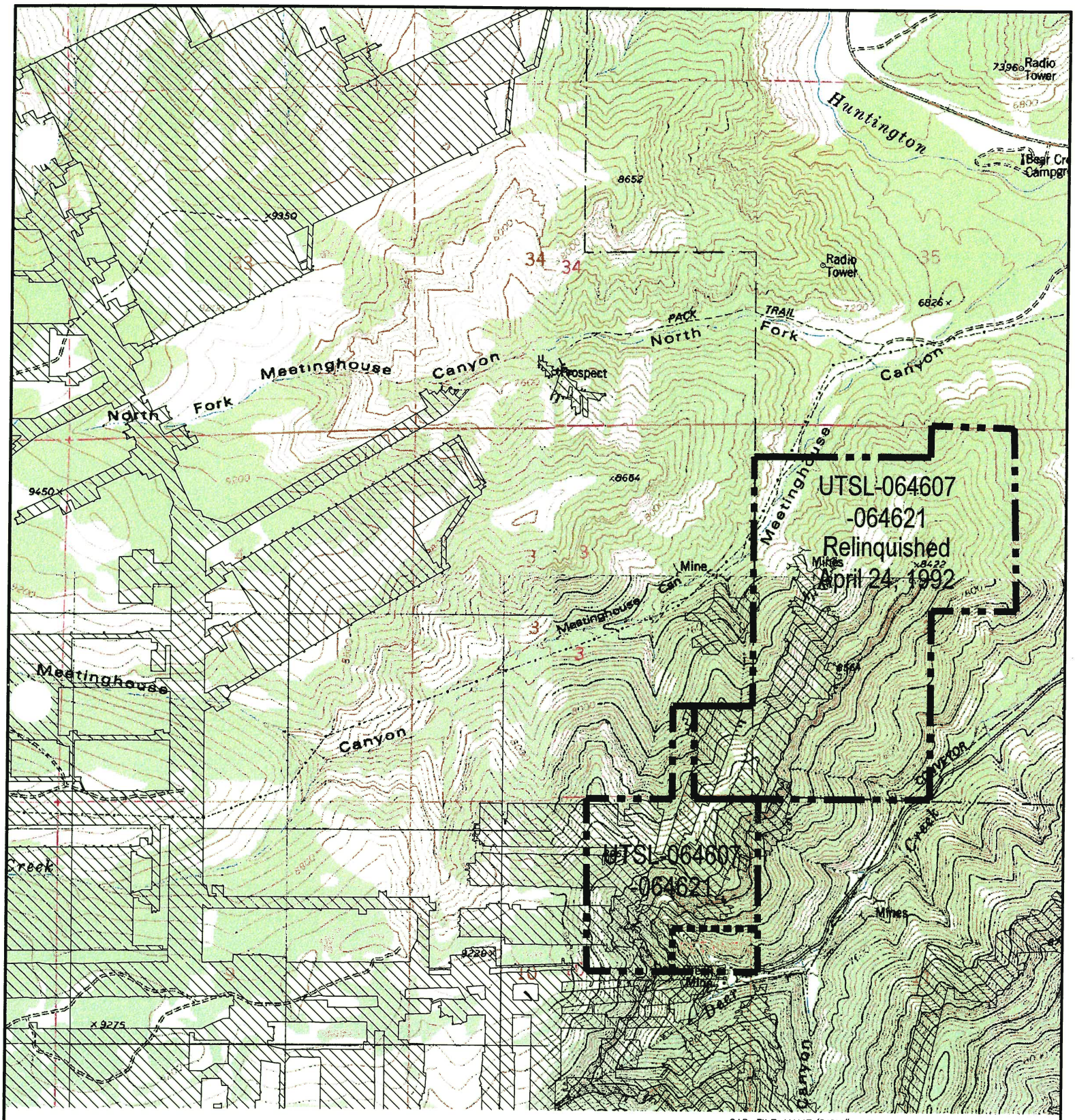
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064607/064621
SUBSIDENCE BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX A	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-064607-064621 Partial Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTSL-064607-064621 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTSL-064607-064621. No restoration and/or mitigation efforts are required for Lease UTSL-064607-064621. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTSL-064607-064621 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTSL-064607-064621

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

FEDERAL LEASE ACREAGE RETAINED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064607/064621
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-064607-064621 Partial Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 86 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTU- and surrounding area.

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP).

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTSL-064607-064621.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The Mill Fork 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the Mill Fork 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. 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 PacifiCorp mining area covers portions of East Mountain and Trail Mountain, which are separated by Cottonwood Canyon, a deep, partially glaciated valley.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable

calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, but is not exposed in the Mill Fork Area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the Mill Fork Area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the Mill Fork Area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the Mill Fork Area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone

are limited to a narrow north-south trending ridge located in the western half of the Mill Fork Area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the waterbearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 Area.

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 lease 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 fault within the Mill Fork Area is the Joes Valley Fault, which forms the western limit of the coal reserves in this area. The Joes Valley Fault is the largest and most prominent of several north south trending fault zones within the Wasatch Plateau coal field. Displacement of the fault is approximately 1,500 feet, downthrown on the western side. The fault creates a continuous north-south escarpment on the east side of Joes Valley. Several side canyons are cut into this escarpment on the western side of the lease area, all of which drain into Joes Valley. The fault zone itself is not visible along this escarpment, but the fault has been intercepted underground in the Genwal Mine to the north. Where the fault has been intercepted in the Genwal mine workings, a drag fold is present, indicated by a gentle downward folding of the strata along the fault zone, extending for a few hundred feet to the east of the fault.

The nearest known faulting outside of the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes to the southeast of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in

the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area (including lease UTU-) and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow

variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk
Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated is that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-

Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The δ2H and δ18O compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.

7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years
    b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
    c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The

radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its $CO_2(g)$ in the soil zone where the partial pressure of CO_2 greatly exceeds atmospheric levels. This CO_2 combines with water to form carbonic acid according to

$$CO_2(g) + H_2O = H_2CO_3 \quad (1)$$

Carbonic acid dissociates into H^+ and HCO_3^- as

$$H_2CO_3 = HCO_3^- + H^+ \quad (2)$$

The H^+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H^+ + \underset{\text{(dolomite)}}{CaMg(CO_3)_2} = Ca^{2+} + Mg^{2+} + 2HCO_3^-, \text{ and} \quad (3)$$

$$H^+ + \underset{\text{(calcite)}}{CaCO_3} = Ca^{2+} + HCO_3^- \quad (4)$$

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$CaSO_4 \bullet 2H_2O = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$
(gypsum)

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-}clay = 2Na^+ + Ca\text{-}clay \quad (9)$$

$$Mg^{2+} + Na\text{-}clay = 2Na^+ + Mg\text{-}clay \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is

supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Because the Mill Fork State Lease (now UTU-88554) was a new lease area that did not have existing underground workings, the solute compositions of in-mine groundwater can only be inferred from compositions of in-mine waters in nearby mines. Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This

condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} - HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and δ^{18}O

The δ^2H and δ^{18}O composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and δ^{18}O composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Energy West and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork Spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^{3}H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^{3}H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^{3}H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^{3}H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep

groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the

shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that

groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute significant groundwater to the discharge from the spring.

  Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – MILL FORK AREA

A. GROUNDWATER

Groundwater within the Mill Fork Area was monitored according to the schedules in established in the Deer Creek MRP. PacifiCorp has conducted baseline and operational monitoring of spring sources in and adjacent to the lease area. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.
The ground water monitoring plan in Appendix C includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights
- Measurable flow based on historical surveys
- Reliable measuring point(s)

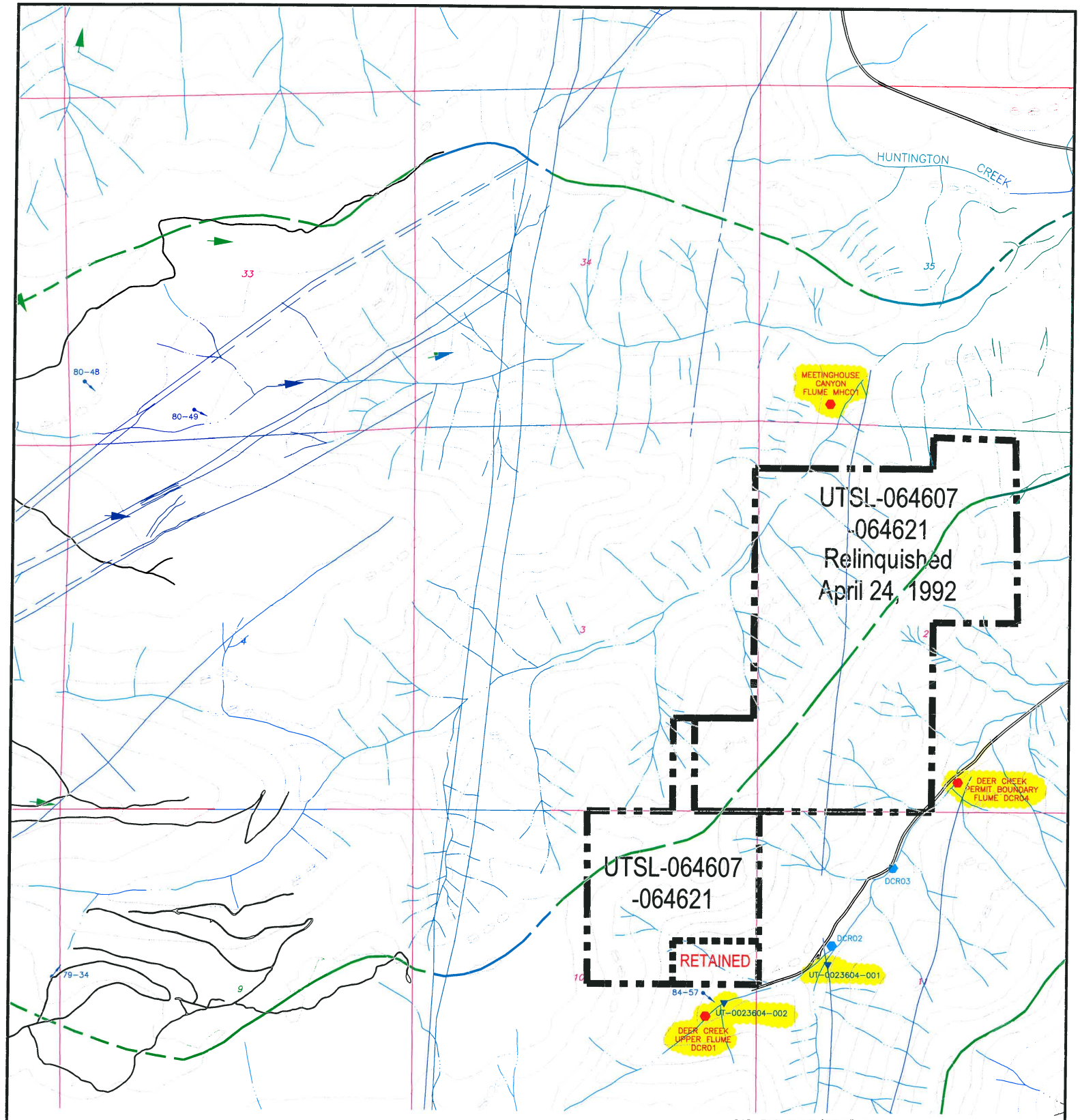
Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency. There are no surface springs monitored within the portion of the lease that is to be relinquished. The surface water monitoring point DCR01 and the UPDES discharge point UT-0023604-002 for the entire southern portion of the mine are within ½ mile of the lease. Water quality and flow data for those points are presented in Appendix C and F (Summary Discharge report).

Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTSL-064607-064621 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTSL-064607-064621 are ephemeral. The majority of the surface flow from the lease block drains to the east into Deer Creek and un-named drainages which report to Huntington Creek. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



CAD FILE NAME/DISK#: UTSL-064607-064621

LEGEND

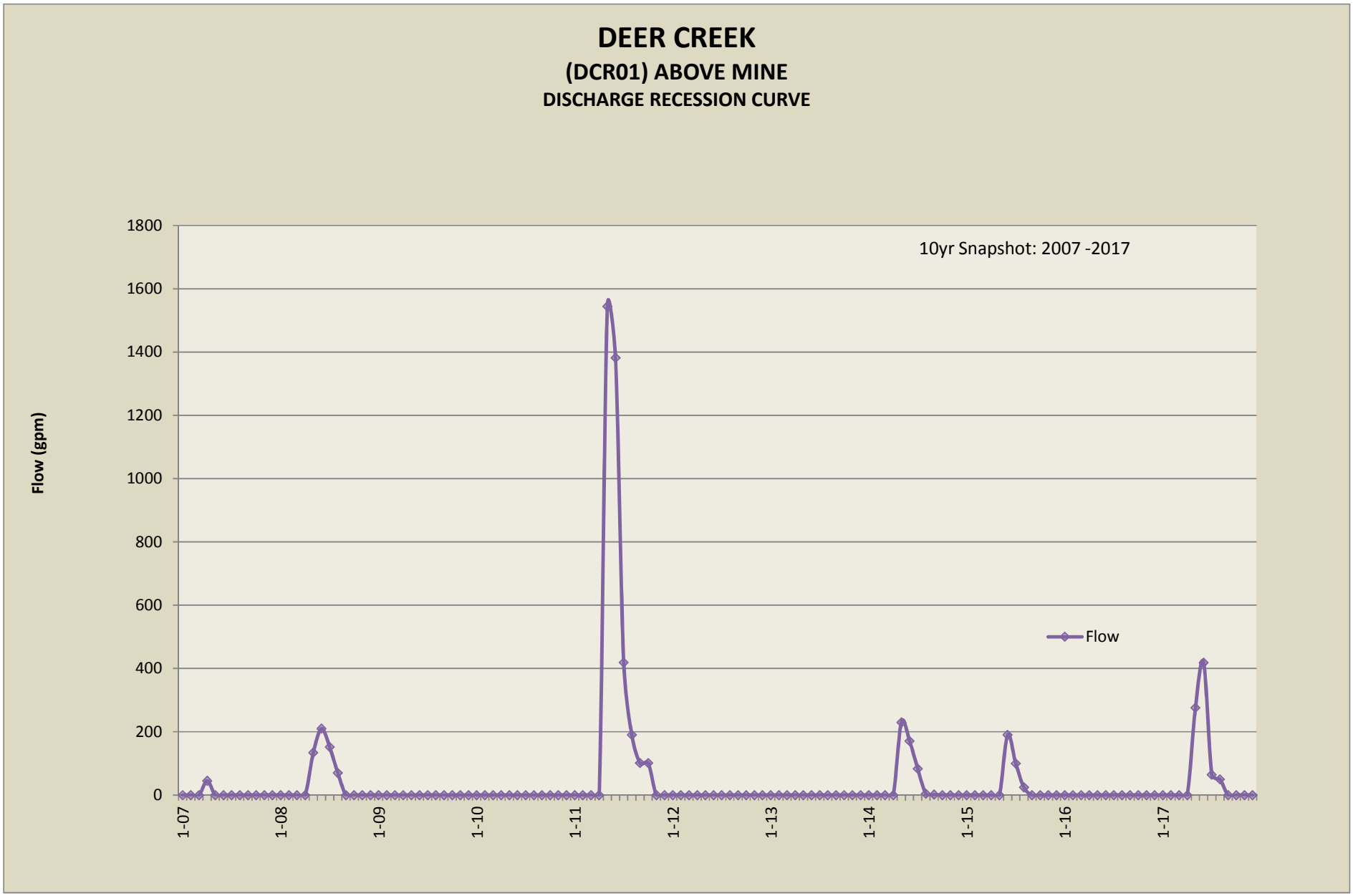
- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064607/064621
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___


DEER CREEK
(DCR01) ABOVE MINE
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
1800
1600
1400
1200
1000
800
600
400
200
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

DEER CREEK SURFACE WATER QUALITY *

DCR01 - ABOVE THE MINE

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170606		261	51.9	0.0	5.0	531	235.00	0.1	0.00	25.54	0.00	0.0	8.4	1.18	27.16	28	29	285
No. of Analysis	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
2017**																		
MIN	0	261	52	0	5	531	235	0	0	26	0	0	8	1	27	28	29	285
MAX	0	261	52	0	5	531	235	0	0	26	0	0	8	1	27	28	29	285
MEAN	0.00	261.00	51.86	0.00	5.00	531.00	235.00	0.11	0.00	25.54	0.00	0.00	8.36	1.18	27.16	28.00	29.00	285.00
2016**	NO SAMPLES DURING 2016																	
2015**	0	251	40.67	0	5	554	215	0.46	0	27.48	0	0	8.48	0.94	32.84	36	18	326
2014**	NO SAMPLES DURING 2014																	
MIN	0	229	35.4	0	5	525	179	0	0	22.03	0	0	8.55	0.9	31.45	36	0	292
MAX	0	244	44.01	11	6	614	253	0.1	0	34.65	0	0	8.59	1.74	45.06	70	9	355
MEAN	0	236.5	39.705	5.5	5.5	569.5	216	0.05	0	28.34	0	0	8.57	1.32	38.255	53	4.5	323.5
2013**	NO SAMPLES DURING 2013																	
2012**	NO SAMPLES DURING 2012																	
2011**																		
MIN	0	249	42.93	0	5	574	243	0	0	25.43	0	0	8.33	0.85	27.21	29	0	320
MAX	0	252	63	24	5	589	262	0.18	0	32.92	0	0	8.55	0.99	38.62	50	26	325
MEAN	0	250.5	52.965	12	5	581.5	252.5	0.09	0	29.175	0	0	8.44	0.92	32.915	39.5	13	322.5
2010**	NO SAMPLES DURING 2010																	
2009**	NO SAMPLES DURING 2009																	
2008**	0	205	39.54	18	4	529	207	0	0	26.31	0	na	8.71	0.96	32.66	34		268
2007**	NO SAMPLES DURING 2007																	
2006**																		
MIN		238	43		6	538	223	0.06		28			8.39	1	30	35	15	279
MAX		283	49		8	720	259	0.06		33			8.59	1	47	68	15	406
MEAN		261	46		7	629	241	0.06		31			8.49	1	39	52	15	343
HISTORICAL 1978-2016																		
MIN	0.0	205.0	2.2	0.0	3.5	360.0	179.0	0.0	0.0	19.3	0.0	0.0	7.0	0.0	13.4	10.0	0.0	231
MAX	137.0	397.0	107.2	24.0	176.0	1580.0	599.0	40.1	0.4	83.9	0.2	5.0	8.8	4.3	111.6	255.0	3592.0	897
MEAN	9.17	297.94	52.51	6.04	15.58	593.23	271.20	0.76	0.07	33.45	0.04	0.98	8.07	1.20	33.93	58.75	86.92	344.86
COUNT	33	50	50	38	51	90	50	80	26	50	72	30	91	40	50	52	83	91

*** Quality parameters are reported as mg/l unless otherwise noted.**

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTSL-064607-064621 Partial Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 86 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the vegetation characteristics of the area.

Vegetation of Lease UTSL-064607-064621 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTSL-064607-064621:

Barren/Sparse Vegetation	BR/SV
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Pinyon-Juniper	PJ
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

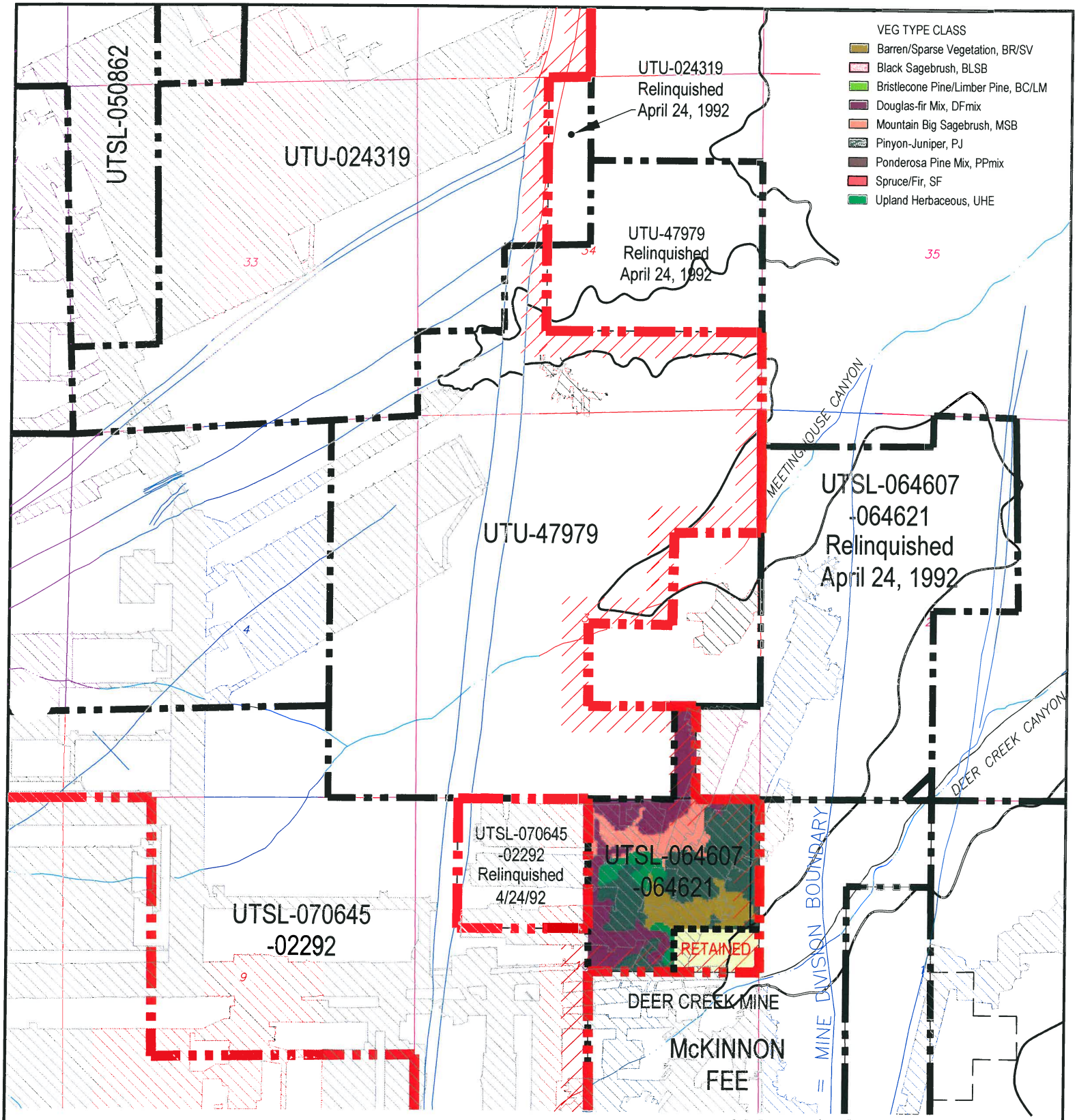
Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are



CAD FILE NAME/DISK#: UTSL-064607-064621

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- SL-064607-064621 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064607/064621
VEGETATION BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX D
SCALE:	1" = 2000'	DRAWING #:
DATE:	MAY 1, 2018	SHEET 1 OF 1 REV. ___

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTSL-064607-064621 area. There were no surface facilities or installations on this lease.

Deer Creek Mine
Federal Coal Lease UTSL-064607-064621 Partial Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in the relinquished portion of Lease UTSL-064607-064621.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTSL-064607-064621 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTSL-064607-064621 have taken place in February 2015 (Blind Canyon Seam). CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-064607/064621 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) Main West, 1st North, 1 1/2 North, 2nd North, 1st - 3rd Left and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) 11/7/18 (Date)

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-064607/064621 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) Main West, 1st North, 1 1/2 North, 2nd North, 1st - 3rd Left and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTSL-064607/064621 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) Main West, 1st North, 1 1/2 North, 2nd North, 1st - 3rd Left and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTSL-064607/064621 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) Main West, 1st North, 1 1/2 North, 2nd North, 1st - 3rd Left and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-064607/064621 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) Main West, 1st North, 1 1/2 North, 2nd North, 1st - 3rd Left and Remainder of Mine Workings and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTSL-064607/064621 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) Main West, 1st North, 1 1/2 North, 2nd North, 1st - 3rd Left and Remainder of Mine Workings and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 1980 – 2017

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTSL-064607-064621
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: Main West, 1st North, 1 1/2 North, 2nd North, 1st - 3rd Left
And Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (Pre-70 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	</70 - 04/15	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	</70 - 04/15	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	</70 - 04/15	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	</70 - 04/15	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	</70 - 04/15	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	</70 - 04/15	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	</70 - 04/15	Naptha	40 - 50%	64742-94-5	All Sections
	</70 - 04/15	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	</70 - 04/15	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	</70 - 04/15	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	</70 - 04/15	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	</70 - 04/15	Propane	14%	74-98-6	All Sections
	</70 - 04/15	Butane	13%	106-97-8	All Sections
	</70 - 04/15	Toluene	17%	108-88-3	All Sections
	</70 - 04/15	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	</70 - 04/15	Napthalene	0.40%	91-20-3	All Sections
	</70 - 04/15	Acetone	41%	67-64-1	All Sections
	</70 - 04/15	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	</70 - 04/15	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	</70 - 04/15	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	</70 - 04/15	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	</70 - 04/15	Mineral Oil	20 - 25%	8042-47-5	All Sections
	</70 - 04/15	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	</70 - 04/15	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	</70 - 04/15	Methanol	<20%	67-56-1	All Sections
	</70 - 04/15	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	</70 - 04/15	Heptane	69 - 79%	142-82-5	All Sections
	</70 - 04/15	Ethyl Ether	11 - 21%	60-29-7	All Sections
	</70 - 04/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	</70 - 04/15	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	</70 - 04/15	Heptane	60 - 70%	142-82-5	All Sections
	</70 - 04/15	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	</70 - 04/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	</70 - 04/15	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	</70 - 04/15	None			All Sections
Cat Transmission and Drive Train Oil	</70 - 04/15	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	</70 - 04/15	Monoethanolamine	<10%	141-41-3	All Sections
	</70 - 04/15	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	</70 - 04/15	Mineral Oil	70 - 95%	Mixture	All Sections
	</70 - 04/15	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	</70 - 04/15	Lubricant base oil	87 - 91%	Various	All Sections
	</70 - 04/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	</70 - 04/15	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	</70 - 04/15	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	</70 - 04/15	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	</70 - 04/15	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	</70 - 04/15	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	</70 - 04/15	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	</70 - 04/15	Trichloroethylene	95 - 99%	79-01-6	All Sections
	</70 - 04/15	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	</70 - 04/15	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	</70 - 04/15	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	</70 - 04/15	Deionized Water	1 - 3%	7732-18-5	All Sections
	</70 - 04/15	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTSL-064607-064621
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: Main West, 1st North, 1 1/2 North, 2nd North, 1st - 3rd Left
And Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (Pre-70 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	</70 - 04/15	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	</70 - 04/15	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	</70 - 04/15	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	</70 - 04/15	Calcium sulfate	2 - 10%		All Sections
	</70 - 04/15	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	</70 - 04/15	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	</70 - 04/15	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	</70 - 04/15	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	</70 - 04/15	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	</70 - 04/15	Lead	34%	7439-92-1	All Sections
	</70 - 04/15	Lead Dioxide	31%	1309-60-0	All Sections
	</70 - 04/15	Lead Sulfate	<1%	7446-14-2	All Sections
	</70 - 04/15	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	</70 - 04/15	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	</70 - 04/15	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	</70 - 04/15	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	</70 - 04/15	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	</70 - 04/15	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	</70 - 04/15	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	</70 - 04/15	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	</70 - 04/15	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	</70 - 04/15	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	</70 - 04/15	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	</70 - 04/15	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	</70 - 04/15	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	</70 - 04/15	Portland Cement		65997-15-1	All Sections
	</70 - 04/15	Crystalline Silicon Dioxide		13397-24-5	All Sections
	</70 - 04/15	Calcium Hydroxide		001-305-620	All Sections
	</70 - 04/15	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	</70 - 04/15	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	</70 - 04/15	Polyglycols	60 - 100%	Mixture (2)	15 W
	</70 - 04/15	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	</70 - 04/15	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	</70 - 04/15	Polyester Resin	5 - 15%	Not Reported	All Sections
	</70 - 04/15	Styrene Monomer	3 - 7%	100-42-5	All Sections
	</70 - 04/15	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	</70 - 04/15	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	</70 - 04/15	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	</70 - 04/15	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	</70 - 04/15	Isobutane	2 - 10%	75-28-5	All Sections
	</70 - 04/15	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	</70 - 04/15	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	</70 - 04/15	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	</70 - 04/15			64742-48-9	All Sections
	</70 - 04/15			64742-88-7	All Sections
	</70 - 04/15	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	</70 - 04/15	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	</70 - 04/15	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	</70 - 04/15	Lubricant base oil	>99	Various	All Sections
	</70 - 04/15	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	</70 - 04/15	Lubricant base oil	87 - 91%	Various	All Sections
	</70 - 04/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	</70 - 04/15	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	</70 - 04/15	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTSL-064607-064621
Partial Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
- **Quantity - Historical Data**
- **Quality - Historical Data (UPDES Parameters)**
  - **Total Suspended Solids**
  - **Iron (Total & Dissolved)**
  - **Oil & Grease**
  - **Total Dissolved Solids**
  - **Ph**

UPDES Permit Data:

Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

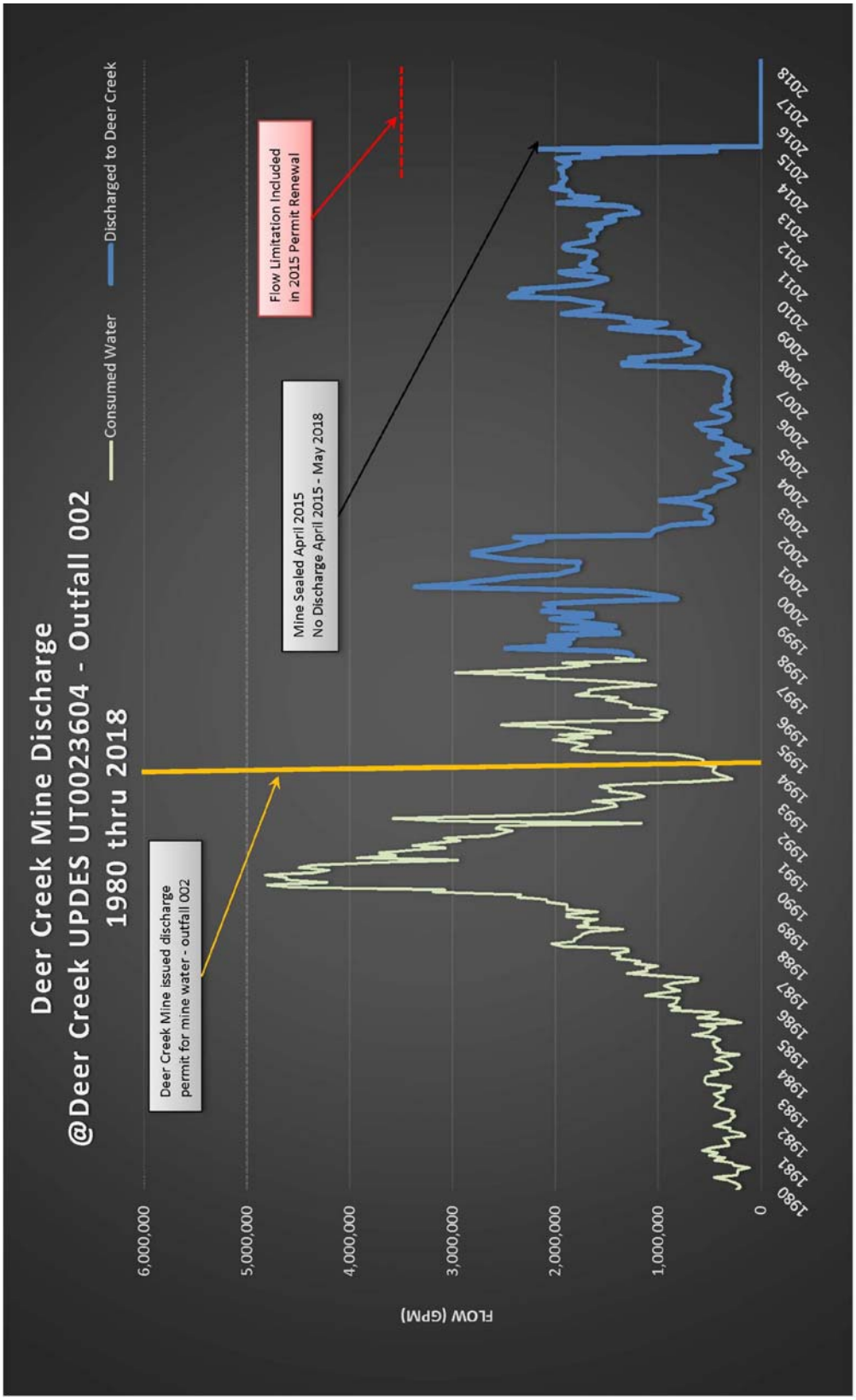
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



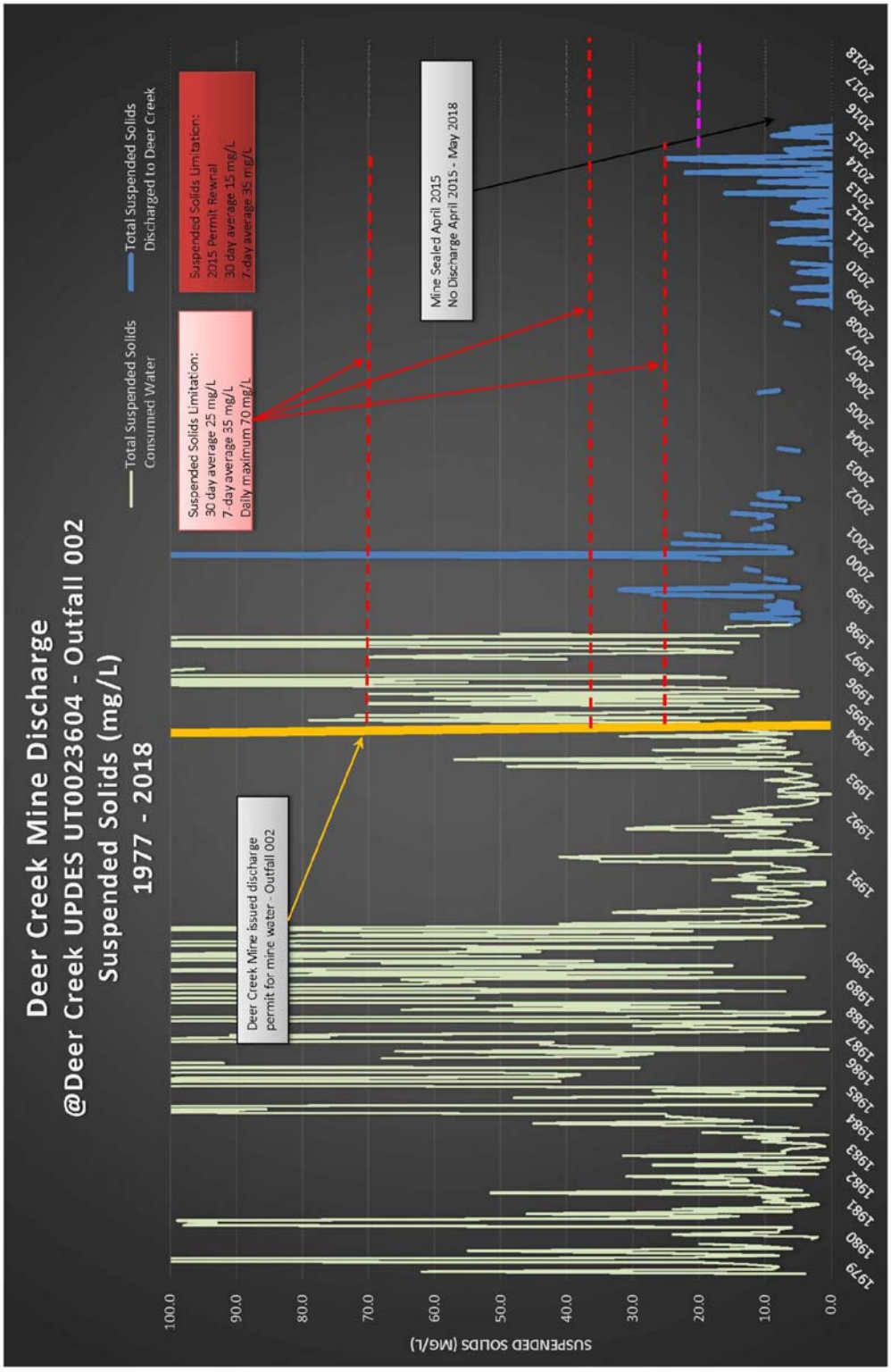
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



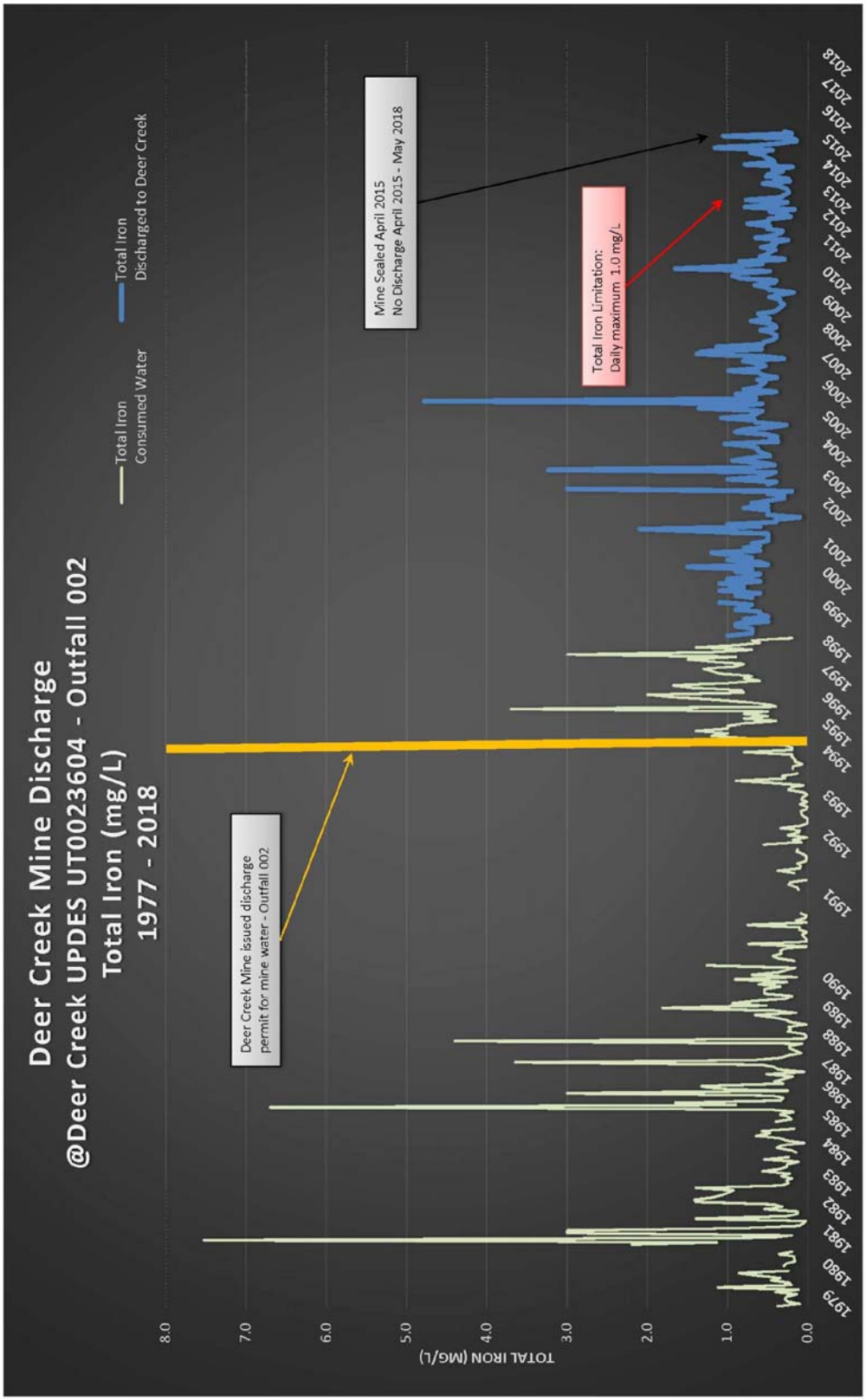
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



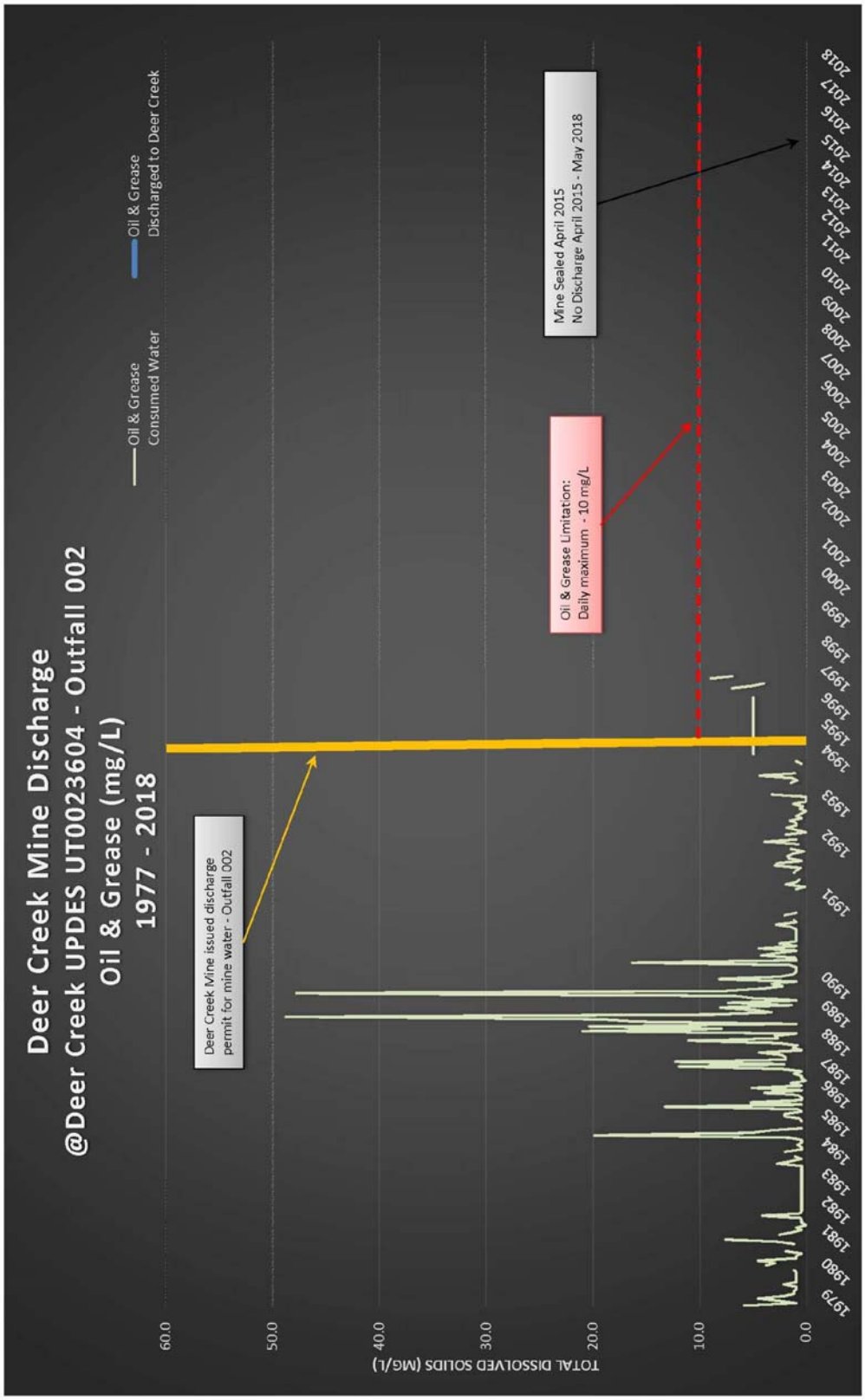
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



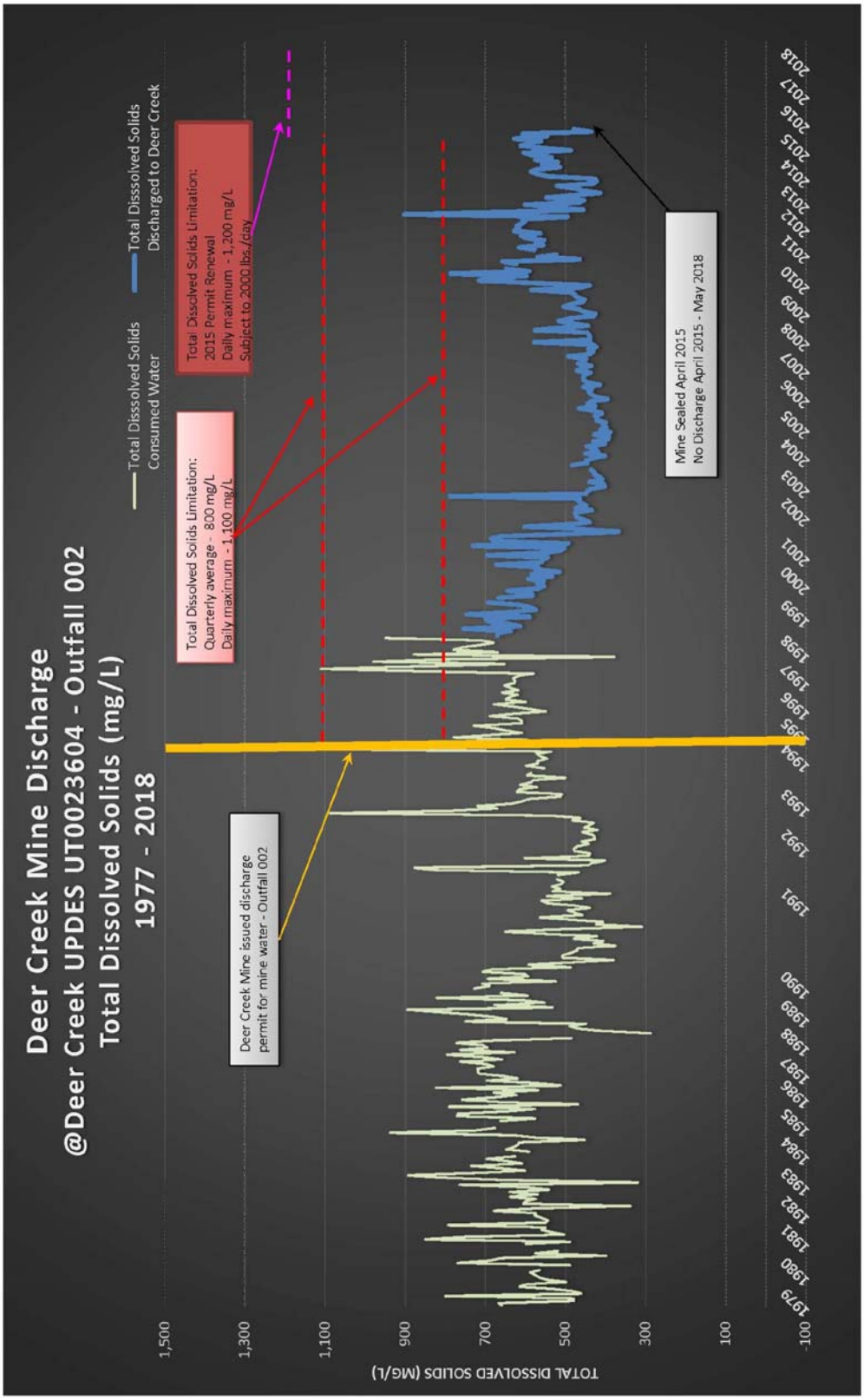
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



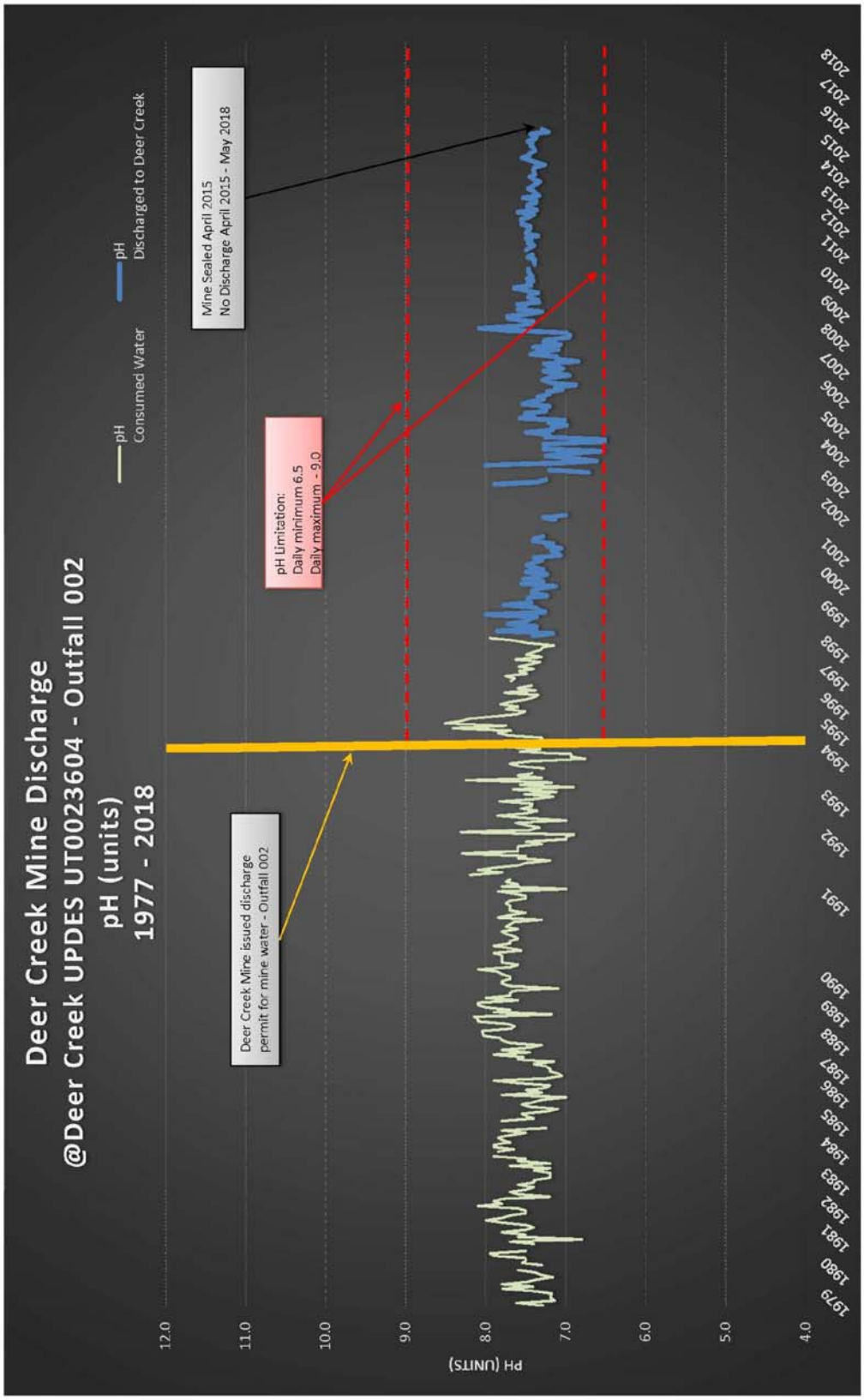
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTSL-070645-02292

November, 2018

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Prepared by:

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTSL-070645/U-02292, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTSL-070645/U-02292. The total acreage being surrendered is 1,070.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTSL-070645/U-02292 is described below:

Federal Coal Lease UTSL-070645/U-02292		
Lease Readjustment Effective Date:		4/1/2012 to 4/1/2022
Lessee of Record:		Armeda McKinnon Illiquid Assets Trust
Sublessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,070.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 4:	S½SW¼, SW¼SE¼	120.00
Sec 5:	SE¼SW¼, S½SE¼	120.00
Sec 9:	NE¼, E½NW¼, NE¼SW¼, N½SE¼	360.00
Sec 10:	W½W½NW¼, SE¼SW¼NW¼, S½SE¼NW¼, SW¼	230.00
Sec 15:	NW¼	160.00
Sec 17:	E½NW¼	80.00
Total Lease Acres for Full Relinquishment:		**1,070.00**
Total Lease Acres Remaining:		**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of the Armeda McKinnon Illiquid Assets Trust (Trust) as the lessee of record and PacifiCorp as the sublessee of record. Consent to relinquishment is acknowledged by the accompanying Relinquishment and Consent signed by the Trust dated September 26, 2018, and as set forth below by PacifiCorp.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7TH of NOV, 2018 by PacifiCorp, the sublessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-070645/U-02292

LEASE ACTIVITIES

1) Coal Lease Number: UTSL-070645/U-02292 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 1,070.00; Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of area relinquished. No areas retained. See also Figure 1 (a map depicting the area to be relinquished in its entirety).*

Original Lease Acreage: 2,560.00 Relinquished to date: 1,490.00 acres Remaining: 1,070.00 acres

- *Partial relinquishment: 250 acres – Accepted effective 4/24/1992*
- *Partial relinquishment: 1,240 acres – Accepted effective 4/30/1997*

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)? YES ☐ NO ☒ (If "YES", describe:

11) Date of initial mining: 1970 ; last mining: January 2005.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-070645/U-02292

12) Number of coal beds mined: 2 coal seams (Blind Canyon and Hiawatha)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain LMU with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to explanation of spring monitoring reductions.*

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt a portion of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-070645/U-02292

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
   - *No improvements were affected.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities? YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐ (If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-070645/U-02292

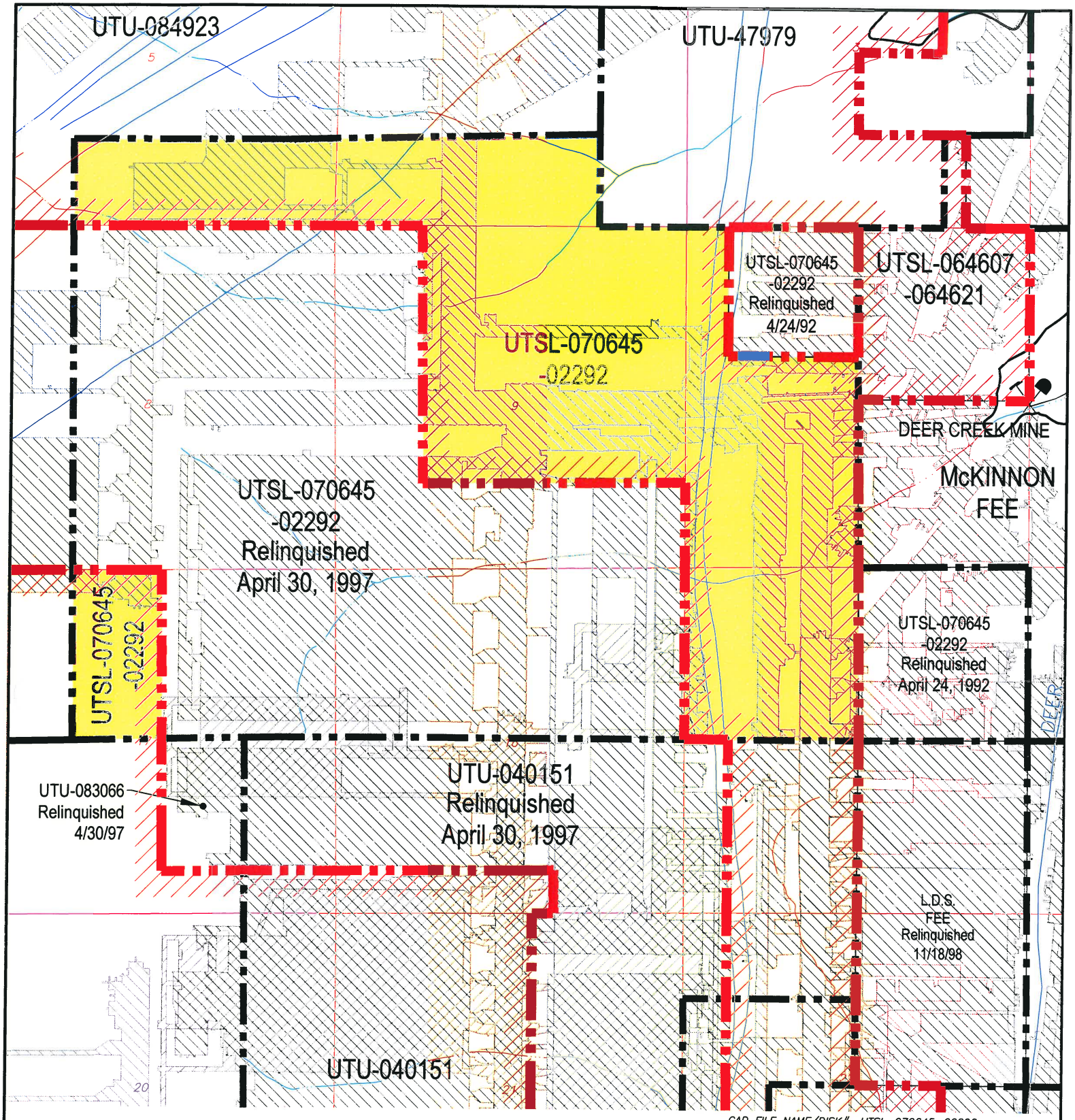
Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTSL-070645/U-02292 is described below:

Federal Coal Lease UTSL-070645/U-02292	
Lease Readjustment Effective Date:	4/1/2012 to 4/1/2022
Lessee of Record:	Armeda McKinnon Illiquid Assets Trust
Sublessee of Record:	PacifiCorp
Federal Coal Lease Acres:	**1,070.00**

Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 4:	S½SW¼, SW¼SE¼	120.00
Sec 5:	SE¼SW¼, S½SE¼	120.00
Sec 9:	NE¼, E½NW¼, NE¼SW¼, N½SE¼	360.00
Sec 10:	W½W½NW¼, SE¼SW¼NW¼, S½SE¼NW¼, SW¼	230.00
Sec 15:	NW¼	160.00
Sec 17:	E½NW¼	80.00
	Total Lease Acres for Full Relinquishment:	**1,070.00**
	Total Lease Acres Remaining:	**0.00**



CAD FILE NAME/DISK#: UTSL-070645-02292

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTSL-070645-02292 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-070645/02292

DRAWN BY:	K. LARSEN	FIGURE 1
SCALE:	1"=2000'	DRAWING #:
DATE:	MAY 1, 2018	SHEET 1 OF 1 REV. ___

FEDERAL COAL LEASE UTSL-070645-02292
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

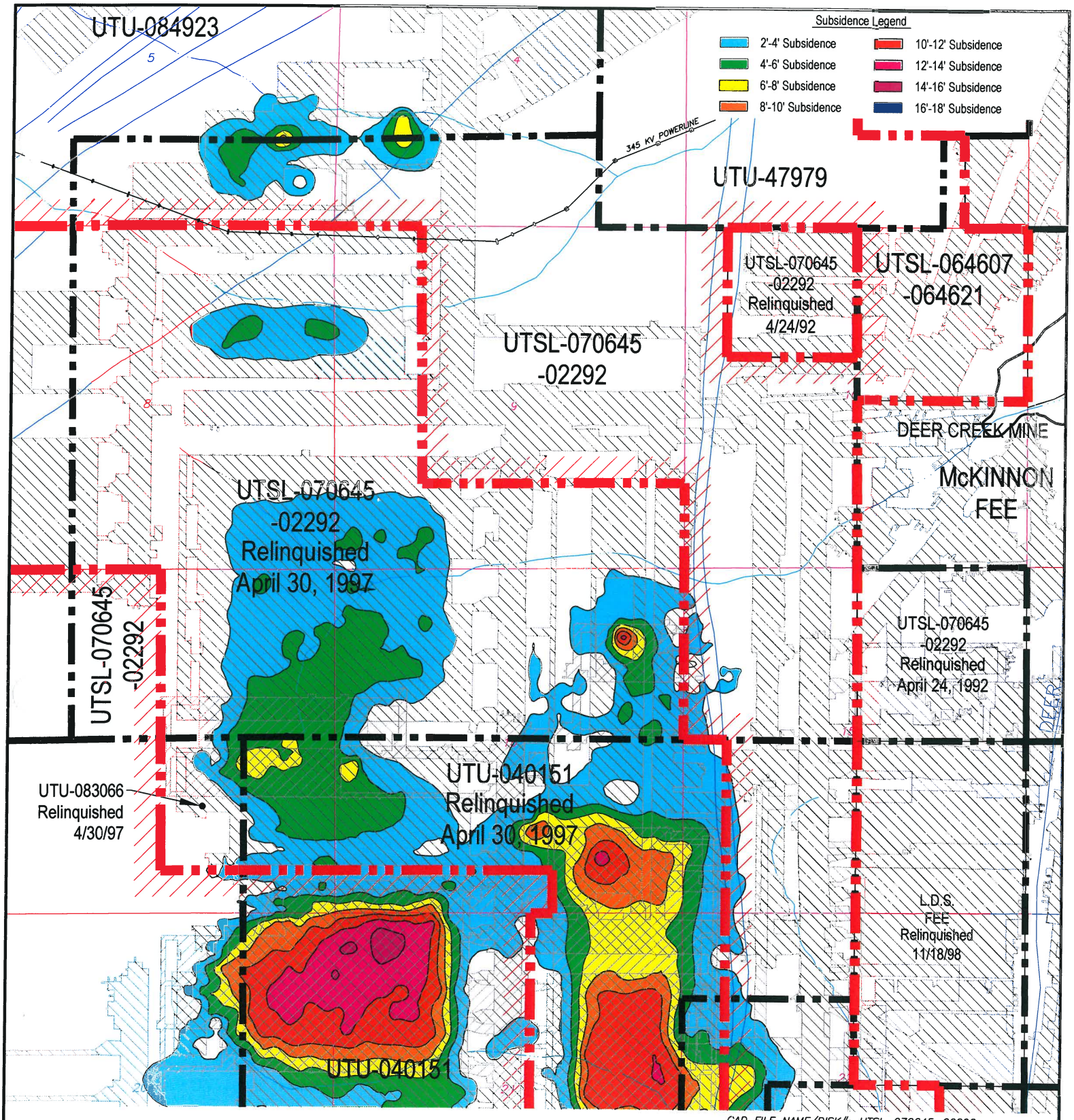
Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification



CAD FILE NAME/DISK#: UTSL-070645-02292

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTSL-070645-02292 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

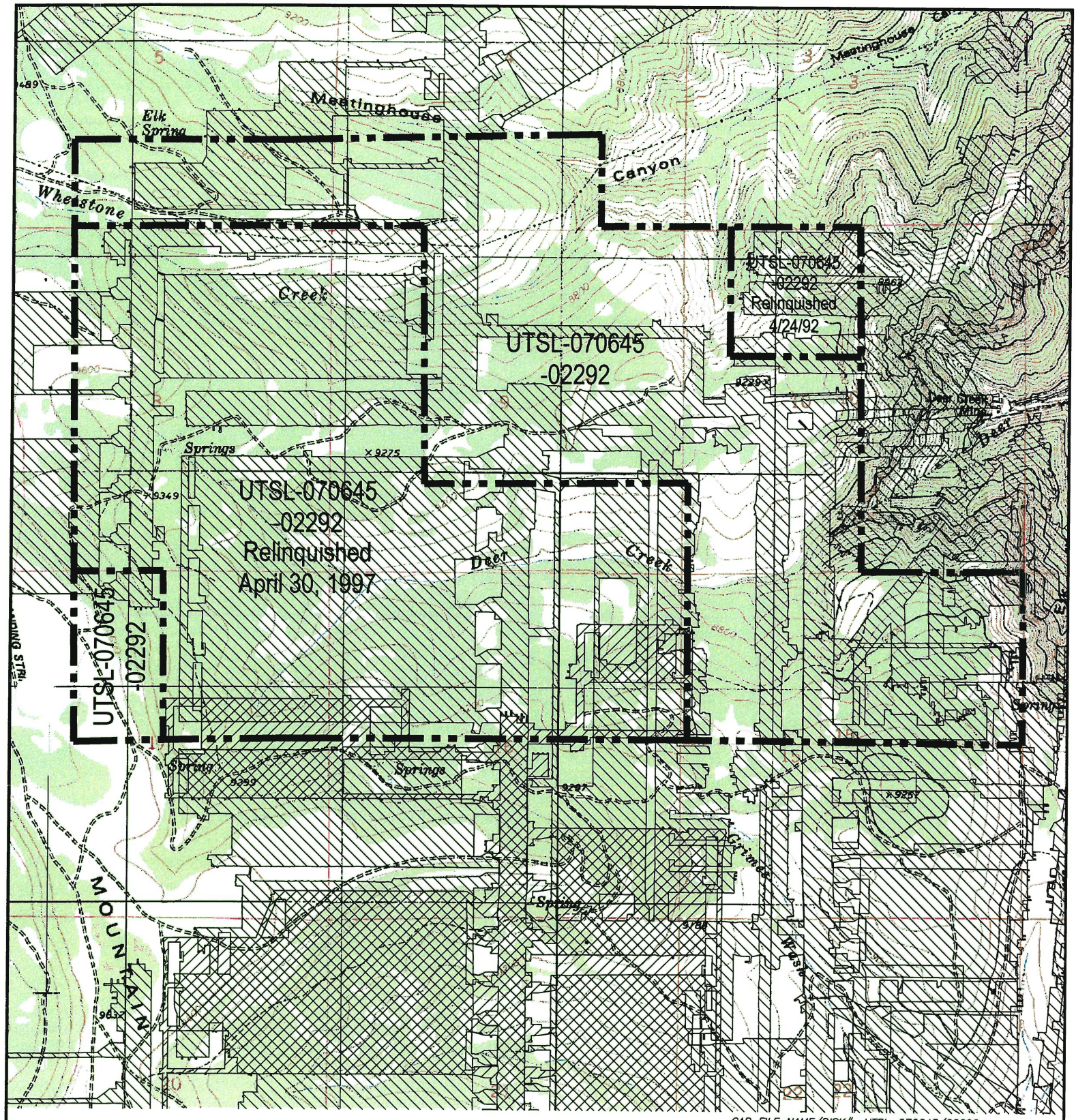
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-070645/02292
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-070645-02292 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTSL-070645-02292 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTSL-070645-02292. No restoration and/or mitigation efforts are required for Lease UTSL-070645-02292. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTSL-070645-02292 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTSL-070645/02292

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-070645/02292
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTSL-070645-02292 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 21 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over some of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTSL-070645-02292 and surrounding area.

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP).

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTSL-070645-02292.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The Mill Fork 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the Mill Fork 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. 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 PacifiCorp mining area covers portions of East Mountain and Trail Mountain, which are separated by Cottonwood Canyon, a deep, partially glaciated valley.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable

calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, but is not exposed in the Mill Fork Area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the Mill Fork Area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the Mill Fork Area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the Mill Fork Area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone

are limited to a narrow north-south trending ridge located in the western half of the Mill Fork Area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the waterbearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 Area.

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 lease 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 fault within the Mill Fork Area is the Joes Valley Fault, which forms the western limit of the coal reserves in this area. The Joes Valley Fault is the largest and most prominent of several north south trending fault zones within the Wasatch Plateau coal field. Displacement of the fault is approximately 1,500 feet, downthrown on the western side. The fault creates a continuous north-south escarpment on the east side of Joes Valley. Several side canyons are cut into this escarpment on the western side of the lease area, all of which drain into Joes Valley. The fault zone itself is not visible along this escarpment, but the fault has been intercepted underground in the Genwal Mine to the north. Where the fault has been intercepted in the Genwal mine workings, a drag fold is present, indicated by a gentle downward folding of the strata along the fault zone, extending for a few hundred feet to the east of the fault.

The nearest known faulting outside of the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes to the southeast of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in

the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area (including lease UTU-070645-02292) and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk
Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated is that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The $\delta 2H$ and $\delta 18O$ compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except

near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.

7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years
    b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
    c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.

14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its $CO_2(g)$ in the soil zone where the partial pressure of CO_2 greatly exceeds atmospheric levels. This CO_2 combines with water to form carbonic acid according to

$$CO_2(g) + H_2O = H_2CO_3 \quad (1)$$

Carbonic acid dissociates into H^+ and HCO_3^- as

$$H_2CO_3 = HCO_3^- + H^+ \quad (2)$$

The H^+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H^+ + CaMg(CO_3)_2 = Ca^{2+} + Mg^{2+} + 2HCO_3^-, \text{ and} \quad (3)$$

(dolomite)

$$H^+ + CaCO_3 = Ca^{2+} + HCO_3^- \quad (4)$$

(calcite)

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$CaSO_4 \bullet 2H_2O = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$

(gypsum)

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-clay} = 2Na^+ + Ca\text{-clay} \quad (9)$$

$$Mg^{2+} + Na\text{-clay} = 2Na^+ + Mg\text{-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is

supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Because the Mill Fork State Lease (now UTU-88554) was a new lease area that did not have existing underground workings, the solute compositions of in-mine groundwater can only be inferred from compositions of in-mine waters in nearby mines. Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This

condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} - HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and δ^{18}O

The δ^2H and δ^{18}O composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and δ^{18}O composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Energy West and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork Spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^{3}H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^{3}H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^{3}H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^{3}H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 “age” dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep

groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the

shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that

groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute significant groundwater to the discharge from the spring.

  Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – MILL FORK AREA

A. GROUNDWATER

Groundwater within the Mill Fork Area was monitored according to the schedules in established in the Deer Creek MRP. PacifiCorp has conducted baseline and operational monitoring of spring sources in and adjacent to the lease area. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.
The ground water monitoring plan in Appendix C includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights
- Measurable flow based on historical surveys
- Reliable measuring point(s)

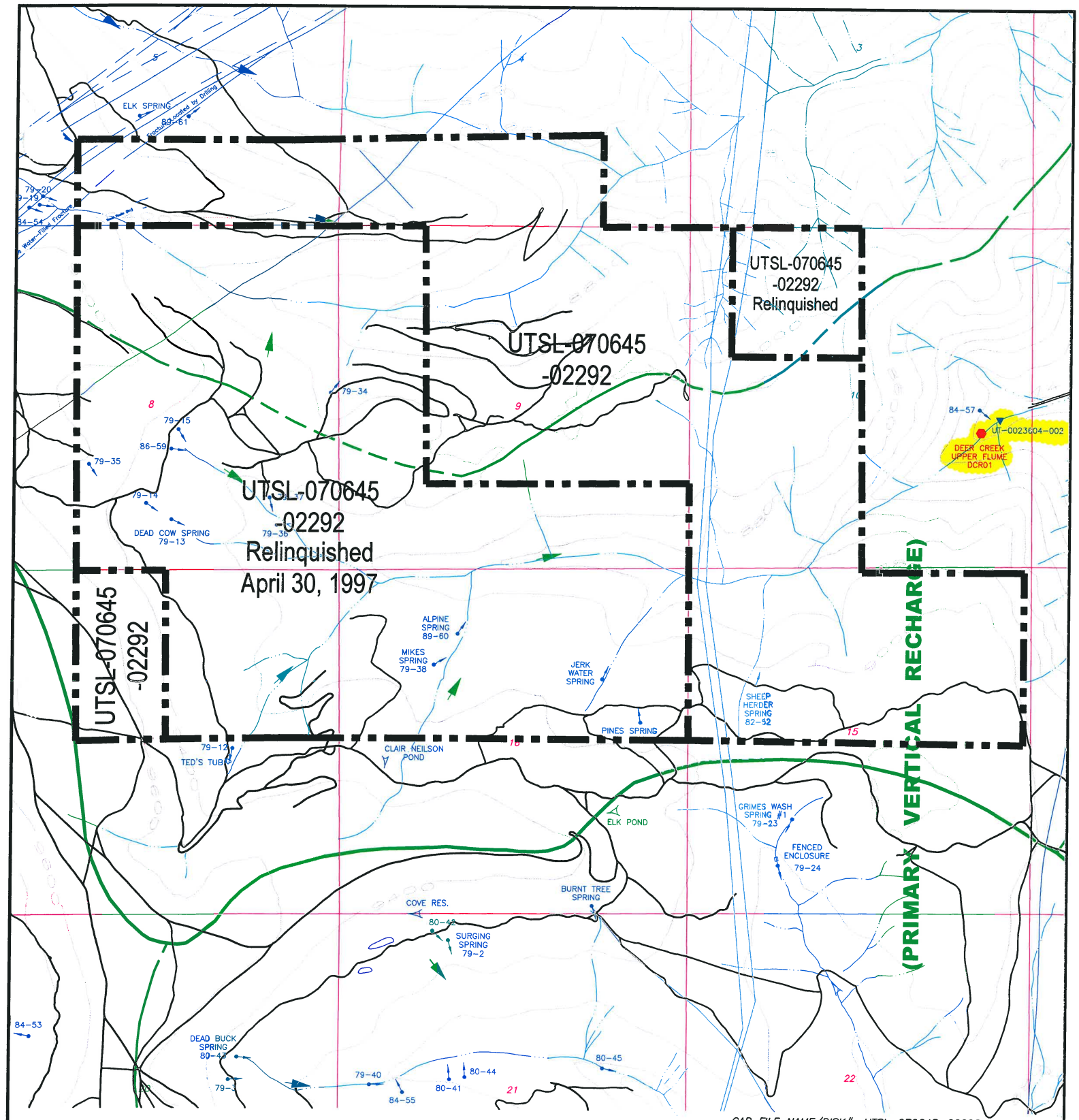
Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency. There are no monitored springs within the lease UTSL-070645—02292. Surface monitoring point DCR01 is within ½ mile of the lease boundary. Data for this point is included in Appendix C. Elk Spring, which is one of the largest springs on East Mountain, is located within this lease. Elk Spring was removed from the monitoring program as it was developed and diverted in 2010 by NEWUSSD as a culinary water source (see also Appendix E). There has been no effect related to mining on the flow of Elk Spring.

Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTSL-070645—02292 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTSL-070645—02292 are ephemeral. The majority of the surface flow from the lease block drains to the east in Deer Creek and Meetinghouse Canyons and un-named drainages which report to Huntington Creek. On the south side East Mountain, surface flows report to the report via Grimes Wash to the Cottonwood Creek drainage system. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



CAD FILE NAME/DISK#: UTSL-070645-02292

LEGEND

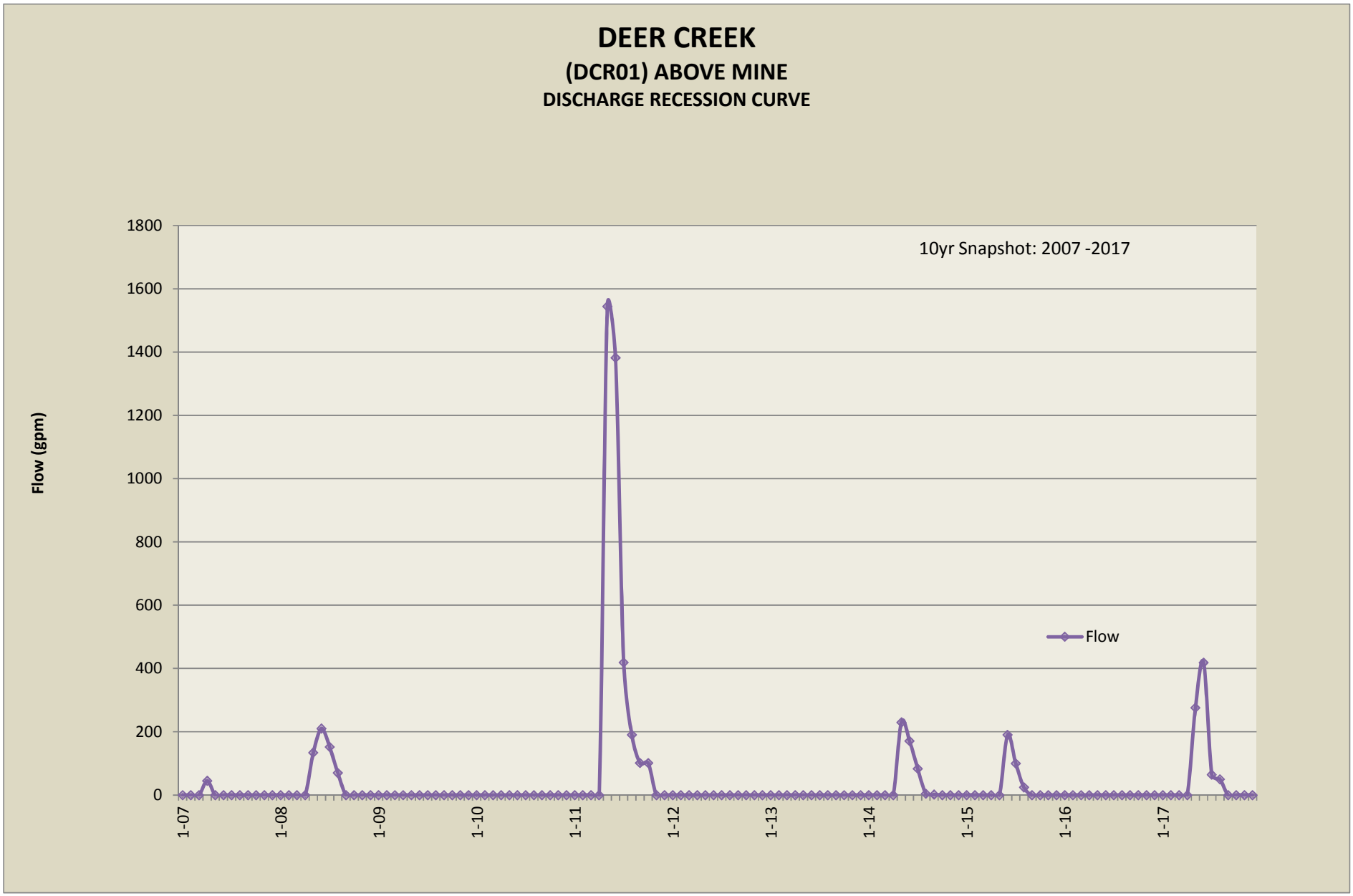
- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-070645/02292
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.


DEER CREEK
(DCR01) ABOVE MINE
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
1800
1600
1400
1200
1000
800
600
400
200
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

DEER CREEK SURFACE WATER QUALITY *

DCR01 - ABOVE THE MINE

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170606		261	51.9	0.0	5.0	531	235.00	0.1	0.00	25.54	0.00	0.0	8.4	1.18	27.16	28	29	285
No. of Analysis	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
2017**																		
MIN	0	261	52	0	5	531	235	0	0	26	0	0	8	1	27	28	29	285
MAX	0	261	52	0	5	531	235	0	0	26	0	0	8	1	27	28	29	285
MEAN	0.00	261.00	51.86	0.00	5.00	531.00	235.00	0.11	0.00	25.54	0.00	0.00	8.36	1.18	27.16	28.00	29.00	285.00
2016**	NO SAMPLES DURING 2016																	
2015**	0	251	40.67	0	5	554	215	0.46	0	27.48	0	0	8.48	0.94	32.84	36	18	326
2014**	NO SAMPLES DURING 2014																	
MIN	0	229	35.4	0	5	525	179	0	0	22.03	0	0	8.55	0.9	31.45	36	0	292
MAX	0	244	44.01	11	6	614	253	0.1	0	34.65	0	0	8.59	1.74	45.06	70	9	355
MEAN	0	236.5	39.705	5.5	5.5	569.5	216	0.05	0	28.34	0	0	8.57	1.32	38.255	53	4.5	323.5
2013**	NO SAMPLES DURING 2013																	
2012**	NO SAMPLES DURING 2012																	
2011**																		
MIN	0	249	42.93	0	5	574	243	0	0	25.43	0	0	8.33	0.85	27.21	29	0	320
MAX	0	252	63	24	5	589	262	0.18	0	32.92	0	0	8.55	0.99	38.62	50	26	325
MEAN	0	250.5	52.965	12	5	581.5	252.5	0.09	0	29.175	0	0	8.44	0.92	32.915	39.5	13	322.5
2010**	NO SAMPLES DURING 2010																	
2009**	NO SAMPLES DURING 2009																	
2008**	0	205	39.54	18	4	529	207	0	0	26.31	0	na	8.71	0.96	32.66	34		268
2007**	NO SAMPLES DURING 2007																	
2006**																		
MIN		238	43		6	538	223	0.06		28			8.39	1	30	35	15	279
MAX		283	49		8	720	259	0.06		33			8.59	1	47	68	15	406
MEAN		261	46		7	629	241	0.06		31			8.49	1	39	52	15	343
HISTORICAL 1978-2016																		
MIN	0.0	205.0	2.2	0.0	3.5	360.0	179.0	0.0	0.0	19.3	0.0	0.0	7.0	0.0	13.4	10.0	0.0	231
MAX	137.0	397.0	107.2	24.0	176.0	1580.0	599.0	40.1	0.4	83.9	0.2	5.0	8.8	4.3	111.6	255.0	3592.0	897
MEAN	9.17	297.94	52.51	6.04	15.58	593.23	271.20	0.76	0.07	33.45	0.04	0.98	8.07	1.20	33.93	58.75	86.92	344.86
COUNT	33	50	50	38	51	90	50	80	26	50	72	30	91	40	50	52	83	91

*** Quality parameters are reported as mg/l unless otherwise noted.**

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTSL-070645-02292 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 21 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over some of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the vegetation characteristics of the area.

Vegetation of Lease UTSL-070645-02292 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTSL-070645-02292:

Aspen	AS
Aspen/Conifer	AS/C
Barren/Sparse Vegetation	BR/SV
Black Sagebrush	BLSB
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Pinyon-Juniper	PJ
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to

exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

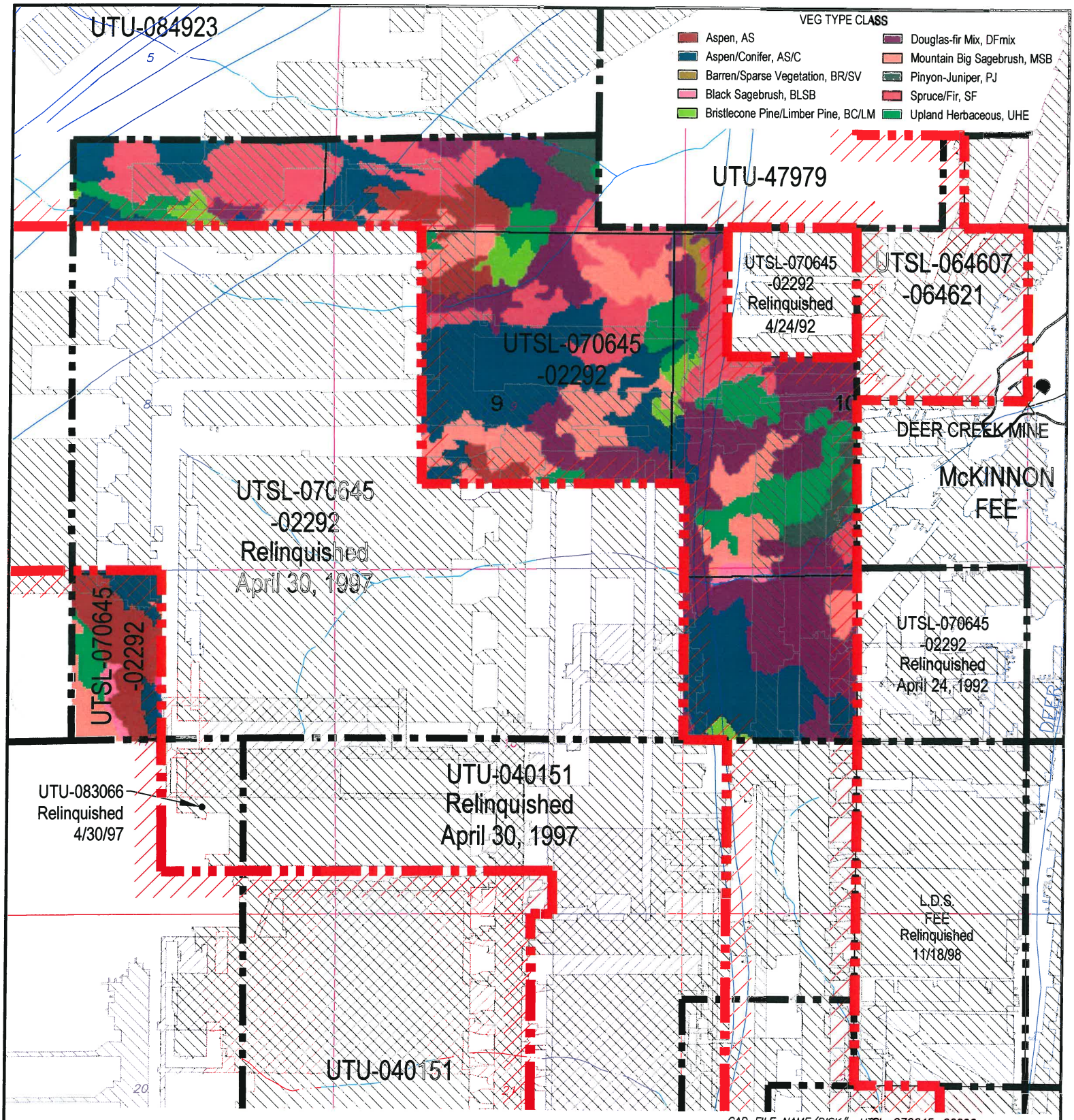
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-070645-02292 area. There were no surface facilities or installations on this lease.



CAD FILE NAME/DISK#: UTSL-070645-02292

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTSL-070645-02292 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-070645/02292
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-070645-02292 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are two private surface improvements in Lease UTU-070645-02292. The first of these is the 345 KV power transmission line that crosses the top of East Mountain within the boundaries of the lease. It is owned by PacifiCorp / Rocky Mountain Power. Two separate studies of the potential subsidence beneath this line were conducted in 1997 and 2004, with the 2004 study being directly related to this lease. The power line crosses the west side of the lease, where underground mining did not reach.

The second improvement is the Elk Spring development and associated water transfer pipeline that was constructed in 2009 – 2010. This pipeline crosses the 1st and 2nd Left longwall panel area in the left fork of Meetinghouse Canyon. The pipeline was constructed 5 years after these panels were extracted and subsidence was considered to be fully stabilized by that time. There have been no impacts to the spring, spring development or the pipeline itself due to mining.

To the best of the knowledge of the lessee through due inquiry including reconnaissance flights, subsidence surveys and periodic surface topography inspections, there are no mining-related impacts associated with the Deer Creek Mine to any private surface improvements on the lease area being relinquished.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTSL-070645-02292 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTSL-070645-02292 have taken place in March 2005, February and March 2015 (Blind Canyon Seam). CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: Nov 7, 2018

Lease(s) # UTU-070645-02292 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine #42-01211

Mine Section (if applicable) Main West, Main East, 1st West Mains, 1st - 3rd South Mains, A North, A South, 1st North and 1.5 North, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV 7, 2018

Lease(s) # UTU-070645/02292 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine #42-01211

Mine Section (if applicable) Main West, Main East, 1st West Mains, 1st - 3rd South Mains, A North, A South, 1st North and 1.5 North, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-070645/02292 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine #42-01211

Mine Section (if applicable) Main West, Main East, 1st West Mains, 1st - 3rd South Mains, A North, A South, 1st North and 1.5 North, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV 7, 2018

Lease(s) # UTU-070645/02292 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine #42-01211

Mine Section (if applicable) Main West, Main East, 1st West Mains, 1st - 3rd South Mains, A North, A South, 1st North and 1.5 North, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV 7, 2018

Lease(s) # UTU-070645/02292 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine #42-01211

Mine Section (if applicable) Main West, Main East, 1st West Mains, 1st - 3rd South Mains, A North, A South, 1st North and 1.5 North, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-070645/02292 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine #42-01211

Mine Section (if applicable) Main West, Main East, 1st West Mains, 1st - 3rd South Mains, A North, A South, 1st North and 1.5 North, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 11/05 – 04/15

Submittal Date: NOV 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTSL-070645-02292
Deer Creek Mine - MSHA # 42-00121 Cottonwood Mine - MSHA # 42-01211
Sealed Mine Sections: Main West, Main East, 1st West Mains, 1st - 3rd South Mains, A North, A South
1st North and 1.5 North, and Remainder of Mine Workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (Pre-70 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	<70 - 04/15	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	<70 - 04/15	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	<70 - 04/15	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	<70 - 04/15	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	<70 - 04/15	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	<70 - 04/15	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	<70 - 04/15	Naptha	40 - 50%	64742-94-5	All Sections
	<70 - 04/15	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	<70 - 04/15	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	<70 - 04/15	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	<70 - 04/15	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	<70 - 04/15	Propane	14%	74-98-6	All Sections
	<70 - 04/15	Butane	13%	106-97-8	All Sections
	<70 - 04/15	Toluene	17%	108-88-3	All Sections
	<70 - 04/15	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	<70 - 04/15	Napthalene	0.40%	91-20-3	All Sections
	<70 - 04/15	Acetone	41%	67-64-1	All Sections
	<70 - 04/15	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	<70 - 04/15	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	<70 - 04/15	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	<70 - 04/15	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	<70 - 04/15	Mineral Oil	20 - 25%	8042-47-5	All Sections
	<70 - 04/15	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	<70 - 04/15	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	<70 - 04/15	Methanol	<20%	67-56-1	All Sections
	<70 - 04/15	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	<70 - 04/15	Heptane	69 - 79%	142-82-5	All Sections
	<70 - 04/15	Ethyl Ether	11 - 21%	60-29-7	All Sections
	<70 - 04/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	<70 - 04/15	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	<70 - 04/15	Heptane	60 - 70%	142-82-5	All Sections
	<70 - 04/15	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	<70 - 04/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	<70 - 04/15	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	<70 - 04/15	None			All Sections
Cat Transmission and Drive Train Oil	<70 - 04/15	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	<70 - 04/15	Monoethanolamine	<10%	141-41-3	All Sections
	<70 - 04/15	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	<70 - 04/15	Mineral Oil	70 - 95%	Mixture	All Sections
	<70 - 04/15	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	<70 - 04/15	Lubricant base oil	87 - 91%	Various	All Sections
	<70 - 04/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	<70 - 04/15	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	<70 - 04/15	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	<70 - 04/15	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	<70 - 04/15	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	<70 - 04/15	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	<70 - 04/15	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	<70 - 04/15	Trichloroethylene	95 - 99%	79-01-6	All Sections
	<70 - 04/15	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	<70 - 04/15	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	<70 - 04/15	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	<70 - 04/15	Deionized Water	1 - 3%	7732-18-5	All Sections
	<70 - 04/15	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTSL-070645-02292
Deer Creek Mine - MSHA # 42-00121 Cottonwood Mine - MSHA # 42-01211
Sealed Mine Sections: Main West, Main East, 1st West Mains, 1st - 3rd South Mains, A North, A South
1st North and 1.5 North, and Remainder of Mine Workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (Pre-70 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	<70 - 04/15	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	<70 - 04/15	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	<70 - 04/15	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	<70 - 04/15	Calcium sulfate	2 - 10%		All Sections
	<70 - 04/15	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	<70 - 04/15	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	<70 - 04/15	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	<70 - 04/15	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	<70 - 04/15	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	<70 - 04/15	Lead	34%	7439-92-1	All Sections
	<70 - 04/15	Lead Dioxide	31%	1309-60-0	All Sections
	<70 - 04/15	Lead Sulfate	<1%	7446-14-2	All Sections
	<70 - 04/15	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	<70 - 04/15	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	<70 - 04/15	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	<70 - 04/15	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	<70 - 04/15	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	<70 - 04/15	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	<70 - 04/15	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	<70 - 04/15	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	<70 - 04/15	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	<70 - 04/15	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	<70 - 04/15	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	<70 - 04/15	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	<70 - 04/15	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	<70 - 04/15	Portland Cement		65997-15-1	All Sections
	<70 - 04/15	Crystalline Silicon Dioxide		13397-24-5	All Sections
	<70 - 04/15	Calcium Hydroxide		001-305-620	All Sections
	<70 - 04/15	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	<70 - 04/15	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	<70 - 04/15	Polyglycols	60 - 100%	Mixture (2)	15 W
	<70 - 04/15	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	<70 - 04/15	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	<70 - 04/15	Polyester Resin	5 - 15%	Not Reported	All Sections
	<70 - 04/15	Styrene Monomer	3 - 7%	100-42-5	All Sections
	<70 - 04/15	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	<70 - 04/15	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	<70 - 04/15	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	<70 - 04/15	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	<70 - 04/15	Isobutane	2 - 10%	75-28-5	All Sections
	<70 - 04/15	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	<70 - 04/15	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	<70 - 04/15	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	<70 - 04/15			64742-48-9	All Sections
	<70 - 04/15			64742-88-7	All Sections
	<70 - 04/15	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	<70 - 04/15	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	<70 - 04/15	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	<70 - 04/15	Lubricant base oil	>99	Various	All Sections
	<70 - 04/15	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	<70 - 04/15	Lubricant base oil	87 - 91%	Various	All Sections
	<70 - 04/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	<70 - 04/15	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	<70 - 04/15	Mineral Oil	>95%	Proprietary	All Sections

Deer Creek Mine

UTSL-077645-02292 Full Relinquishment

Equipment Remaining In Mine as of December 20, 2017

Pumps and D-Boxes, Grouped by Location

3rd North

D/Box		XC-31 #5
Pump	6.4	XC-6 #4
Pump	5	XC-6 #6
D/Box		XC-2 #4
D/Box		XC-2 #5
D/Box		XC-2 #6

1st West Mains

D/Box		XC-7 #2
Pump	13	XC-7 #4

Main West

D/Box		XC-36 #2
D/Box		XC-36 #3
Pump	28	XC-36 #4
Pump	28	XC-36 #5
Pump	30	XC-36 #6
D/Box		XC-35 #4
D/Box		XC-35 #5
Pump	??	XC-35 #5

Transformer		XC-34 #5
Transformer		XC-11 #4
D/Box		XC-5 #1
D/Box		XC-5 #3
Feeder		Bott. Bin

17th Right

Pump	6.4	XC-2 #2

3rd South

Pump	13	XC-10 #3
D/Box		XC-9 #1
D/Box		XC-4 #4

Main North

D/Box		XC-2 #2
Pump	13	XC-9
Pump	5	Sump

Main West East Side of Fault

D/Box		XC-39 #2
D/Box		XC-39 #3
D/Box		XC-37 #1
D/Box		XC-37 #2
D/Box		XC-37 #3
Transformer		XC-37 #2
D/Box		XC-32 #2
D/Box		XC-28 #2

Transformer		XC-27 #2
Pump	6.4	XC-41 #3
Pump	5	XC-41 #2
Pump	6.4	XC-40 #3
Pump	5	XC-40 #2
Pump	5	XC-39 #3
D/Box		XC-38 #3
D/Box		XC-20 #3

2nd South

Pump	6.4	XC-1 #1
Pump	5	XC-2 #1

1st South

Pump	6.4	XC-3 #5
D/Box		XC-3 #5
Compressor		XC-4 #4 (Asset # 14-087)
Pump	5	XC-6 #3

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTSL-070645-02292
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
- **Quantity - Historical Data**
- **Quality - Historical Data (UPDES Parameters)**
  - **Total Suspended Solids**
  - **Iron (Total & Dissolved)**
  - **Oil & Grease**
  - **Total Dissolved Solids**
  - **Ph**

UPDES Permit Data:

Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

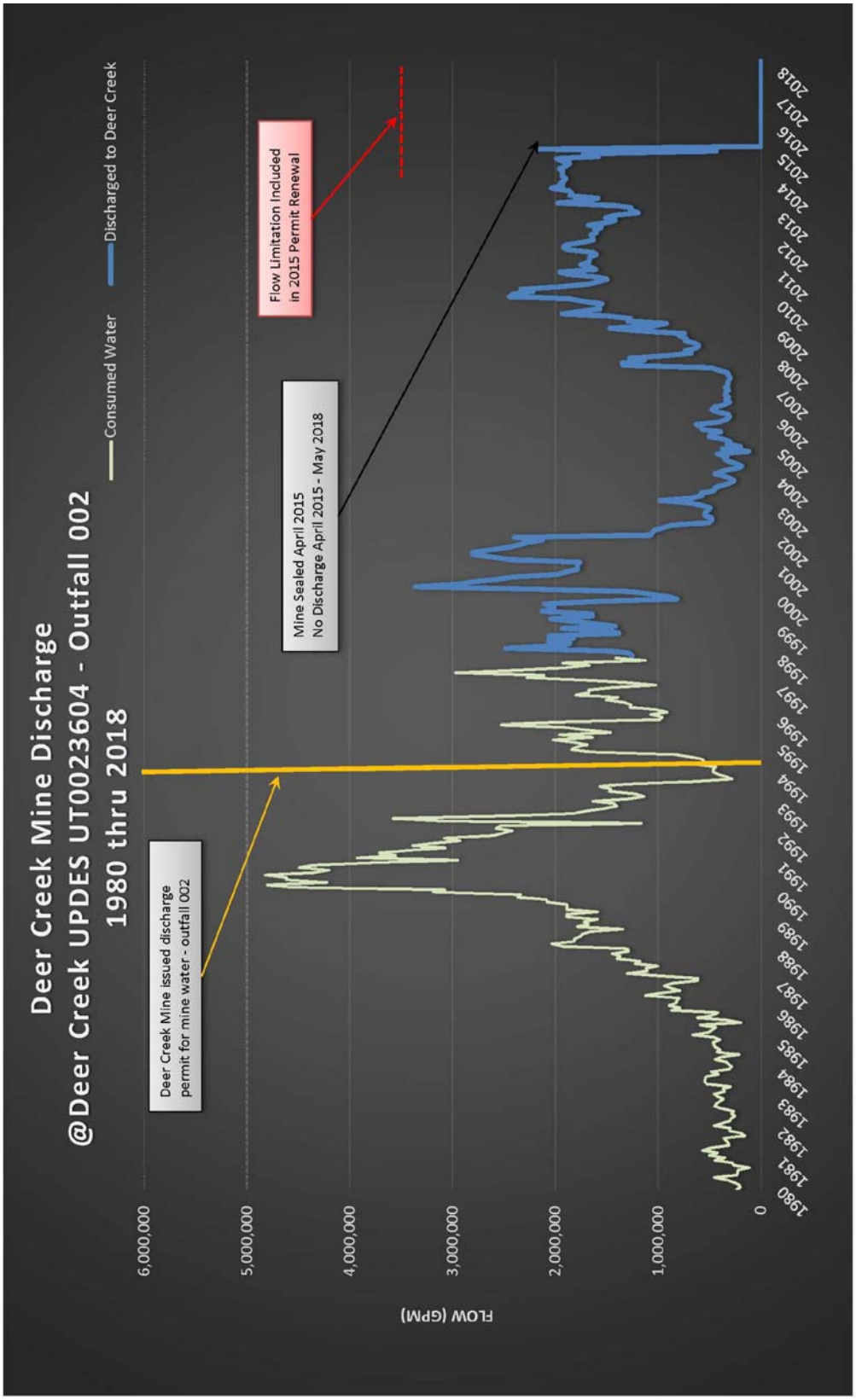
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



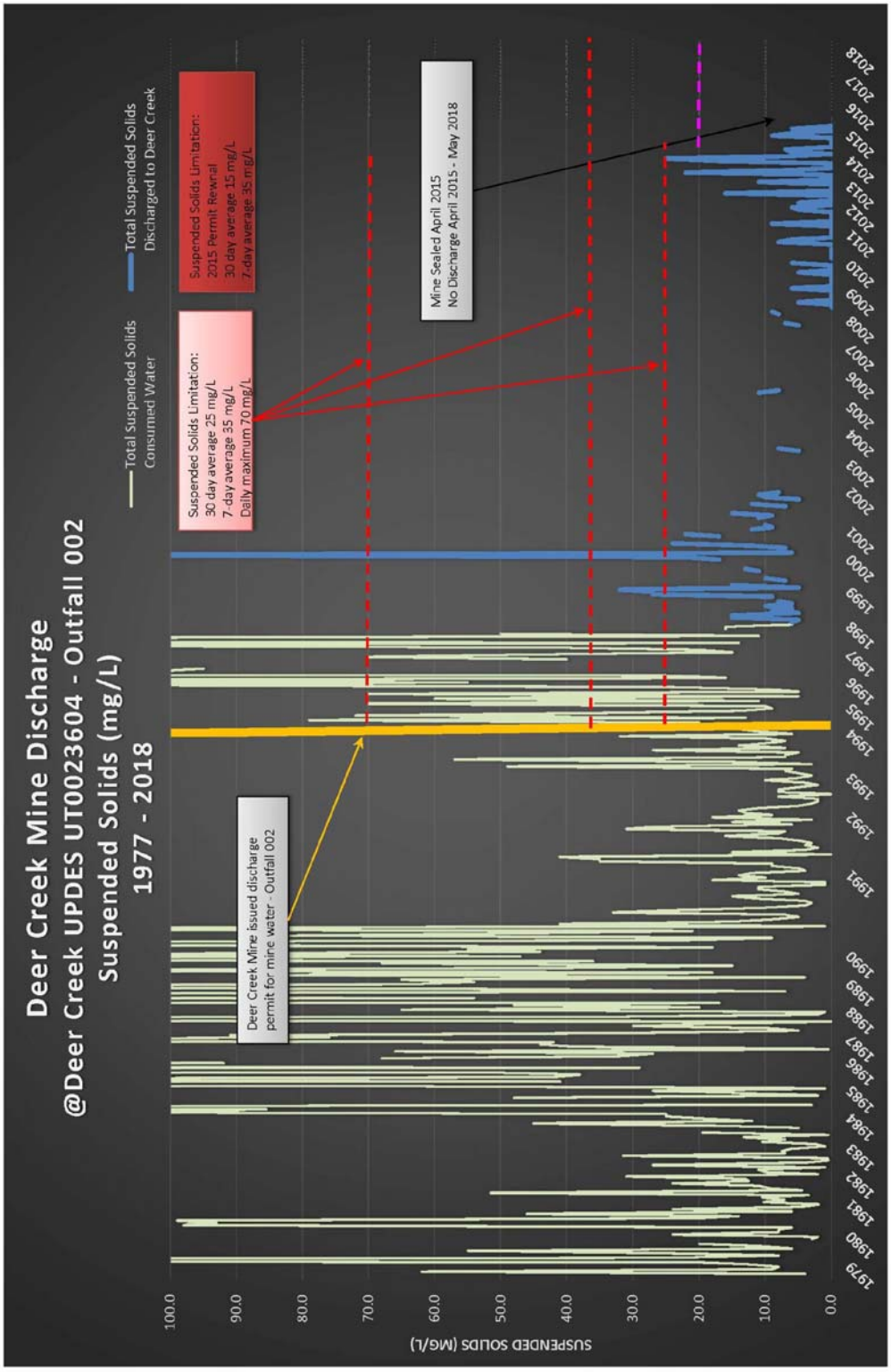
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



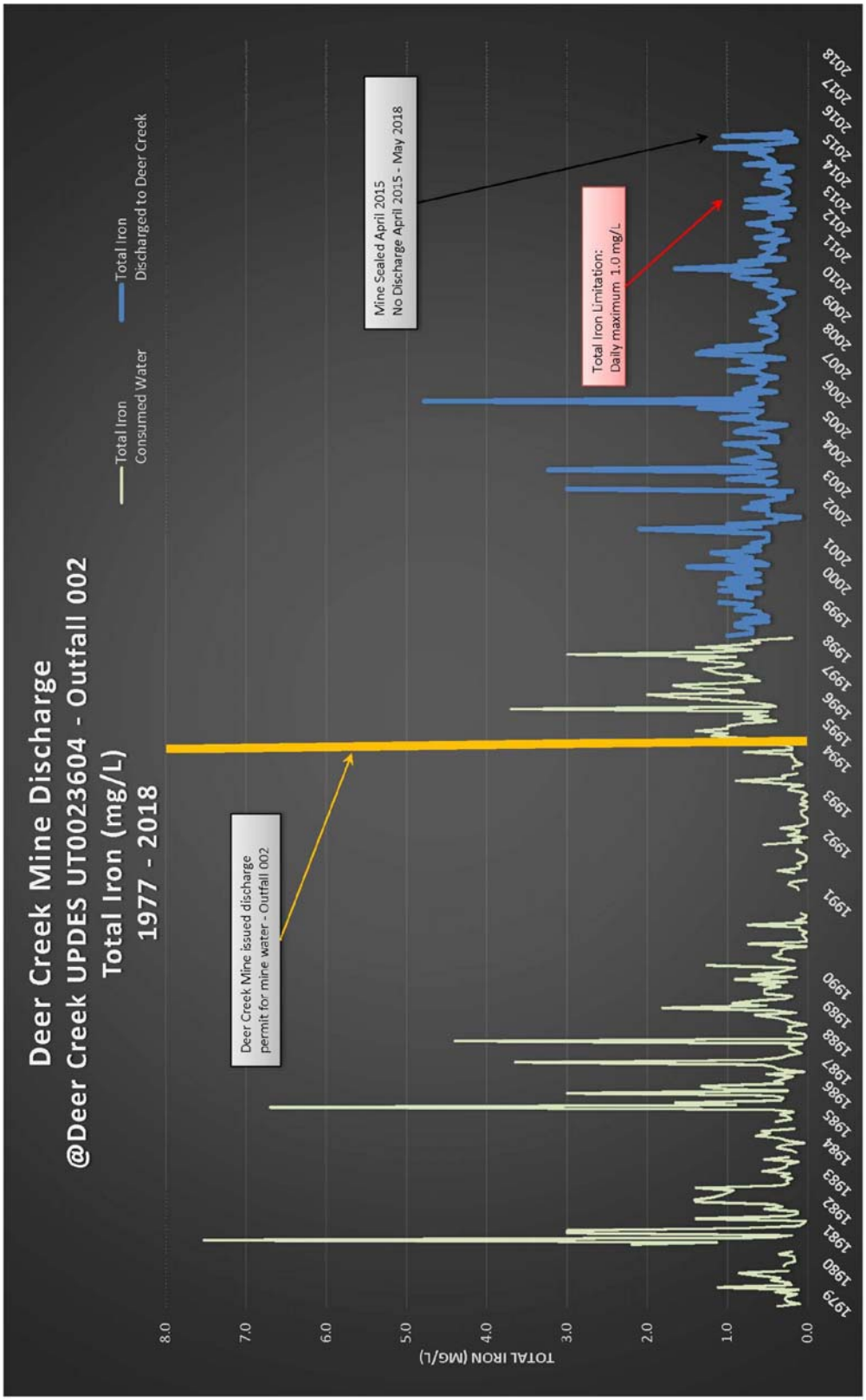
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



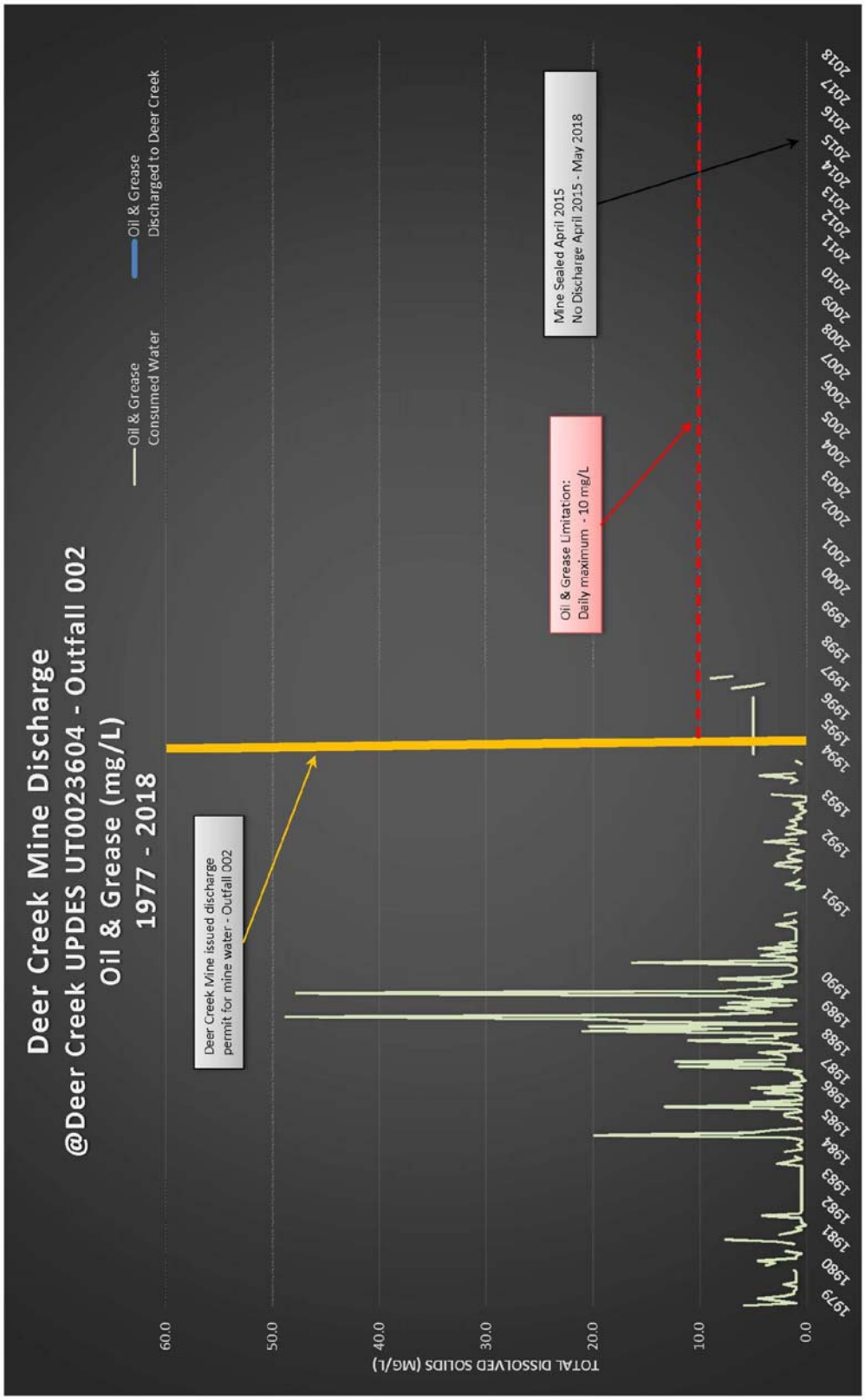
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



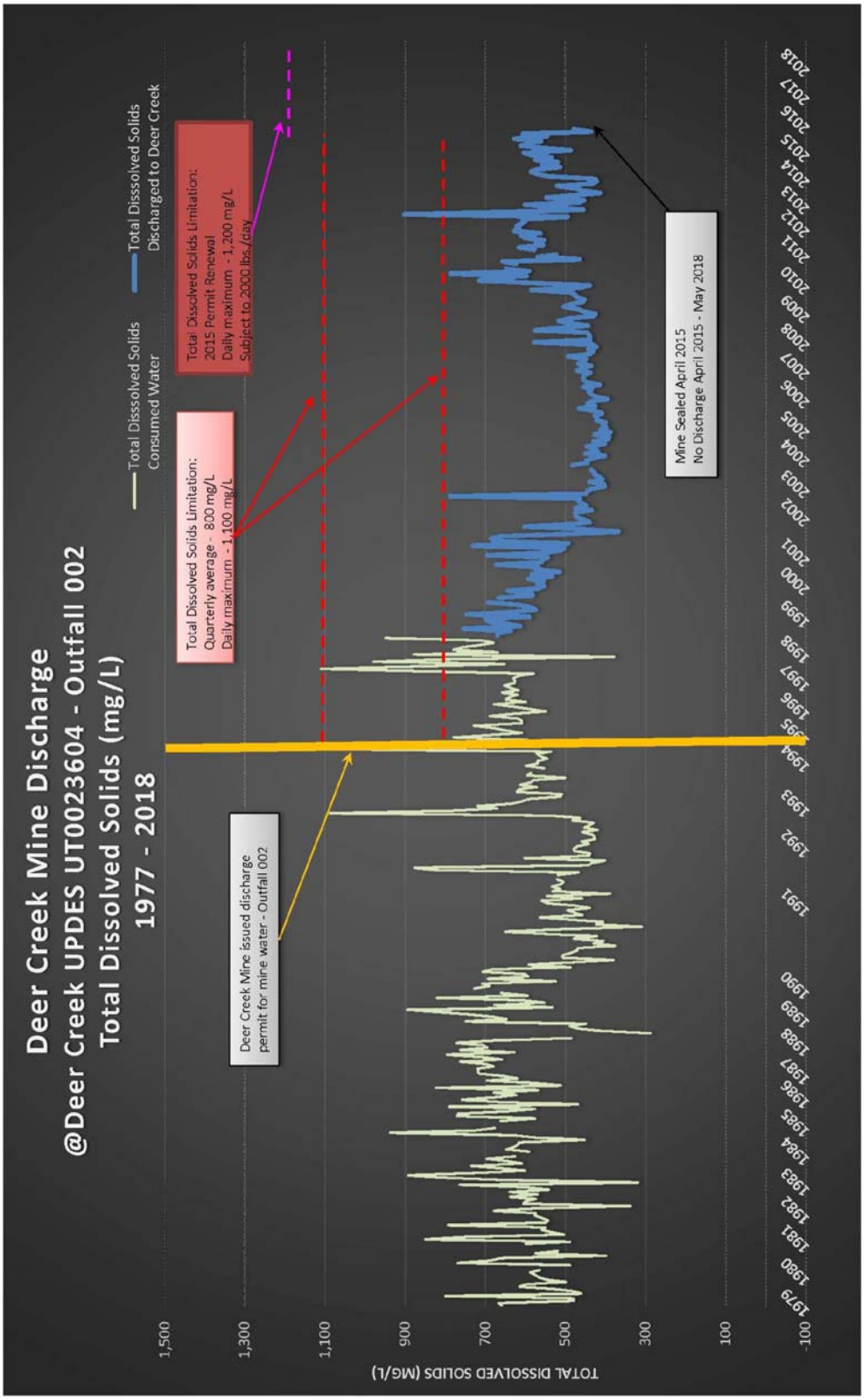
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



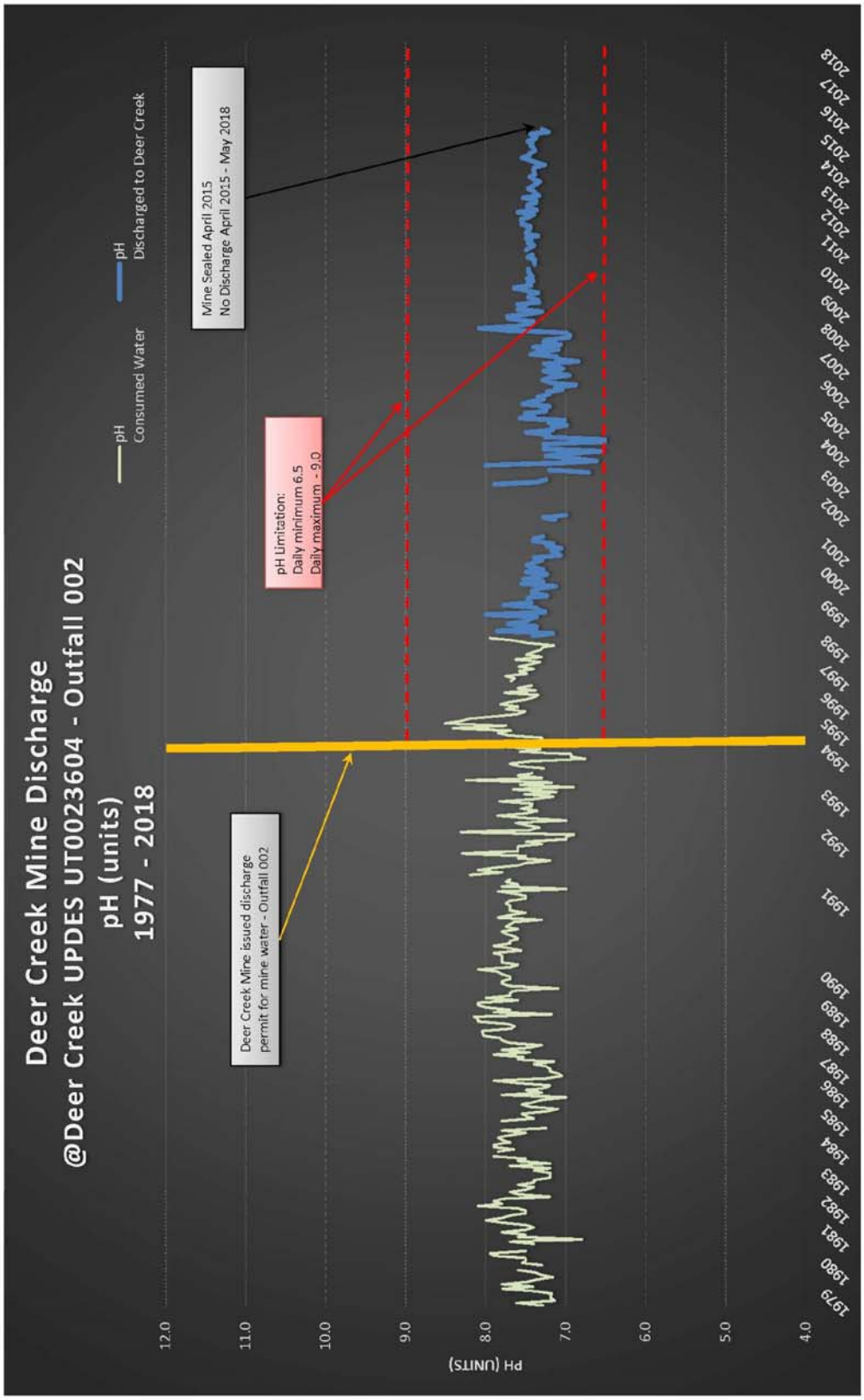
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTU-083066

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-083066, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-083066. The total acreage being surrendered is 2,422.77 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTU-083066 is described below:

Federal Coal Lease UTU-083066		
Lease Readjustment Effective Date:		3/1/2012 to 3/1/2022
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**2,422.77**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R6E, SLB&M Emery County, UT		
Sec 13:	E½SW¼, SE¼	240.00
Sec 24:	E½, E½W½	480.00
Sec 25:	N½NE¼	80.00
T17S, R7E, SLB&M Emery County, UT		
Sec 17:	SW¼, S½SW¼SE¼	180.00
Sec 18:	Lots 3 and 5, SE¼	207.10
Sec 19:	Lots 2-5, E½	412.67
Sec 20:	W½E½, W½	480.00
Sec 29:	NW¼NE¼, N½NW¼	120.00
Sec 30:	Lots 1, 5 and 6, N½NE¼, SW¼NE¼, NW¼SE¼	223.00
	Total Lease Acres for Full Relinquishment:	**2,422.77**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-083066

LEASE ACTIVITIES

1) Coal Lease Number: UTU-083066 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine) and C/015/0019 (Cottonwood Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 2,422.77; Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of area relinquished. No areas retained. See also Figure 1 (a map depicting the area to be relinquished in its entirety).*

Original Lease Acreage: 2,482.77 per amended description (BLM letter dated 5/24/2012)
Relinquished to date: 60.00 acres Remaining: 2,422.77 acres

- *Partial relinquishment: 60 acres – Accepted effective: 4/30/1997*

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)? YES ☐ NO ☒ (If "YES", describe:

11) Date of initial mining: December 1979; last mining: June 1986

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-083066

12) Number of coal beds mined: 2 coal seams (Blind Canyon and Hiawatha)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to explanation of spring monitoring reduction*

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to DOGM write up*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-083066

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
   - *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F*

24) Was there any surface disturbance conducted independent of mining activities? YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐ (If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

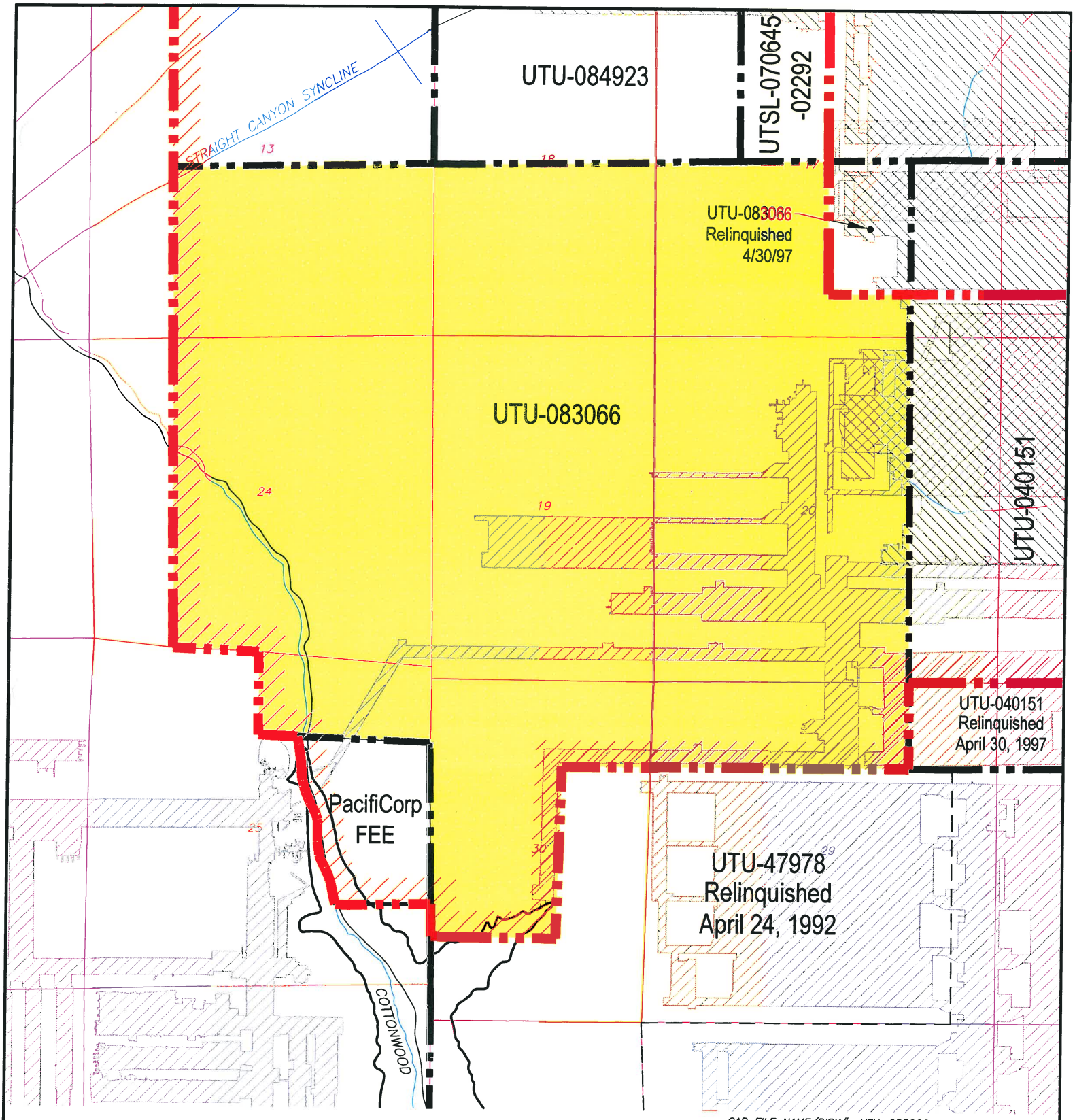
Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-083066

Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTU-083066 is described below:

Federal Coal Lease UTU-083066 Lease Readjustment Effective Date: Lessee of Record: **Federal Coal Lease Acres:**		3/1/2012 to 3/1/2022 PacifiCorp **2,422.77**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R6E, SLB&M	**Emery County, UT**	
Sec 13:	E½SW¼, SE¼	240.00
Sec 24:	E½, E½W½	480.00
Sec 25:	N½NE¼	80.00
T17S, R7E, SLB&M	**Emery County, UT**	
Sec 17:	SW¼, S½SW¼SE¼	180.00
Sec 18:	Lots 3 and 5, SE¼	207.10
Sec 19:	Lots 2-5, E½	412.67
Sec 20:	W½E½, W½	480.00
Sec 29:	NW¼NE¼, N½NW¼	120.00
Sec 30:	Lots 1, 5 and 6, N½NE¼, SW¼NE¼, NW¼SE¼	223.00
	Total Lease Acres for Full Relinquishment:	**2,422.77**
	Total Lease Acres Remaining:	**0.00**



CAD FILE NAME/DISK#: UTU-083066

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-083066 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-083066

DRAWN BY:	K. LARSEN	FIGURE 1
SCALE:	1" =2000'	DRAWING #:
DATE:	MAY 1, 2018	SHEET 1 OF 1 REV.

FEDERAL COAL LEASE UTU-080366
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-083066 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Blind Canyon and Hiawatha seams in both the Deer Creek Mine and the Cottonwood/Wilberg Mine. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam took place between 12/1979 and 6/1986, and in the Hiawatha Seam between 11/1977 and 6/1995.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the East Mountain LMU were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

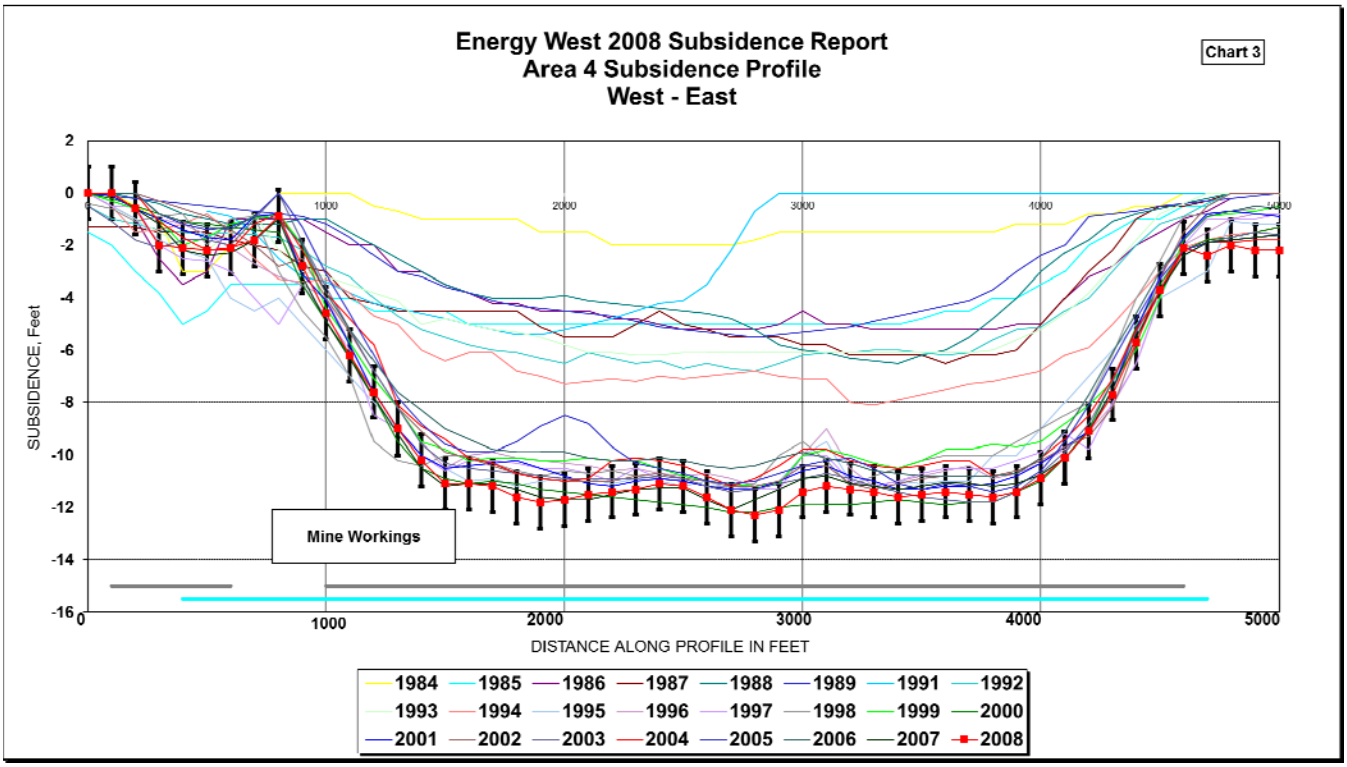
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-083066 Subsidence Data

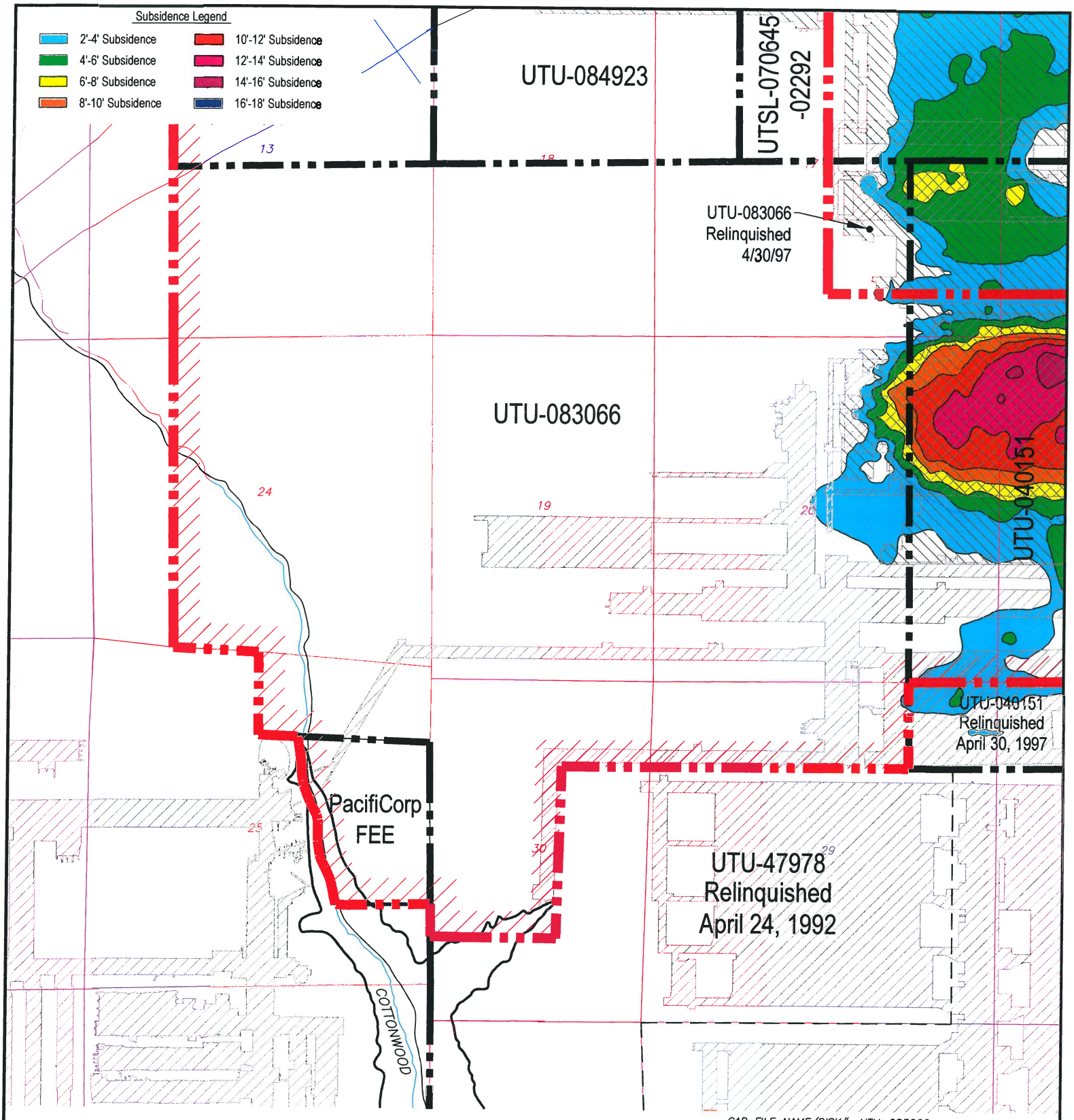
Subsidence in the lease UTU-083066 area was monitored from 1984 to 2008. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1999 and 2009. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

PacifiCorp delineated a profile (Area 4) that covers part of Lease UTU-083066, including part of the dual-seam mining overlay area, are shown on the following figure and accompanying map. Some surface cracking did occur along the eastern edge of the lease – this was either repaired or allowed to fill in naturally. Subsidence within this area has reached a maximum of just over 9 feet. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.



Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-083066.

The proposed relinquishment area of Lease UTU-083066 is stable and subsidence is substantially complete.



CAD FILE NAME/DISK#: UTU-083066

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-083066 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

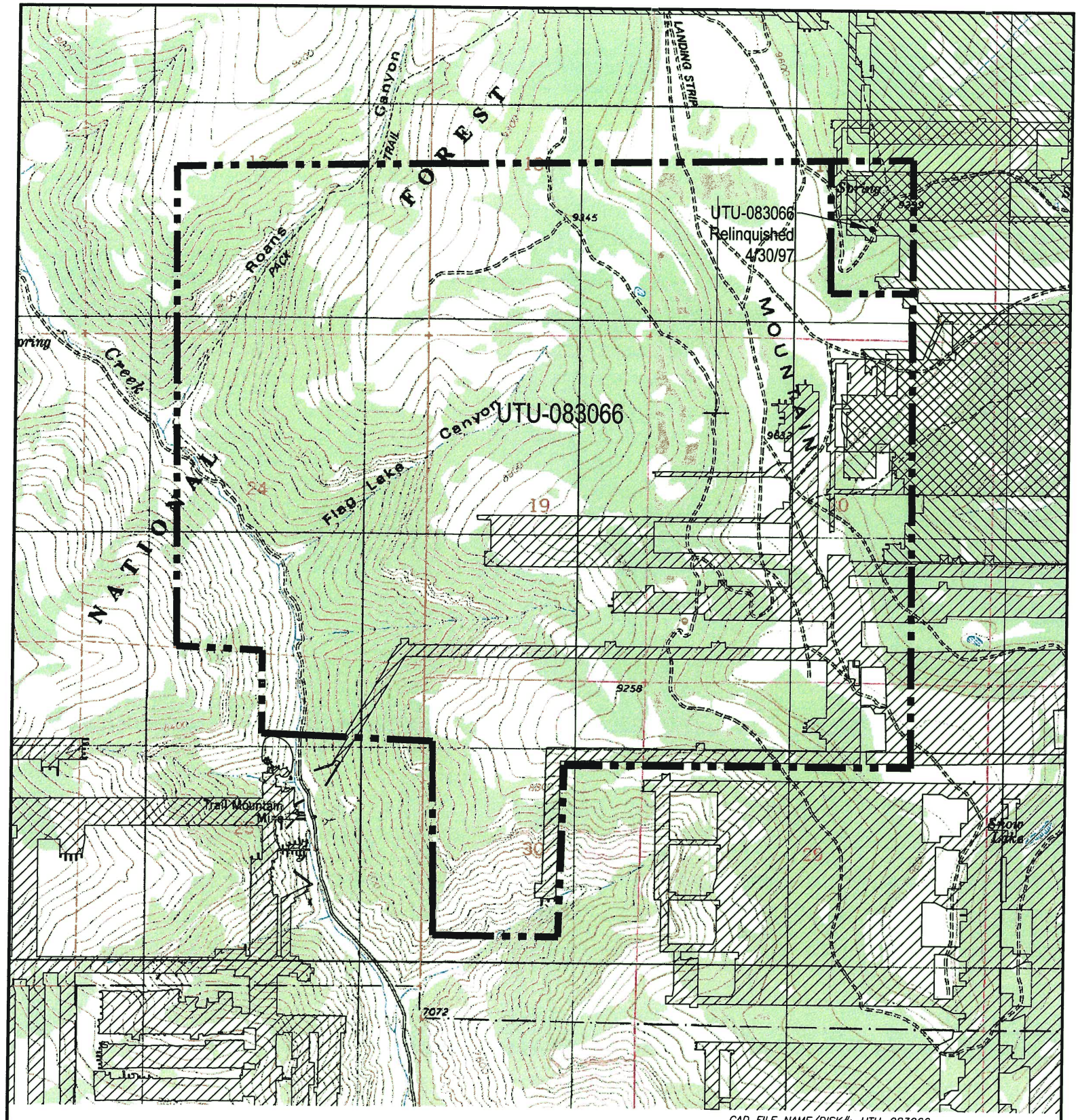
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-083066
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-083066 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-083066 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-083066. No restoration and/or mitigation efforts are required for Lease UTU-083066. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-083066 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTU-083066

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-083066
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-083066 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Statement concerning Hydrologic Monitoring Reduction Amendment, submitted May 03, 2013, and approved by UDOGM November 25, 2014 and previous reduction amendments and relinquishments.

The purpose of this amendment was to reduce the hydrologic monitoring responsibilities of PacifiCorp for the following reasons:

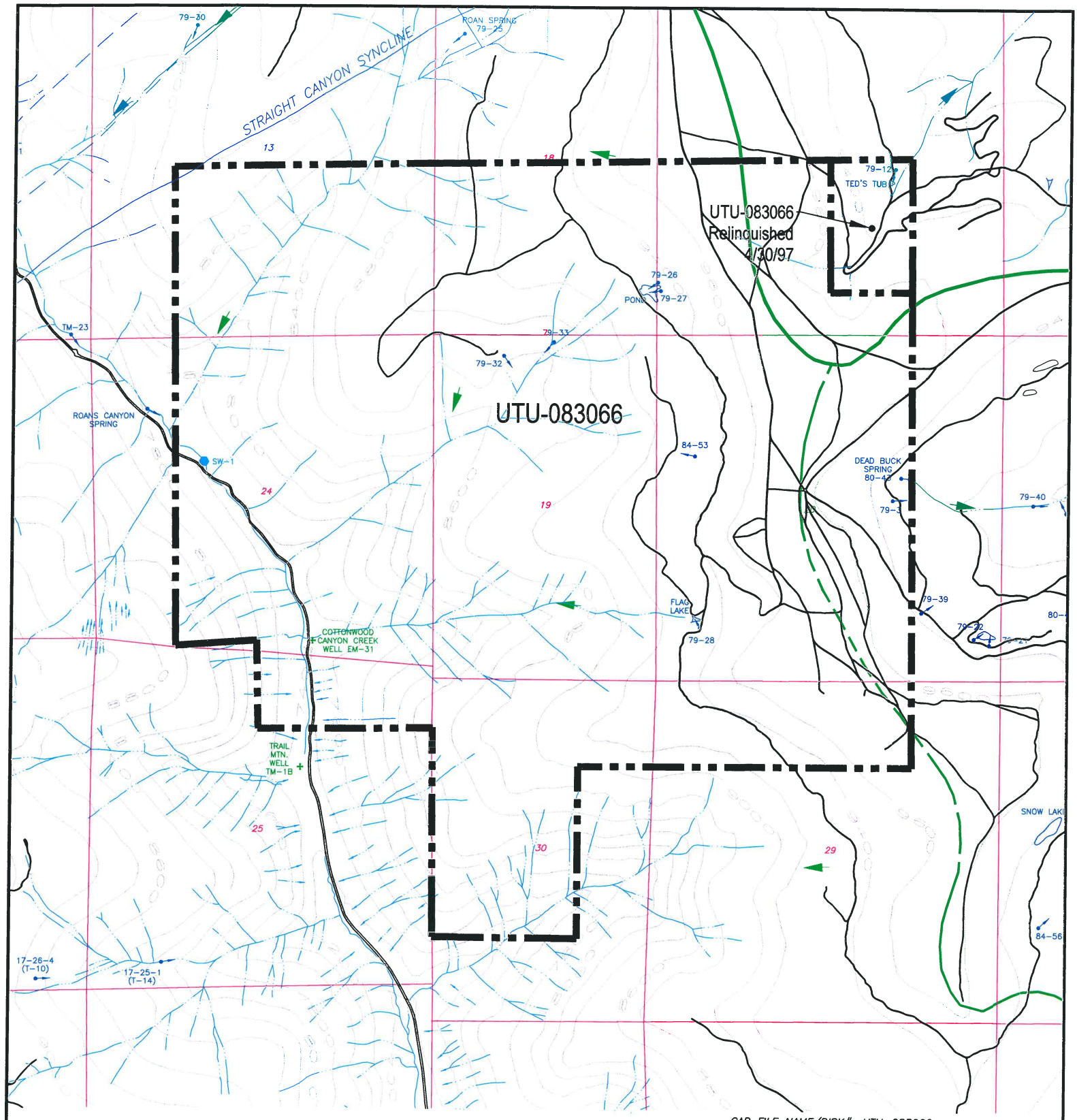
To eliminate sites outside of existing permit boundaries,
To eliminate sites outside of federal lease boundaries,
To eliminate sites in areas that were mined out and stabilized,
To eliminate sites in areas that will not be mined.

Two investigations are referred to in the amendment which conclude that there is no significant relationship between underground mining and intercepted groundwater and changes in surface and groundwater quantity or quality.

PacifiCorp submitted the first of three phases of lease relinquishment to the BLM for areas in the southern part of the LMU that had been mined out and where subsidence was considered to be substantially complete, or would not be mined. These relinquishment phases were approved by BLM and its Memorandum Of Understanding (MOU) partners (UDOGM, USDA Forest Service) in 1992, 1997 (East Mountain LMU UTU-73336), and 2009 (Trail Mountain LMU).

The approval of the monitoring reduction amendment by DOGM in 2014 is an indication of agreement by all parties involved that there have been no impacts to surface or groundwater from the mining in these leases. The fact that PacifiCorp is no longer required by the MOU participant agencies to monitor surface or groundwater in this area is sufficient documentation for the remainder of the leases to be relinquished.

Mining in the southern half of the East Mountain LMU has been essentially complete since the year 2001, when the Cottonwood Mine ceased production and the portals were closed. In the intervening years, as those areas have stabilized, monitoring of subsidence and hydrology were terminated as those areas were considered to be stable and not impacted by mining.



CAD FILE NAME/DISK#: UTU-083066

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-083066
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-083066 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Vegetation of Lease UTU-083066 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-083066:

Aspen	AS
Aspen/Conifer	AS/C
Barren/Sparse Vegetation	BR/SV
Black Sagebrush	BLSB
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Gambel Oak	GO
Mountain Big Sagebrush	MSB
Mountain Mahogany	MM
Mountain Shrubland	MS
Pinyon-Juniper	PJ
Ponderosa Pine Mix	PPmix
Riparian Herbaceous	RHE
Riparian Woody	RW
Silver Sagebrush	SSB
Spruce/Fir	SF
Upland Herbaceous	UHE
White Fir Mix	WFmix

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to

exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Utah Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

Stat. of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR
OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

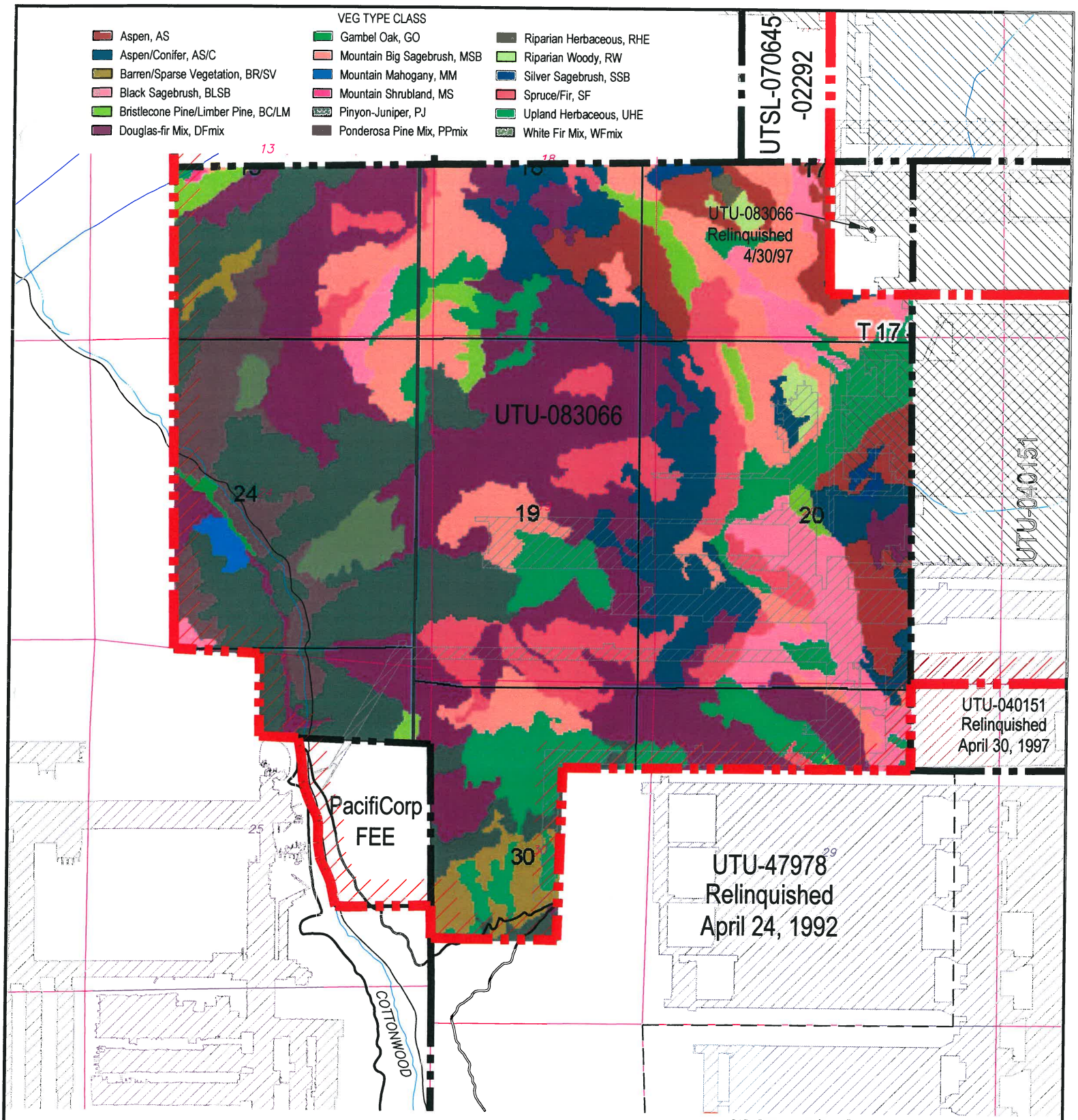
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-083066 area. There were no surface facilities or installations on this lease.



LEGEND

- LMU BOUNDARY UTU–73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-083066 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU–083066

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU–083066
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-083066 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in Lease UTU-083066 that would have been affected by mining.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-083066 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTU-038066 took place on May 7, 2001, prior to sealing of the Cottonwood/Wilberg Mine. CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-083066 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st - 7th Right Sections, Main West, 3rd South, Trail Mountain Access, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-083066 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st - 7th Right Sections, Main West, 3rd South, Trail Mountain Access, and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-083066 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st - 7th Right Sections, Main West, 3rd South, Trail Mountain Access, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

D. m R.L. 11/7/18

(Officer of the Lessee) (Date)

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTU-083066 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) _1st - 7th Right Sections, Main West, 3rd South, Trail Mountain Access, and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-083066 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st - 7th Right Sections, Main West, 3rd South, Trail Mountain Access, and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-083066 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st - 7th Right Sections, Main West, 3rd South, Trail Mountain Access, and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Dates: 11/05 – 04/15

Submittal Date: NOV. 7, 2018

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Price Field Office
125 South 600 West
Price, Utah 84501

3482
SL-064900
(UT-070)

Pamela Grubaugh-Littig
Permit Supervisor
Utah Division of Oil, Gas and Mining
1594 West North Temple Street
Salt Lake City, Utah 84114-5801

AUG 30 2001

Re: Temporary Closure, Cottonwood/Wilberg Mines, PacifiCorp

Dear Mrs. Grubaugh-Littig:

Enclosed is a copy of two inspection reports of joint onsites at the subject mines conducted by field personnel from both our agencies. The report was to document findings at the said mine during temporary closure. Along with these reports are our recommendations on the closure plan received from the company.

PacifiCorp, through its wholly owned subsidiary Energy West, Inc., sent a notice to us on February 8, 2001, of "Temporary Cessation of Operations for the Trail Mountain, Cottonwood and Wilberg Mines". We have previously commented on the Trail Mountain Mine portion of the cessation plan. An underground inspection of the Cottonwood/Wilberg Mine was held which we could not attend. However, we have visited the mine portal areas and participated in the underground inspection of the area to be sealed in the Deer Creek/ Wilberg shaft area. The Deer Creek/Wilberg shaft area was inspected from the Deer Creek Mine, as the company had to seal the 1st South Mains as access to the top of the shaft. This was far more practical than trying to seal at the shaft. These two inspection reports are enclosed. The inspections verify the closure plan and support our findings for the proposed cessation plan.

The application for "Temporary Cessation of Operations" submitted by PacifiCorp details the plans for putting the Cottonwood/Wilberg Mine in a temporarily closed condition with temporary portal seals and documents what items will be left in the mine. Most of the items to be left are belt structure, power cable and pipe. Should the mine be re-opened much of these items will be used or replaced. Should the mine never re-open and reclamation occurs, these items of themselves should not cause any impacts to the hydrologic regime in the mine. These items are inert metals with no liquids or oils. No other items potentially hazardous or toxic were noted during the inspection. We therefore have no objections to leaving the listed items underground should the mine never be opened again.

With regard to temporary sealing of the portals, the plan is adequate to protect the unmined coal resource and bar access to the resource. The seals meet standards set by MSHA and are acceptable to us for compliance with rules under the Mineral Leasing Act for abandonment and protection of the unmined coal and other mineral resource (43 CFR 3484.2 (b)).

Pursuant to the Mineral Leasing Act of 1920, as amended, and in conjunction with the rules at 43 CFR 3400, and the lease terms, PacifiCorp's plan for temporary abandonment of the Cottonwood/Wilberg Mine is acceptable and confirmed by us. Should you have further questions, please contact Stephen Falk of my staff at (435) 636-3600.

Sincerely,

/S/ THOMAS E. RASMUSSEN

Acting FOR Richard L. Manus
Field Manager

Enclosure
Inspection Reports (2)

cc: UT-921, SD, Utah (w/enclosure)
Manti-LaSal National Forest (w/enclosure)
599 West Price River Road
Price, Utah 84501
Energy West Mining Company (w/enclosure)
P. O. Box 310
Huntington, Utah 84528
Utah Division of Oil, Gas and Mining (w/enclosure)
Price Field Office
451 East 400 North
Price, Utah 84501

Bureau of Land Management
Inspection Report For Coal Operations

Inspection Number swf06/20/01

Thursday, August 09, 2001

Inspection Date 6/20/01

Quarter 3rd *Fiscal Year* FY2001

Mine Cottonwood *Purpose* Special

SL-064900 Lead lease
U-044025 Portal location

Current Mine Status

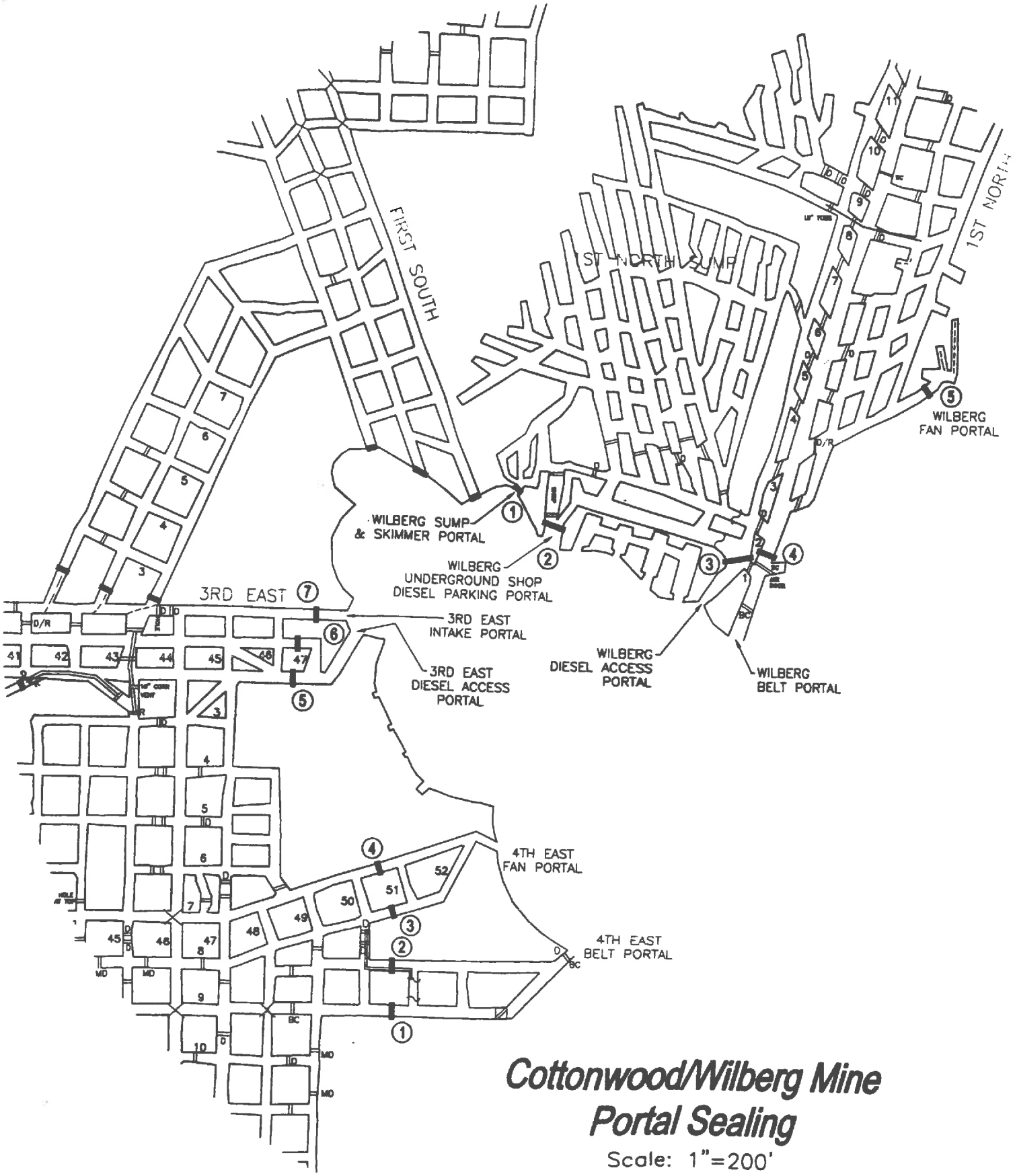
On June 20. 2001, I (Stephen Falk) and Sue Burger (summer intern) inspected the erected temporary seals at the Cottonwood/Wilberg Mine portal area. Seth McCourt was our company representative. The purpose of the inspection was to verify the temporary seals erected by Energy West at all the portals at the Cottonwood/Wilberg surface facilities.

On February 8, 2001, BLM received from Energy West a notice for "Temporary cessation of operations for the Trail Mountain, Cottonwood, and Wilberg Mines". In short summary, the Trail Mountain Mine had finished longwall mining of the reserves on the Trail Mountain property. Coal was conveyed via an enclosed conveyor belt across Cottonwood Canyon from the Trail Mountain portals to the Cottonwood belt portals and conveyed through the Cottonwood Mine to the Cottonwood/Wilberg loadout facilities in Grimes Wash. This was used for many years to allow the use of the same loadout facilities and the ability to ship triple coal haul truck trailers down the existing Wilberg haul road to the Hunter Power Plant. With the cessation of coal production at Trail Mountain, Energy West has opted to idle the operations and in so doing to construct temporary seals over all portals. Also the plan noted items to be left underground. Two underground inspections with Utah Division of Oil Gas and Mining personnel were held with company officials, one for Trail Mountain and one for Cottonwood/Wilberg. BLM attended the Trail Mountain inspection but were not able to attend the Cottonwood/Wilberg inspection. This inspection (June 20, 2001) was to note the seals that had been erected after the final underground inspection.

There are 12 portals at this complex. Three portals have been sealed since the Wilberg fire in 1984 (First South intakes). We checked the rest of the portal seals. From the east to the west, we first saw the Wilberg Fan portal which has the fan taken away and a block seal back behind the blast-proof fan housing. Around the corner were the Wilberg belt and roadway portals. Both were blocked sealed back 100 feet from the opening and the opening fenced off at the direct opening. The sump and shop portals next to the underground office were both blocked at the opening. At the 3rd East intake portal pad, the two portals were open with fence at the opening. Seals were 200 feet inby with three seals. 4th East fan portal had the fan housing sealed at the explosion doors. And last, the 4th East belt entry was fenced and block sealed 200 feet inby. These seals meet temporary closure standards for protection of the coal resource. One suggestion was given to Energy West was to fence off the tunnel access opening for the 3rd East pad. Energy West has plans for remote cameras for site security as the gate down the haul road does not have fencing on either side of the gate.

Close Out Discussion

The seals and fencing used on the portals meets the requirements for resource protection under a temporary closure of the mine. The items listed that would be left in the mine, we believe do not have any known substances that would be considered hazardous or would pose a problem to to hydrologic resources. We have no objections to things to be left in the mine.



Cottonwood/Wilberg Mine Portal Sealing

Scale: 1"=200'

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-083066
Deer Creek Mine - MSHA # 42-00121, Cottonwood Mine MSHA # 42-01211
Sealed Mine Sections: 1st - 7th Right Sections, Main West, 3rd South, Trail Mountain Access, And remainder of mine workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (11/77 - 06/95) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	11/77 - 06/95	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	11/77 - 06/95	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	11/77 - 06/95	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	11/77 - 06/95	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	11/77 - 06/95	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	11/77 - 06/95	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	11/77 - 06/95	Naptha	40 - 50%	64742-94-5	All Sections
	11/77 - 06/95	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	11/77 - 06/95	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	11/77 - 06/95	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	11/77 - 06/95	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	11/77 - 06/95	Propane	14%	74-98-6	All Sections
	11/77 - 06/95	Butane	13%	106-97-8	All Sections
	11/77 - 06/95	Toluene	17%	108-88-3	All Sections
	11/77 - 06/95	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	11/77 - 06/95	Napthalene	0.40%	91-20-3	All Sections
	11/77 - 06/95	Acetone	41%	67-64-1	All Sections
	11/77 - 06/95	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	11/77 - 06/95	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	11/77 - 06/95	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	11/77 - 06/95	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	11/77 - 06/95	Mineral Oil	20 - 25%	8042-47-5	All Sections
	11/77 - 06/95	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	11/77 - 06/95	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	11/77 - 06/95	Methanol	<20%	67-56-1	All Sections
	11/77 - 06/95	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	11/77 - 06/95	Heptane	69 - 79%	142-82-5	All Sections
	11/77 - 06/95	Ethyl Ether	11 - 21%	60-29-7	All Sections
	11/77 - 06/95	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	11/77 - 06/95	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	11/77 - 06/95	Heptane	60 - 70%	142-82-5	All Sections
	11/77 - 06/95	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	11/77 - 06/95	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	11/77 - 06/95	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	11/77 - 06/95	None			All Sections
Cat Transmission and Drive Train Oil	11/77 - 06/95	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	11/77 - 06/95	Monoethanolamine	<10%	141-41-3	All Sections
	11/77 - 06/95	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	11/77 - 06/95	Mineral Oil	70 - 95%	Mixture	All Sections
	11/77 - 06/95	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	11/77 - 06/95	Lubricant base oil	87 - 91%	Various	All Sections
	11/77 - 06/95	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	11/77 - 06/95	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	11/77 - 06/95	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	11/77 - 06/95	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	11/77 - 06/95	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	11/77 - 06/95	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	11/77 - 06/95	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	11/77 - 06/95	Trichloroethylene	95 - 99%	79-01-6	All Sections
	11/77 - 06/95	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	11/77 - 06/95	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	11/77 - 06/95	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	11/77 - 06/95	Deionized Water	1 - 3%	7732-18-5	All Sections
	11/77 - 06/95	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-083066
Deer Creek Mine - MSHA # 42-00121, Cottonwood Mine MSHA # 42-01211
Sealed Mine Sections: 1st - 7th Right Sections, Main West, 3rd South, Trail Mountain Access, And remainder of mine workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (11/77 - 06/95) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	11/77 - 06/95	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	11/77 - 06/95	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	11/77 - 06/95	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	11/77 - 06/95	Calcium sulfate	2 - 10%		All Sections
	11/77 - 06/95	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	11/77 - 06/95	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	11/77 - 06/95	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	11/77 - 06/95	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	11/77 - 06/95	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	11/77 - 06/95	Lead	34%	7439-92-1	All Sections
	11/77 - 06/95	Lead Dioxide	31%	1309-60-0	All Sections
	11/77 - 06/95	Lead Sulfate	<1%	7446-14-2	All Sections
	11/77 - 06/95	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	11/77 - 06/95	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	11/77 - 06/95	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	11/77 - 06/95	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	11/77 - 06/95	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	11/77 - 06/95	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	11/77 - 06/95	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	11/77 - 06/95	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	11/77 - 06/95	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	11/77 - 06/95	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	11/77 - 06/95	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	11/77 - 06/95	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	11/77 - 06/95	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	11/77 - 06/95	Portland Cement		65997-15-1	All Sections
	11/77 - 06/95	Crystalline Silicon Dioxide		13397-24-5	All Sections
	11/77 - 06/95	Calcium Hydroxide		001-305-620	All Sections
	11/77 - 06/95	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	11/77 - 06/95	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	11/77 - 06/95	Polyglycols	60 - 100%	Mixture (2)	15 W
	11/77 - 06/95	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	11/77 - 06/95	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	11/77 - 06/95	Polyester Resin	5 - 15%	Not Reported	All Sections
	11/77 - 06/95	Styrene Monomer	3 - 7%	100-42-5	All Sections
	11/77 - 06/95	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	11/77 - 06/95	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	11/77 - 06/95	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	11/77 - 06/95	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	11/77 - 06/95	Isobutane	2 - 10%	75-28-5	All Sections
	11/77 - 06/95	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	11/77 - 06/95	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	11/77 - 06/95	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	11/77 - 06/95			64742-48-9	All Sections
	11/77 - 06/95			64742-88-7	All Sections
	11/77 - 06/95	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	11/77 - 06/95	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	11/77 - 06/95	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	11/77 - 06/95	Lubricant base oil	>99	Various	All Sections
	11/77 - 06/95	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	11/77 - 06/95	Lubricant base oil	87 - 91%	Various	All Sections
	11/77 - 06/95	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	11/77 - 06/95	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	11/77 - 06/95	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-083066
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

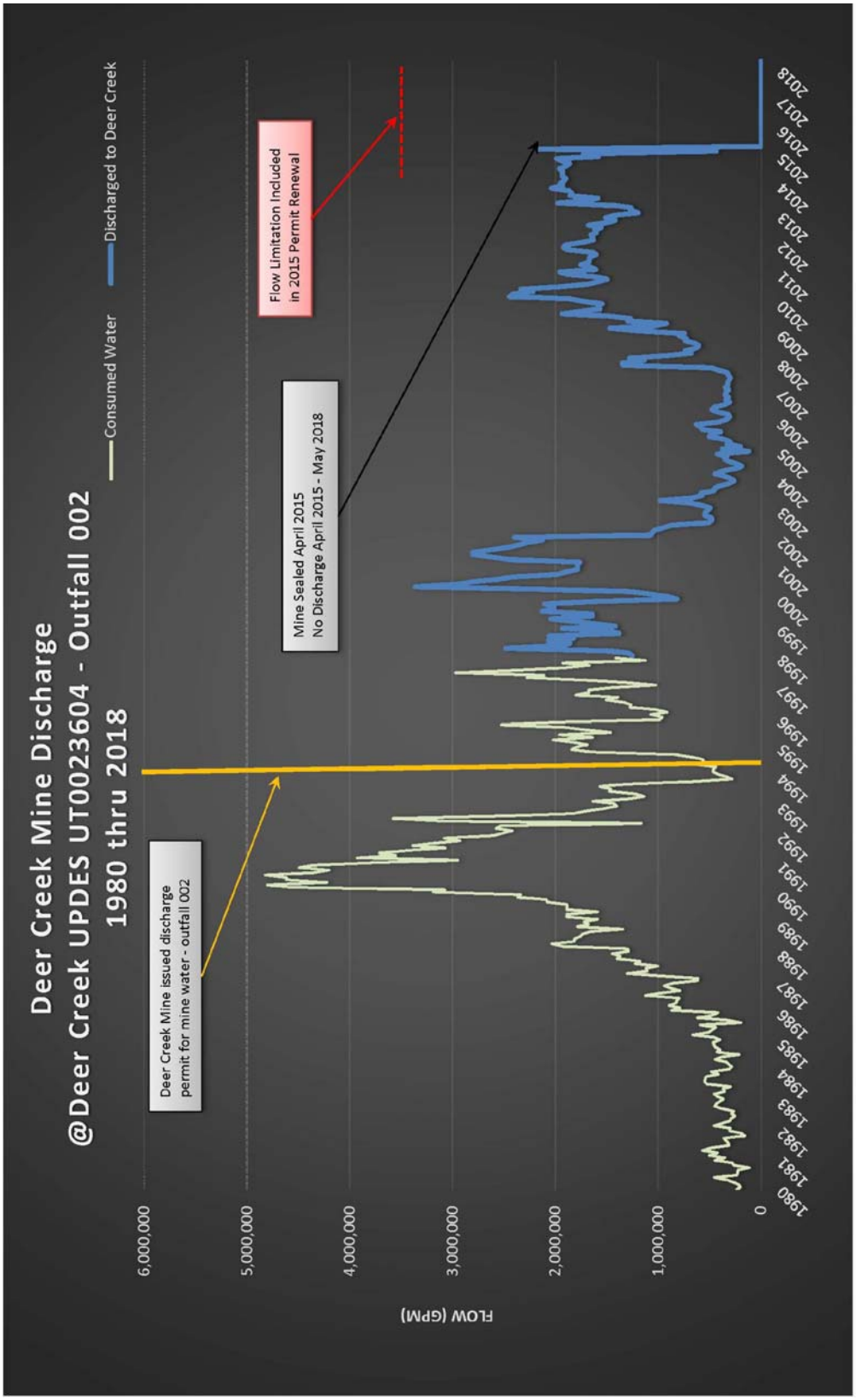
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



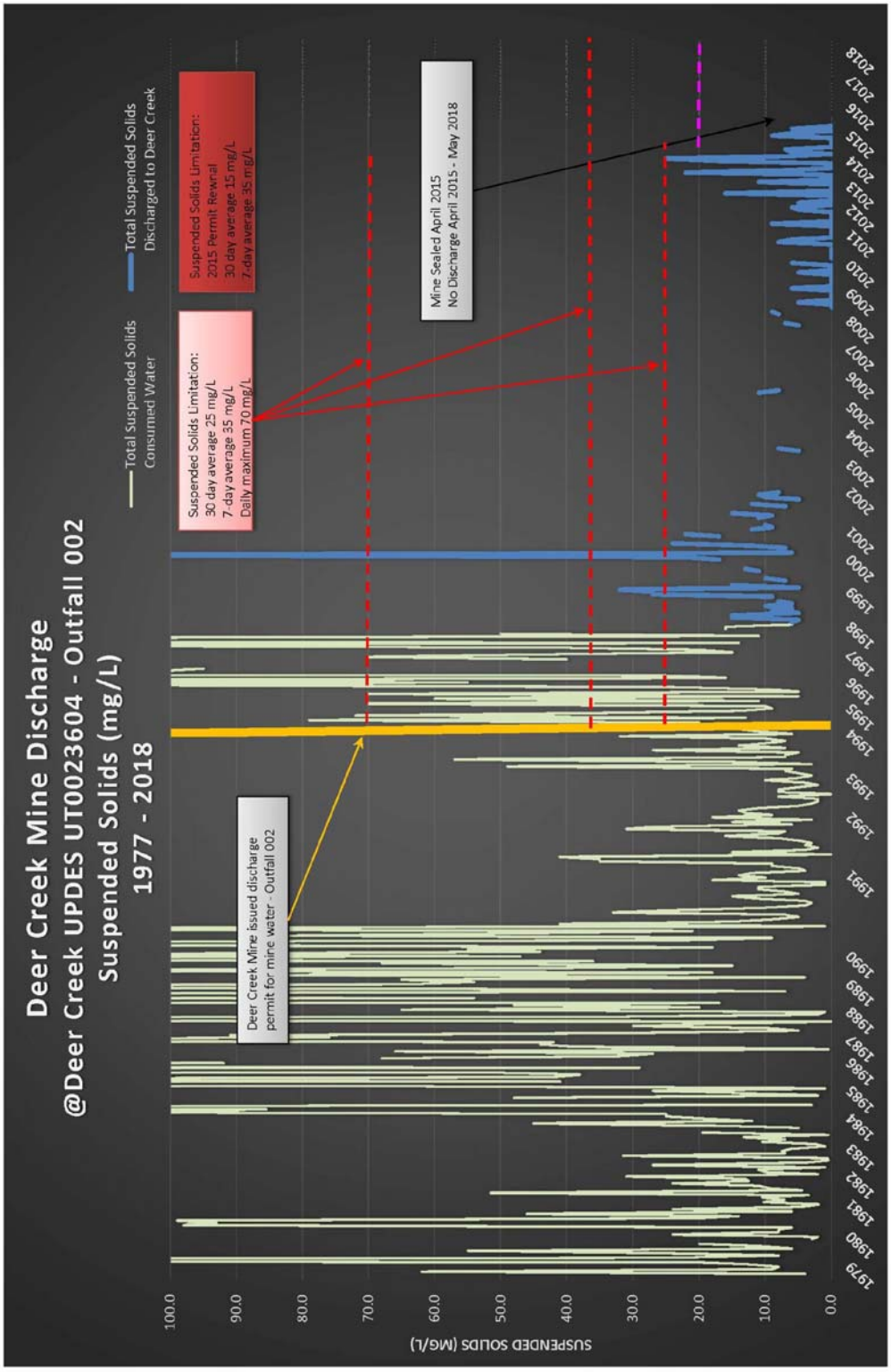
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



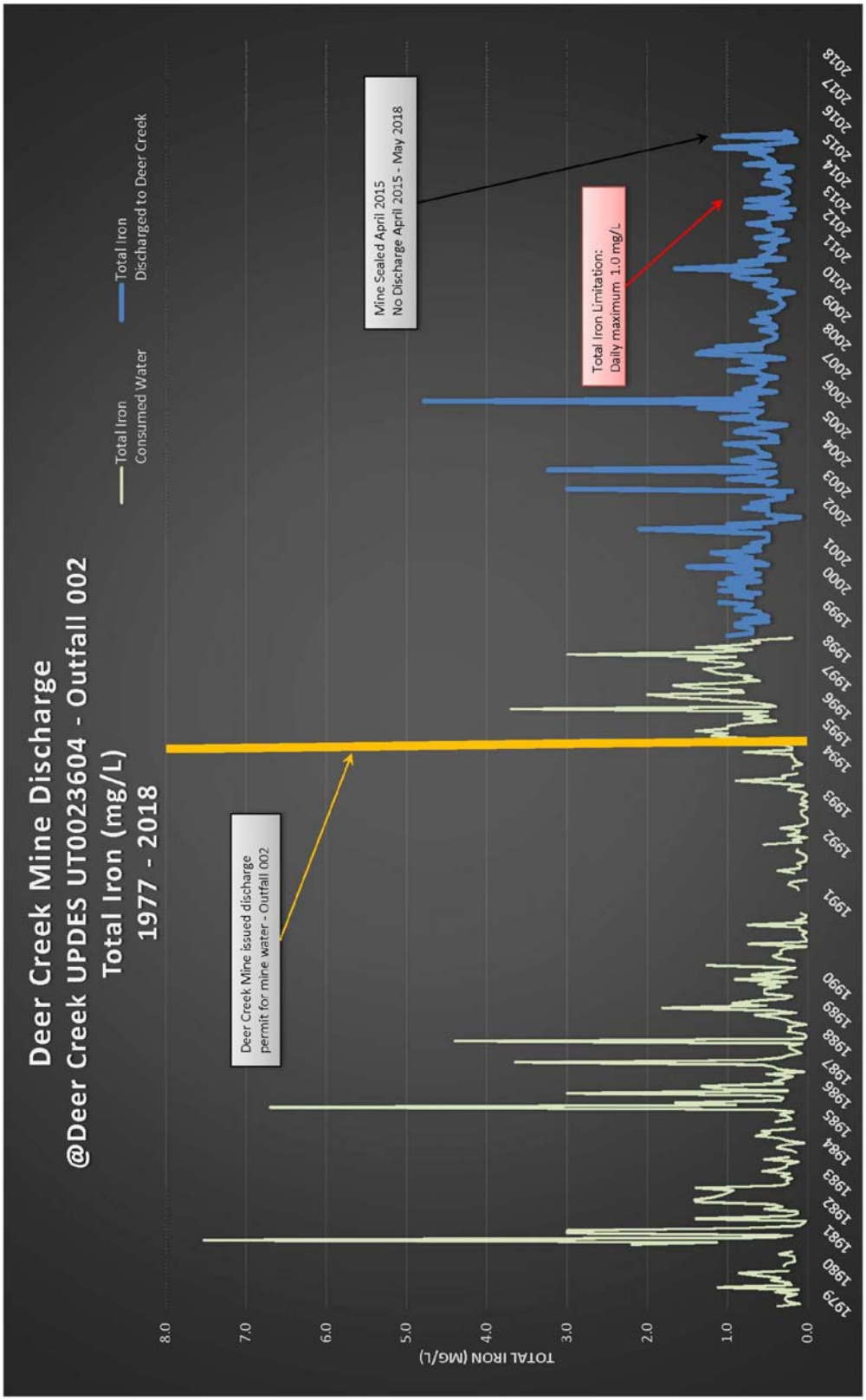
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



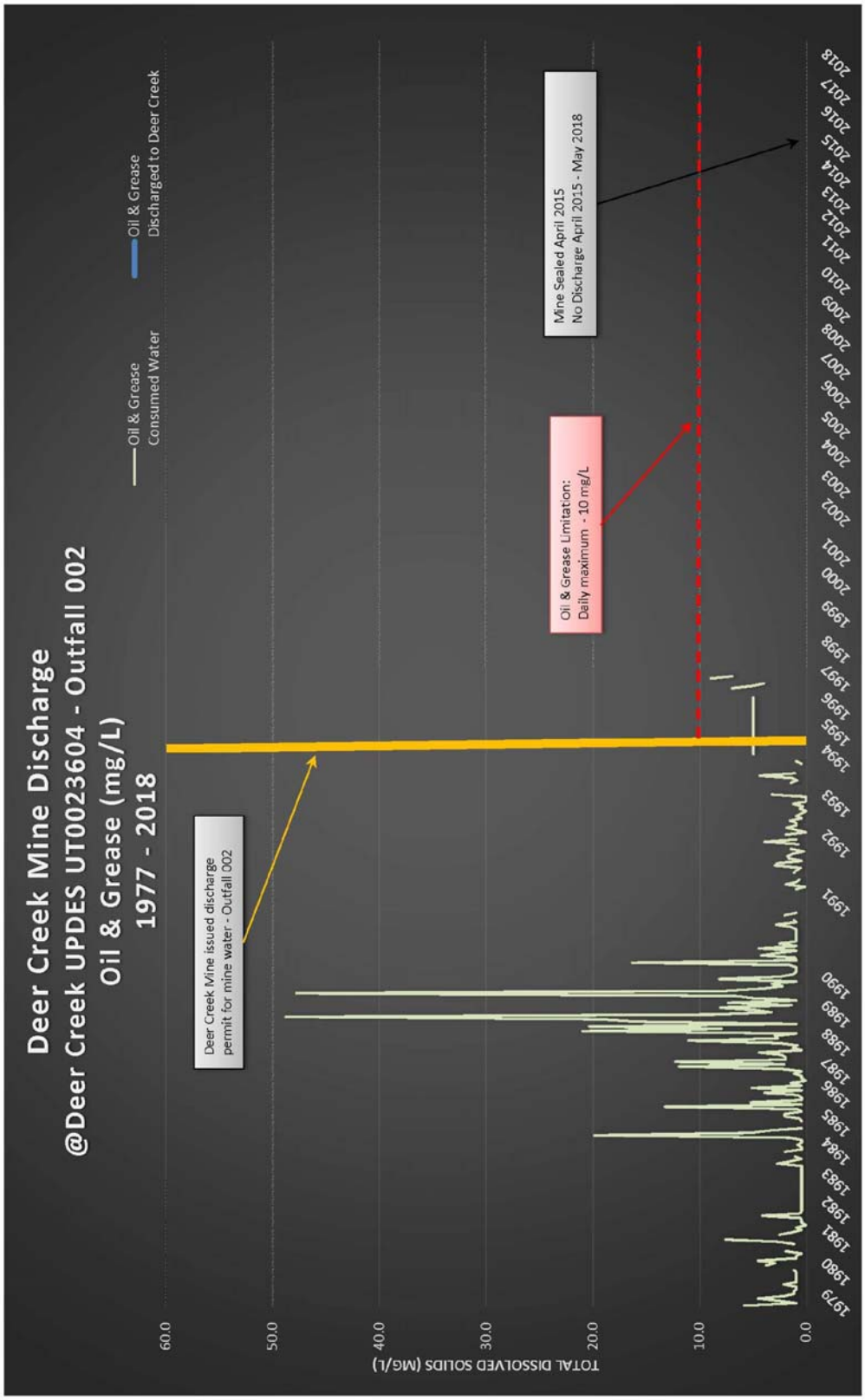
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



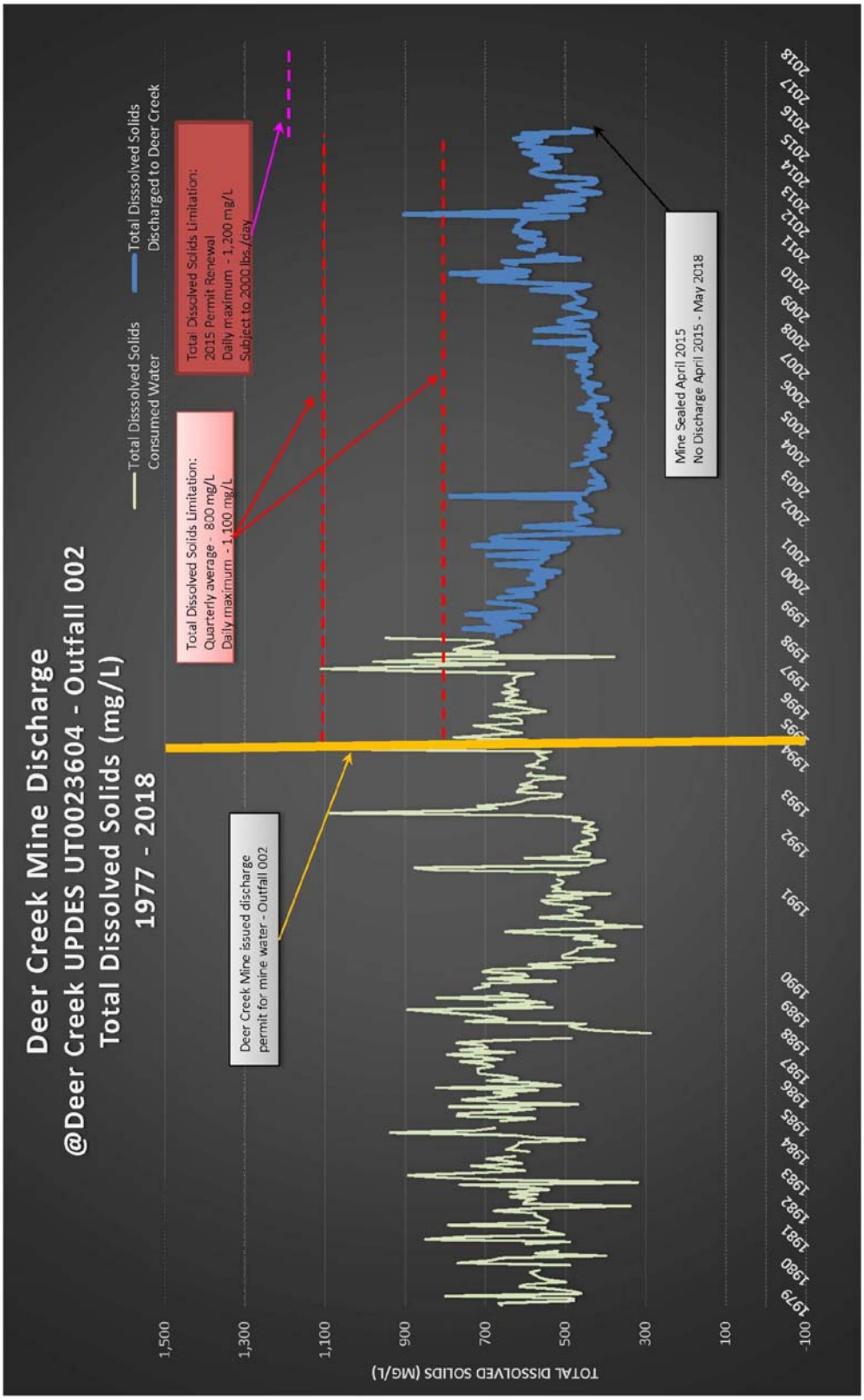
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



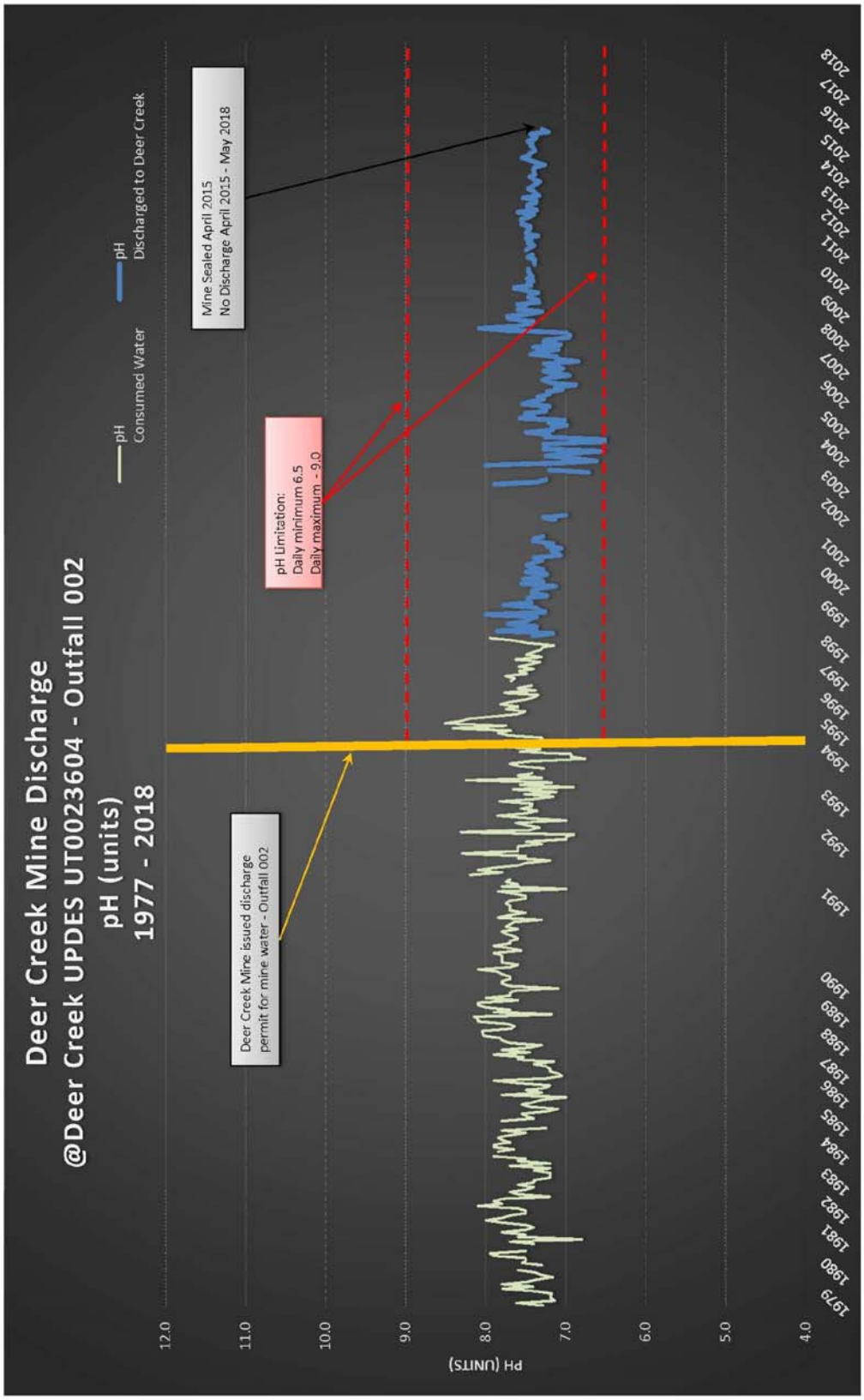
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Partial Relinquishment
Federal Coal Lease
UTU-040151

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Partial Relinquishment of Federal Coal Lease UTU-040151, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's partial relinquishment of acreage under federal coal lease UTU-040151. The total acreage being surrendered is 1,000.00 acres. The total acreage being retained for reclamation purposes is 20.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government.

Partial Relinquishment

The legal description for the area of partial relinquishment of UTU-040151 is described below:

Federal Coal Lease UTU-040151		
Lease Readjustment Effective Date:		3/1/2012 to 3/1/2022
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,020.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 15:	E½SW¼, E½W½SW¼	120.00
Sec 16:	S½S½SW¼, SW¼SW¼SE¼	50.00
Sec 17:	S½SE¼SE¼	20.00
Sec 20:	E½E½	160.00
Sec 21:	W½, W½W½W½NE¼, W½W½NW¼SE¼, S½SE¼	430.00
Sec 22:	NE¼NW¼, E½NW¼NW¼	60.00
Sec 27:	NW¼NW¼, W½NE¼NW¼	60.00
Sec 28:	E½NE¼NW¼, N½NE¼	100.00
	Total Lease Acreage Being Relinquished:	**1,000.00**
	Total Lease Acres Remaining:	**20.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec. 27	E½NE¼NW¼	**20.00**
	Total Lease Acreage Being Retained:	**20.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-040151

LEASE ACTIVITIES

1) Coal Lease Number: UTU-040151 *(Partial Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine) and C/015/0019 (Cottonwood Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 1,000.00; Entire lease? YES ☐ NO ☒ (See attached map.) Comments: *This is a partial relinquishment. Refer to Exhibit A for the legal descriptions of acreage relinquished and acreage retained. See also Figures 1 and 2 (a map depicting the area to be relinquished and retained). Lease acreage to be retained: 20.00.*

Original Lease Acreage: 1,720.00 Relinquished to date: 700.00 acres Remaining: 1,020.00 acres

- *Partial relinquishment: 700 acres – Accepted effective 4/30/1997*

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)?
YES ☒ NO ☐ (If "YES", describe: *Mine portals with surface support facilities. All facilities have been removed, all portals have been sealed and all disturbed lands have been reclaimed in accordance with DOGM mine permit C/015/0019.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-040151

11) Date of initial mining: August 1972; last mining: September 1995.

12) Number of coal beds mined: 2 coal seams (Blind Canyon and Hiawatha)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to explanation of spring monitoring reductions*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-040151

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D?
YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *Refer to DOGM write up*

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F?
YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
- *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities?
YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐
(If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-040151

Exhibit A

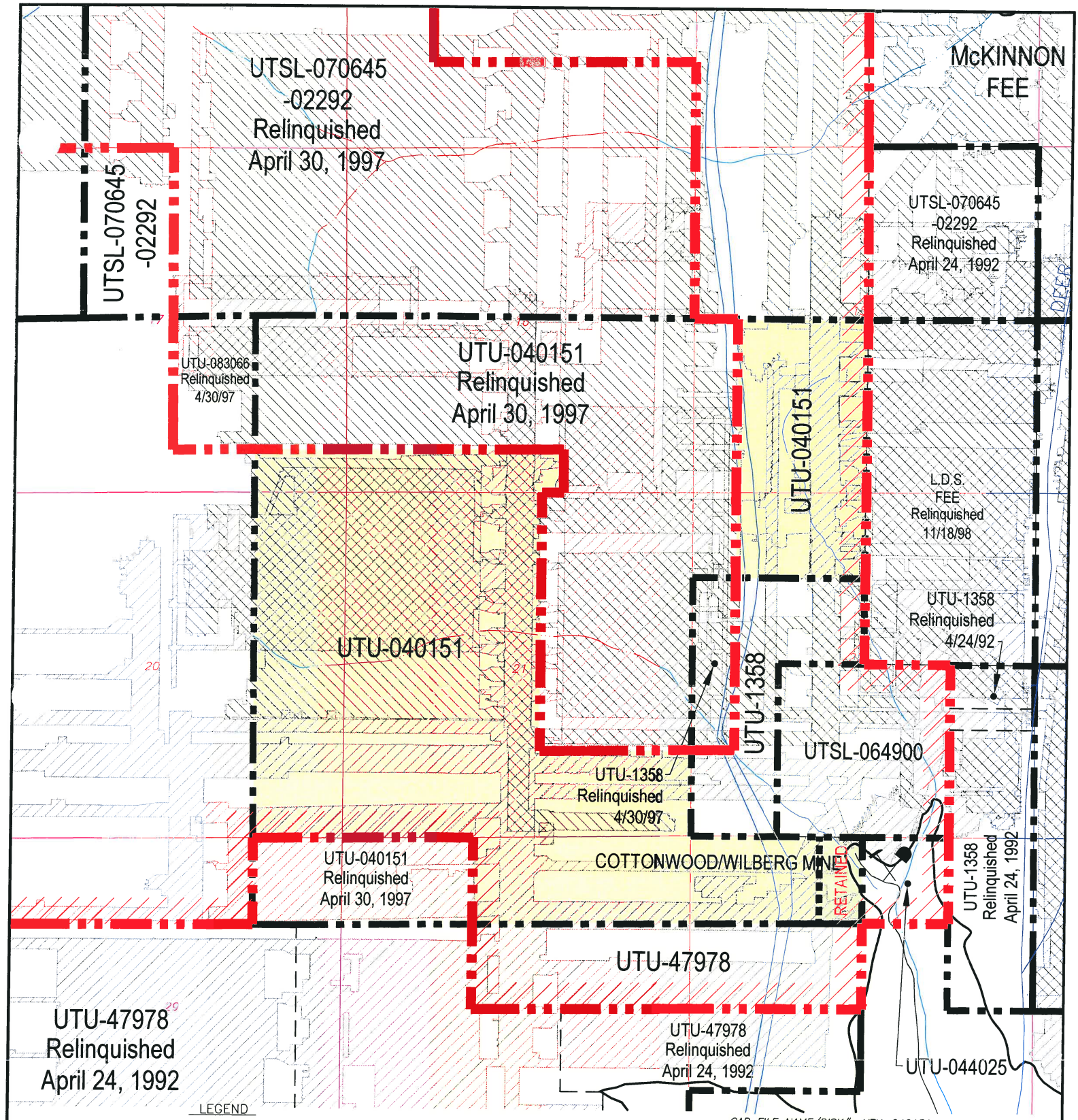
Partial Relinquishment

The legal description for the area of partial relinquishment of UTU-040151 is described below:

Federal Coal Lease UTU-040151		
Lease Readjustment Effective Date:		3/1/2012 to 3/1/2022
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,020.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 15:	E½SW¼, E½W½SW¼	120.00
Sec 16:	S½S½SW¼, SW¼SW¼SE¼	50.00
Sec 17:	S½SE¼SE¼	20.00
Sec 20:	E½E½	160.00
Sec 21:	W½, W½W½W½NE¼, W½W½NW¼SE¼, S½SE¼	430.00
Sec 22:	NE¼NW¼, E½NW¼NW¼	60.00
Sec 27:	NW¼NW¼, W½NE¼NW¼	60.00
Sec 28:	E½NE¼NW¼, N½NE¼	100.00
	Total Lease Acreage Being Relinquished:	**1,000.00**
	Total Lease Acres Remaining:	**20.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec. 27	E½NE¼NW¼	**20.00**
	Total Lease Acreage Being Retained:	**20.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-040151 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA
- FEDERAL COAL LEASE RETAINMENT AREA

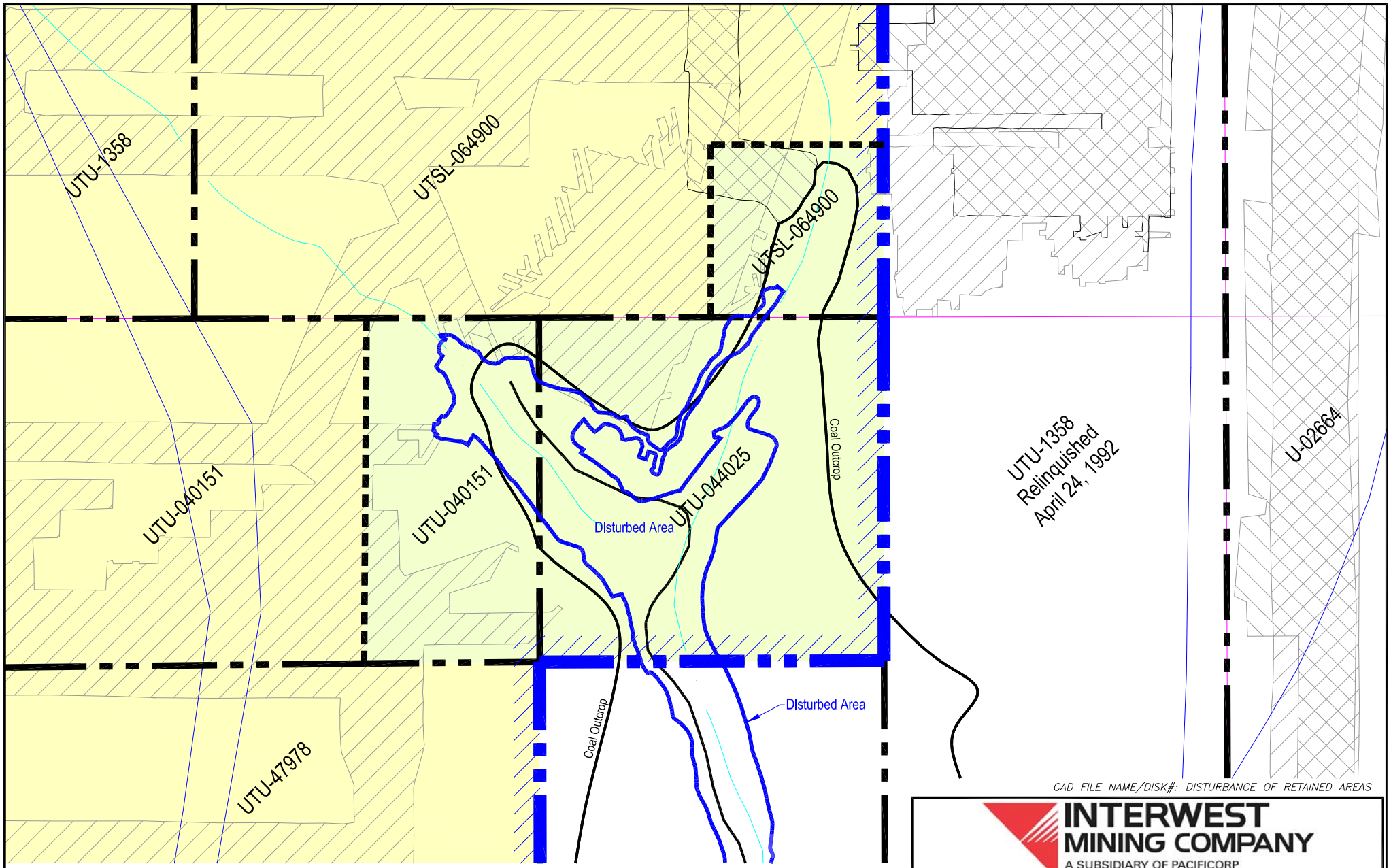
N

CAD FILE NAME/DISK#: UTU-040151

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-040151

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" = 2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___



CAD FILE NAME/DISK#: DISTURBANCE OF RETAINED AREAS

LEGEND

DISTURBED AREA TO BE RECLAIMED	UTU-044025	FEDERAL LEASE NUMBER
COAL OUTCROP		FEDERAL LEASE LINE
HIAWATHA SEAM MINE WORKINGS		FEDERAL COAL LEASE ACREAGE RETAINED
BLIND CANYON SEAM MINE WORKINGS		FEDERAL COAL LEASE ACREAGE RELINQUISHED

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD MINE
FEDERAL COAL LEASE ACREAGE RETAINED
WITH DISTURBED AREA

DRAWN BY:	K. LARSEN	FIGURE 2	
SCALE:	1" =500'	DRAWING #:	
DATE:	OCTOBER 1, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTU-040151
Checklist and Data Documentation for
Federal Coal Partial Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-040151 Partial Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of two separate blocks of coal reserves in the Blind Canyon and Hiawatha seams in the Deer Creek and Cottonwood/Wilberg mines. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam took place between 8/1972 and 7/1987, and in the Hiawatha Seam between 5/1976 and 9/1995.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the Trail Mountain Area were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

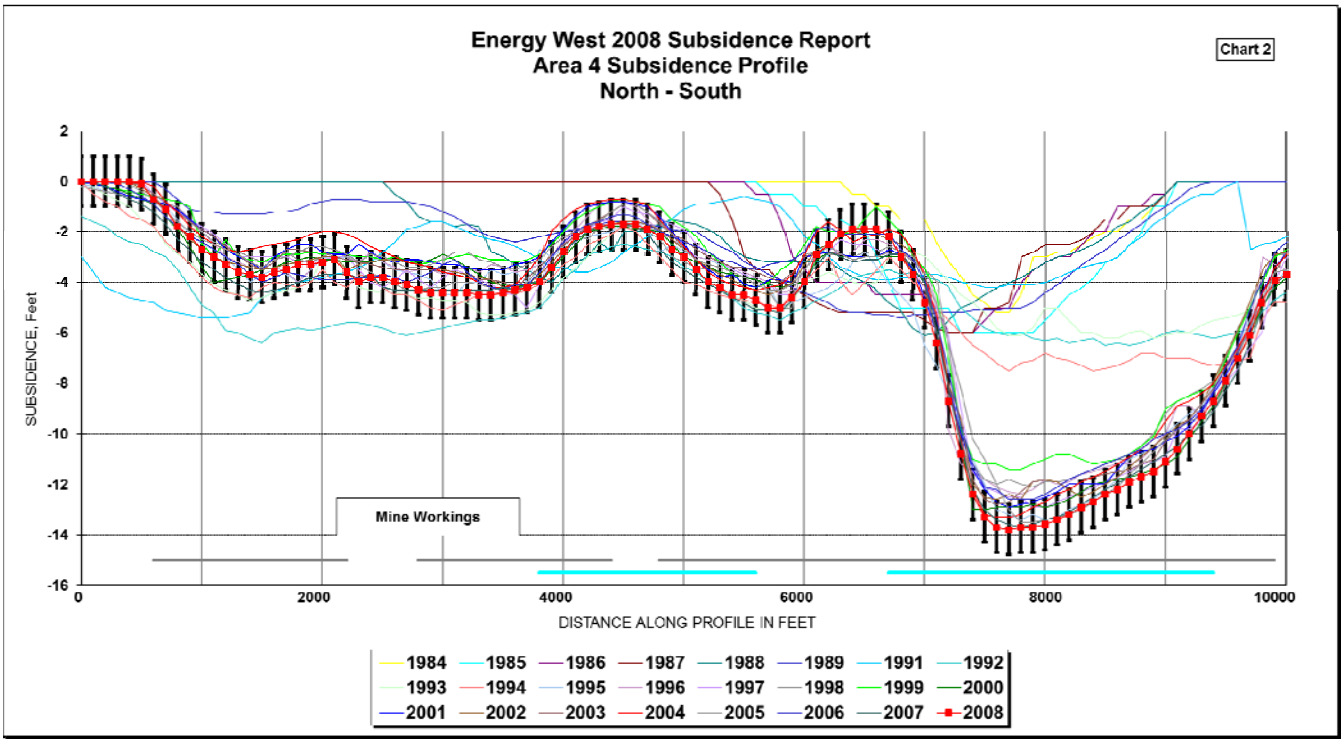
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

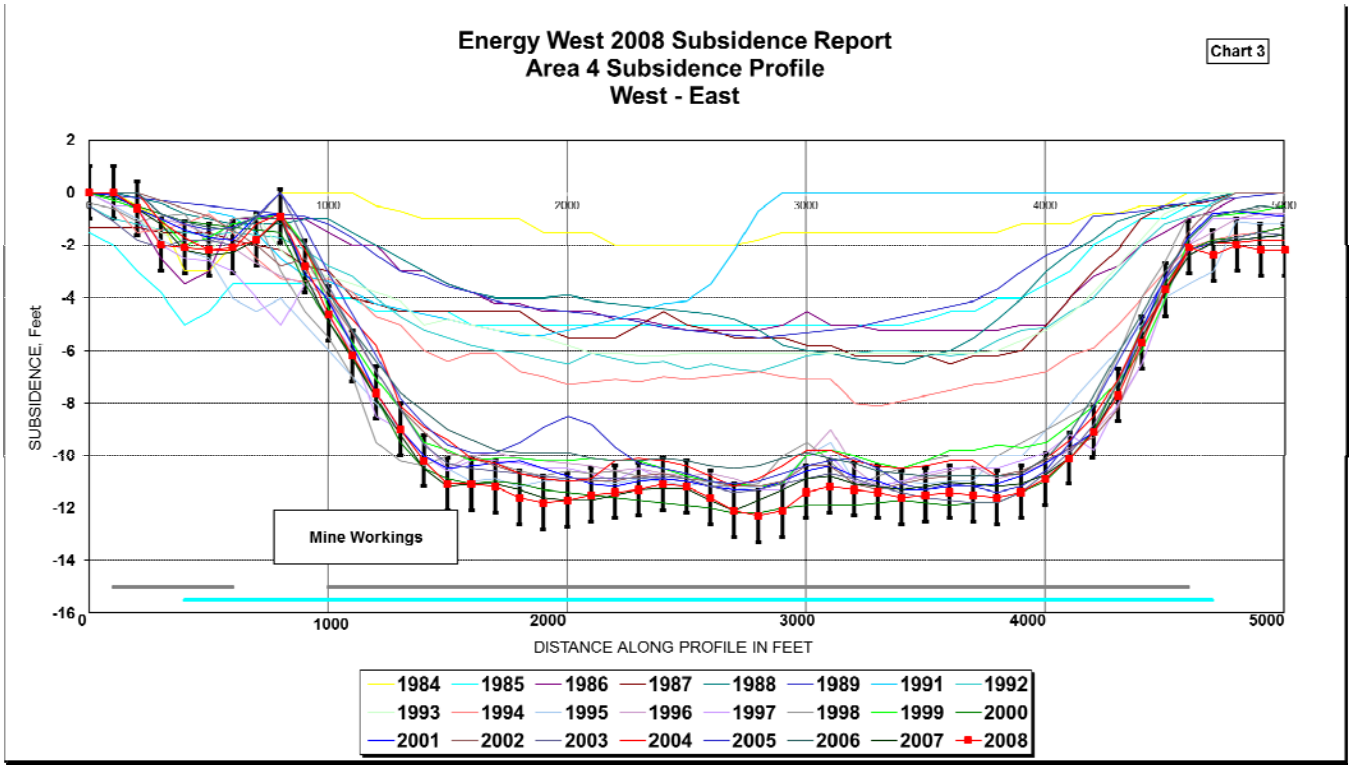
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-040151 Subsidence Data

Subsidence in the lease UTU-040151 area was monitored from 1999 to 2009. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1984 and 2008. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

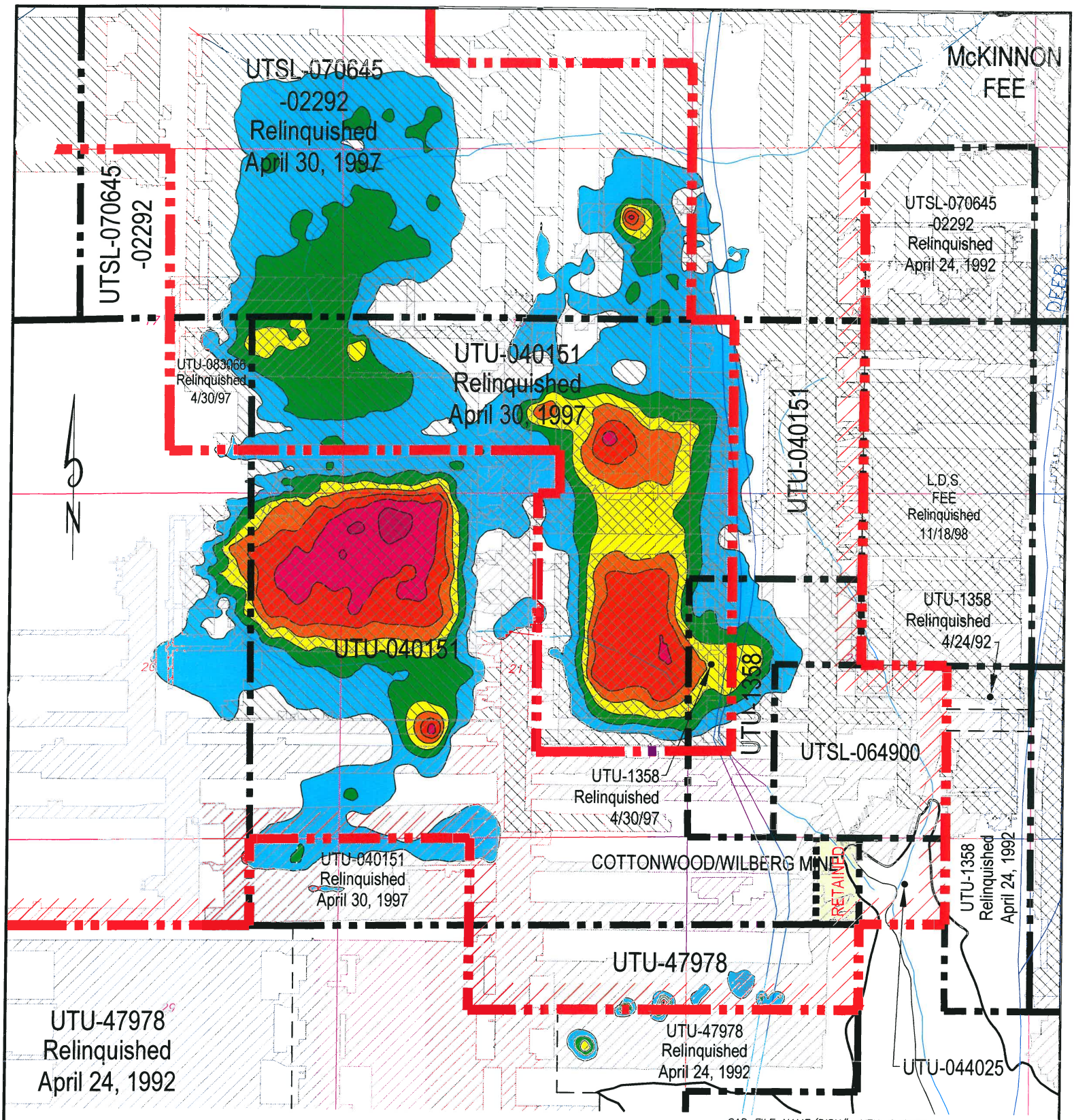
PacifiCorp delineated a set of two profiles (Area 4) covering the main longwall panel district in Lease UTU-040151, including the dual-seam mining overlay area, are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 14 feet. Some surface cracking did occur along the northwestern edge of the dual seam mining area. These cracks were either repaired or left to fill in naturally.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-040151.

The proposed relinquishment area of Lease UTU-040151 is stable and subsidence is substantially complete.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-040151 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

Subsidence Legend

- 2'-4' Subsidence
- 4'-6' Subsidence
- 6'-8' Subsidence
- 8'-10' Subsidence
- 10'-12' Subsidence
- 12'-14' Subsidence
- 14'-16' Subsidence
- 16'-18' Subsidence

CAD FILE NAME/DISK#: UTU-040151

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

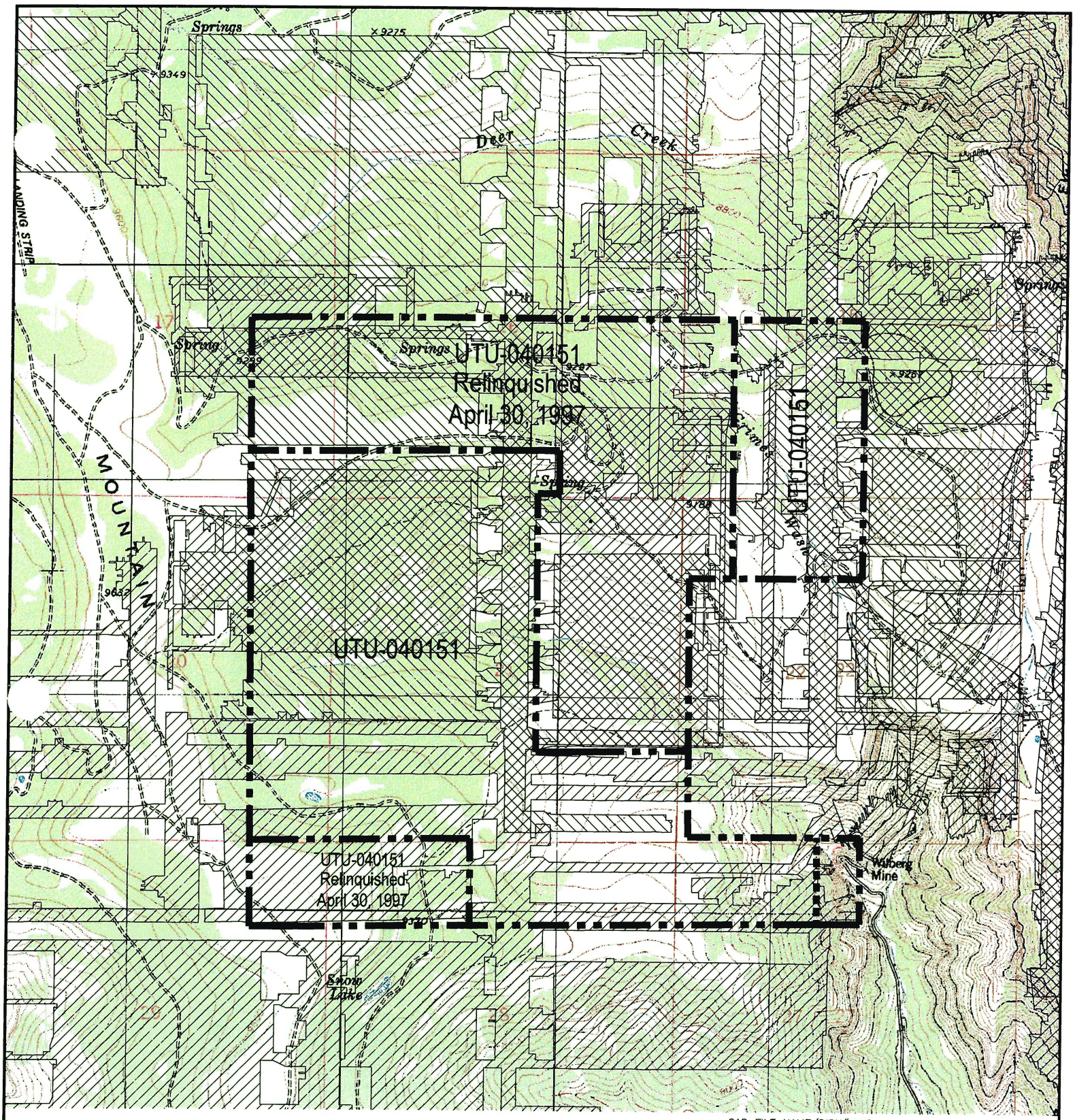
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-040151
SUBSIDENCE BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX A	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-040151 Partial Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-040151 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-040151. No restoration and/or mitigation efforts are required for Lease UTU-040151. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-040151 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTU-040151

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

FEDERAL LEASE ACREAGE RETAINED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-040151
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-040151 Partial Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Statement concerning Hydrologic Monitoring Reduction Amendment, submitted May 03, 2013, and approved by UDOGM November 25, 2014 and previous reduction amendments and relinquishments.

The purpose of this amendment was to reduce the hydrologic monitoring responsibilities of PacifiCorp for the following reasons:

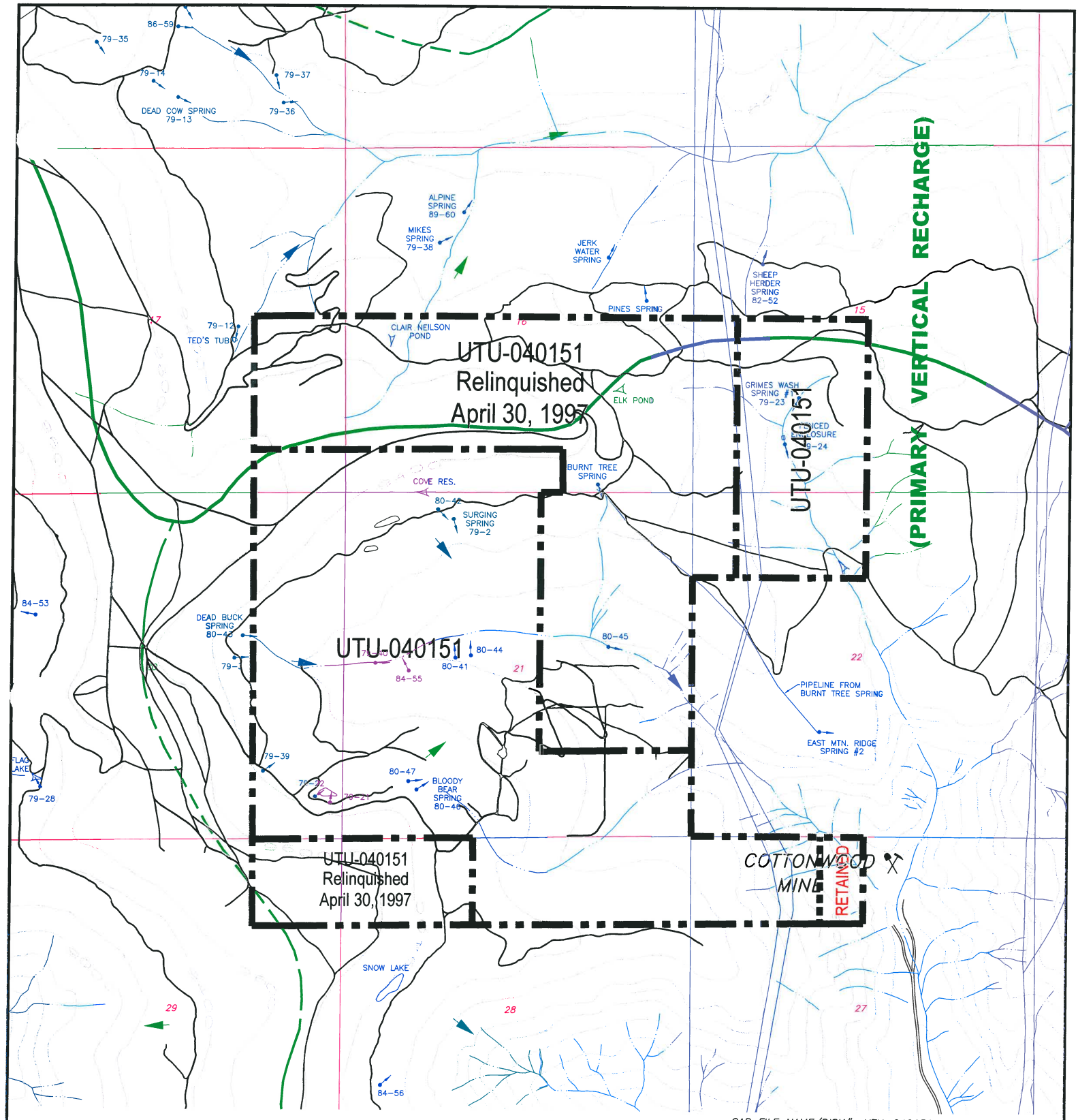
To eliminate sites outside of existing permit boundaries,
To eliminate sites outside of federal lease boundaries,
To eliminate sites in areas that were mined out and stabilized,
To eliminate sites in areas that will not be mined.

Two investigations are referred to in the amendment which conclude that there is no significant relationship between underground mining and intercepted groundwater and changes in surface and groundwater quantity or quality.

PacifiCorp submitted the first of three phases of lease relinquishment to the BLM for areas in the southern part of the LMU that had been mined out and where subsidence was considered to be substantially complete, or would not be mined. These relinquishment phases were approved by BLM and its Memorandum Of Understanding (MOU) partners (UDOGM, USDA Forest Service) in 1992, 1997 (East Mountain LMU UTU-73336), and 2009 (Trail Mountain LMU).

The approval of the monitoring reduction amendment by DOGM in 2014 is an indication of agreement by all parties involved that there have been no impacts to surface or groundwater from the mining in these leases. The fact that PacifiCorp is no longer required by the MOU participant agencies to monitor surface or groundwater in this area is sufficient documentation for the remainder of the leases to be relinquished.

Mining in the southern half of the East Mountain LMU has been essentially complete since the year 2001, when the Cottonwood Mine ceased production and the portals were closed. In the intervening years, as those areas have stabilized, monitoring of subsidence and hydrology were terminated as those areas were considered to be stable and not impacted by mining.



CAD FILE NAME/DISK#: UTU-040151

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UTD-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-040151
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-040151 Partial Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Vegetation of Lease UTU-040151 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-040151:

Aspen	AS
Aspen/Conifer	AS/C
Black Sagebrush	BLSB
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Ponderosa Pine Mix	PPmix
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

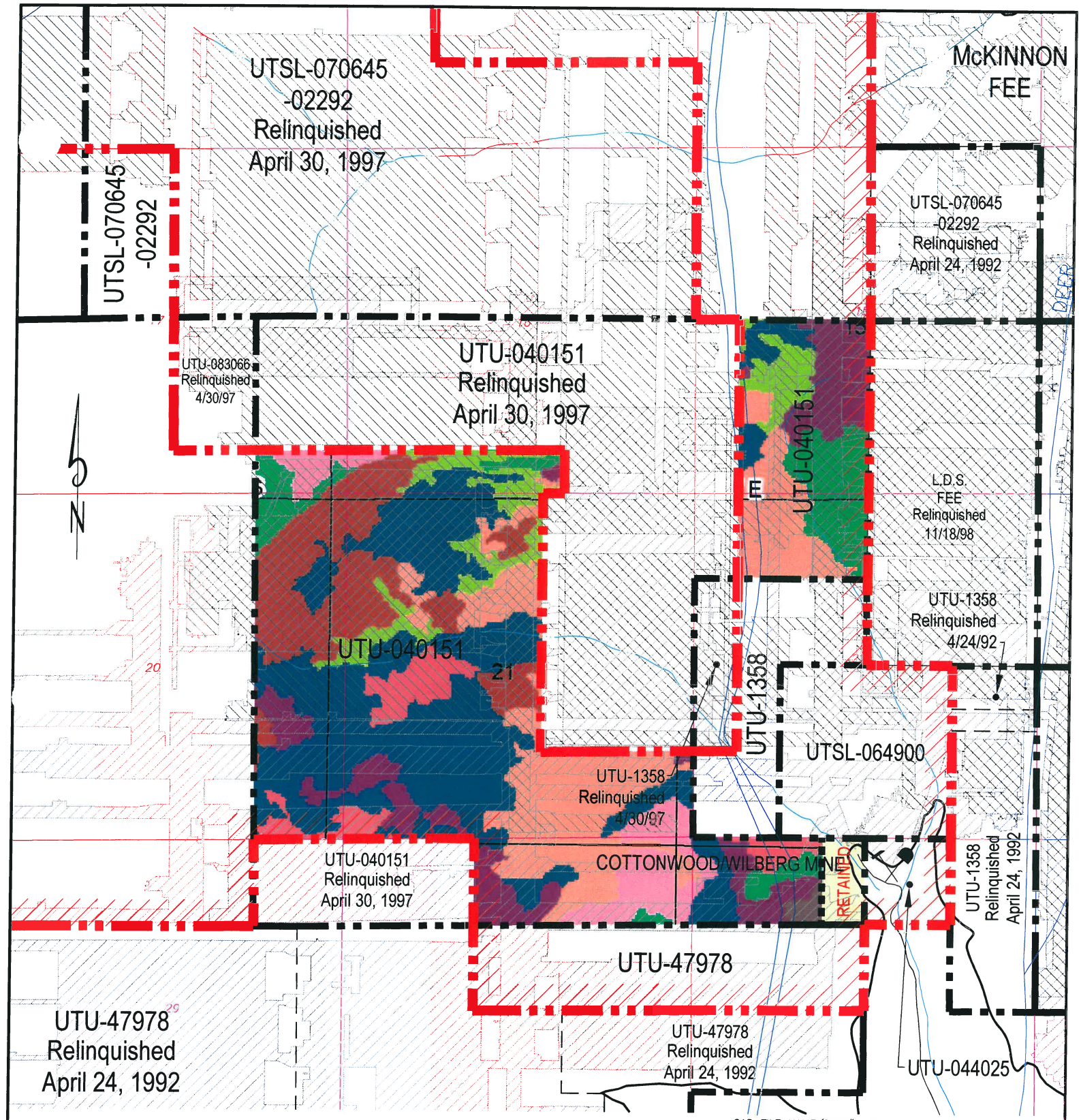
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-040151 area. There were no surface facilities or installations on this lease.



CAD FILE NAME/DISK#: UTU-040151

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-040151 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

VEG TYPE CLASS

- Aspen, AS
- Aspen/Conifer, AS/C
- Black Sagebrush, BLSB
- Bristlecone Pine/Limber Pine, BC/LM
- Douglas-fir Mix, DFmix
- Mountain Big Sagebrush, MSB
- Ponderosa Pine Mix, PPmix
- Spruce/Fir, SF
- Upland Herbaceous, UHE

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-040151
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1"=2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-040151 Partial Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

Other than a few isolated private cabins, which have not been affected by mining, there are no private surface improvements in Lease UTU-040151.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-040151 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTU-1358 took place on May 7, 2001, prior to sealing of the Cottonwood/Wilberg Mine. CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Partial documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-040151 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 3rd South, 1st - 7th Right, 3rd Left, 2nd North, 2nd - 6th Left, Main West, 1st West and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

D. M. Rl _____ 11/9/18 _____

(Officer of the Lessee) (Date)

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) #UTU-040151 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 3rd South, 1st - 7th Right, 3rd Left, 2nd North, 2nd - 6th Left, Main West, 1st West and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-040151 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 3rd South, 1st - 7th Right, 3rd Left, 2nd North, 2nd - 6th Left, Main West, 1st West and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/3/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTU-040151 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 3rd South, 1st - 7th Right, 3rd Left, 2nd North, 2nd - 6th Left, Main West, 1st West and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-040151 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 3rd South, 1st - 7th Right, 3rd Left, 2nd North, 2nd - 6th Left, Main West, 1st West and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) #UTU-040151 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 13rd South, 1st - 7th Right, 3rd Left, 2nd North, 2nd - 6th Left, Main West, 1st West and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Dates: 08/72 – 09/95

Submittal Date: NOV. 7, 2018

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Price Field Office
125 South 600 West
Price, Utah 84501

3482
SL-064900
(UT-070)

Pamela Grubaugh-Littig
Permit Supervisor
Utah Division of Oil, Gas and Mining
1594 West North Temple Street
Salt Lake City, Utah 84114-5801

AUG 30 2001

Re: Temporary Closure, Cottonwood/Wilberg Mines, PacifiCorp

Dear Mrs. Grubaugh-Littig:

Enclosed is a copy of two inspection reports of joint onsites at the subject mines conducted by field personnel from both our agencies. The report was to document findings at the said mine during temporary closure. Along with these reports are our recommendations on the closure plan received from the company.

PacifiCorp, through its wholly owned subsidiary Energy West, Inc., sent a notice to us on February 8, 2001, of "Temporary Cessation of Operations for the Trail Mountain, Cottonwood and Wilberg Mines". We have previously commented on the Trail Mountain Mine portion of the cessation plan. An underground inspection of the Cottonwood/Wilberg Mine was held which we could not attend. However, we have visited the mine portal areas and participated in the underground inspection of the area to be sealed in the Deer Creek/ Wilberg shaft area. The Deer Creek/Wilberg shaft area was inspected from the Deer Creek Mine, as the company had to seal the 1st South Mains as access to the top of the shaft. This was far more practical than trying to seal at the shaft. These two inspection reports are enclosed. The inspections verify the closure plan and support our findings for the proposed cessation plan.

The application for "Temporary Cessation of Operations" submitted by PacifiCorp details the plans for putting the Cottonwood/Wilberg Mine in a temporarily closed condition with temporary portal seals and documents what items will be left in the mine. Most of the items to be left are belt structure, power cable and pipe. Should the mine be re-opened much of these items will be used or replaced. Should the mine never re-open and reclamation occurs, these items of themselves should not cause any impacts to the hydrologic regime in the mine. These items are inert metals with no liquids or oils. No other items potentially hazardous or toxic were noted during the inspection. We therefore have no objections to leaving the listed items underground should the mine never be opened again.

With regard to temporary sealing of the portals, the plan is adequate to protect the unmined coal resource and bar access to the resource. The seals meet standards set by MSHA and are acceptable to us for compliance with rules under the Mineral Leasing Act for abandonment and protection of the unmined coal and other mineral resource (43 CFR 3484.2 (b)).

Pursuant to the Mineral Leasing Act of 1920, as amended, and in conjunction with the rules at 43 CFR 3400, and the lease terms, PacifiCorp's plan for temporary abandonment of the Cottonwood/Wilberg Mine is acceptable and confirmed by us. Should you have further questions, please contact Stephen Falk of my staff at (435) 636-3600.

Sincerely,

/S/ THOMAS E. RASMUSSEN

Acting FOR Richard L. Manus
Field Manager

Enclosure
Inspection Reports (2)

cc: UT-921, SD, Utah (w/enclosure)
Manti-LaSal National Forest (w/enclosure)
599 West Price River Road
Price, Utah 84501
Energy West Mining Company (w/enclosure)
P. O. Box 310
Huntington, Utah 84528
Utah Division of Oil, Gas and Mining (w/enclosure)
Price Field Office
451 East 400 North
Price, Utah 84501

Bureau of Land Management
Inspection Report For Coal Operations

Inspection Number swf06/20/01

Thursday, August 09, 2001

Inspection Date 6/20/01

Quarter 3rd *Fiscal Year* FY2001

Mine Cottonwood *Purpose* Special

SL-064900 Lead lease
U-044025 Portal location

Current Mine Status

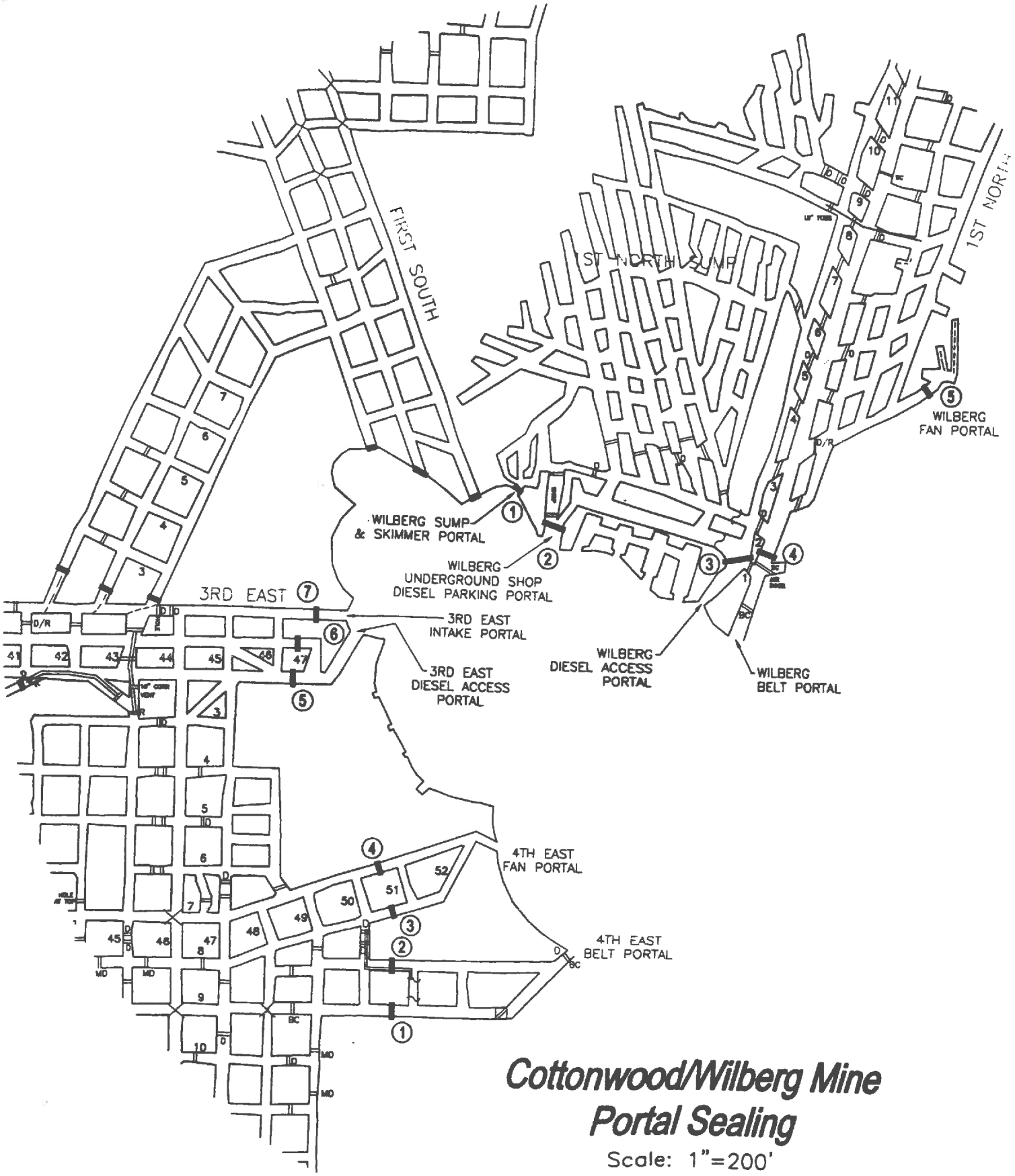
On June 20. 2001, I (Stephen Falk) and Sue Burger (summer intern) inspected the erected temporary seals at the Cottonwood/Wilberg Mine portal area. Seth McCourt was our company representative. The purpose of the inspection was to verify the temporary seals erected by Energy West at all the portals at the Cottonwood/Wilberg surface facilities.

On February 8, 2001, BLM received from Energy West a notice for "Temporary cessation of operations for the Trail Mountain, Cottonwood, and Wilberg Mines". In short summary, the Trail Mountain Mine had finished longwall mining of the reserves on the Trail Mountain property. Coal was conveyed via an enclosed conveyor belt across Cottonwood Canyon from the Trail Mountain portals to the Cottonwood belt portals and conveyed through the Cottonwood Mine to the Cottonwood/Wilberg loadout facilities in Grimes Wash. This was used for many years to allow the use of the same loadout facilities and the ability to ship triple coal haul truck trailers down the existing Wilberg haul road to the Hunter Power Plant. With the cessation of coal production at Trail Mountain, Energy West has opted to idle the operations and in so doing to construct temporary seals over all portals. Also the plan noted items to be left underground. Two underground inspections with Utah Division of Oil Gas and Mining personnel were held with company officials, one for Trail Mountain and one for Cottonwood/Wilberg. BLM attended the Trail Mountain inspection but were not able to attend the Cottonwood/Wilberg inspection. This inspection (June 20, 2001) was to note the seals that had been erected after the final underground inspection.

There are 12 portals at this complex. Three portals have been sealed since the Wilberg fire in 1984 (First South intakes). We checked the rest of the portal seals. From the east to the west, we first saw the Wilberg Fan portal which has the fan taken away and a block seal back behind the blast-proof fan housing. Around the corner were the Wilberg belt and roadway portals. Both were blocked sealed back 100 feet from the opening and the opening fenced off at the direct opening. The sump and shop portals next to the underground office were both blocked at the opening. At the 3rd East intake portal pad, the two portals were open with fence at the opening. Seals were 200 feet inby with three seals. 4th East fan portal had the fan housing sealed at the explosion doors. And last, the 4th East belt entry was fenced and block sealed 200 feet inby. These seals meet temporary closure standards for protection of the coal resource. One suggestion was given to Energy West was to fence off the tunnel access opening for the 3rd East pad. Energy West has plans for remote cameras for site security as the gate down the haul road does not have fencing on either side of the gate.

Close Out Discussion

The seals and fencing used on the portals meets the requirements for resource protection under a temporary closure of the mine. The items listed that would be left in the mine, we believe do not have any known substances that would be considered hazardous or would pose a problem to to hydrologic resources. We have no objections to things to be left in the mine.



Cottonwood/Wilberg Mine Portal Sealing

Scale: 1"=200'

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-040151
Deer Creek Mine - MSHA # 42-00121, Cottonwood Mine MSHA # 42-01211
Sealed Mine Sections: 3rd South, 1st - 7th Right, 3rd Left, 2nd North, 2nd - 6th Left, Main West, 1st West
And remainder of mine workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (08/72 - 09/95) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	08/72 - 09/95	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	08/72 - 09/95	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	08/72 - 09/95	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	08/72 - 09/95	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	08/72 - 09/95	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	08/72 - 09/95	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	08/72 - 09/95	Naptha	40 - 50%	64742-94-5	All Sections
	08/72 - 09/95	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	08/72 - 09/95	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	08/72 - 09/95	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	08/72 - 09/95	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	08/72 - 09/95	Propane	14%	74-98-6	All Sections
	08/72 - 09/95	Butane	13%	106-97-8	All Sections
	08/72 - 09/95	Toluene	17%	108-88-3	All Sections
	08/72 - 09/95	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	08/72 - 09/95	Napthalene	0.40%	91-20-3	All Sections
	08/72 - 09/95	Acetone	41%	67-64-1	All Sections
	08/72 - 09/95	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	08/72 - 09/95	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	08/72 - 09/95	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	08/72 - 09/95	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	08/72 - 09/95	Mineral Oil	20 - 25%	8042-47-5	All Sections
	08/72 - 09/95	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	08/72 - 09/95	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	08/72 - 09/95	Methanol	<20%	67-56-1	All Sections
	08/72 - 09/95	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	08/72 - 09/95	Heptane	69 - 79%	142-82-5	All Sections
	08/72 - 09/95	Ethyl Ether	11 - 21%	60-29-7	All Sections
	08/72 - 09/95	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	08/72 - 09/95	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	08/72 - 09/95	Heptane	60 - 70%	142-82-5	All Sections
	08/72 - 09/95	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	08/72 - 09/95	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	08/72 - 09/95	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	08/72 - 09/95	None			All Sections
Cat Transmission and Drive Train Oil	08/72 - 09/95	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	08/72 - 09/95	Monoethanolamine	<10%	141-41-3	All Sections
	08/72 - 09/95	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	08/72 - 09/95	Mineral Oil	70 - 95%	Mixture	All Sections
	08/72 - 09/95	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	08/72 - 09/95	Lubricant base oil	87 - 91%	Various	All Sections
	08/72 - 09/95	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	08/72 - 09/95	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	08/72 - 09/95	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	08/72 - 09/95	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	08/72 - 09/95	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	08/72 - 09/95	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	08/72 - 09/95	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	08/72 - 09/95	Trichloroethylene	95 - 99%	79-01-6	All Sections
	08/72 - 09/95	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	08/72 - 09/95	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	08/72 - 09/95	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	08/72 - 09/95	Deionized Water	1 - 3%	7732-18-5	All Sections
	08/72 - 09/95	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-040151
Deer Creek Mine - MSHA # 42-00121, Cottonwood Mine MSHA # 42-01211
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And remainder of mine workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (08/72 - 09/95) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	08/72 - 09/95	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	08/72 - 09/95	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	08/72 - 09/95	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	08/72 - 09/95	Calcium sulfate	2 - 10%		All Sections
	08/72 - 09/95	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	08/72 - 09/95	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	08/72 - 09/95	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	08/72 - 09/95	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	08/72 - 09/95	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	08/72 - 09/95	Lead	34%	7439-92-1	All Sections
	08/72 - 09/95	Lead Dioxide	31%	1309-60-0	All Sections
	08/72 - 09/95	Lead Sulfate	<1%	7446-14-2	All Sections
	08/72 - 09/95	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	08/72 - 09/95	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	08/72 - 09/95	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	08/72 - 09/95	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	08/72 - 09/95	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	08/72 - 09/95	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	08/72 - 09/95	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	08/72 - 09/95	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	08/72 - 09/95	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	08/72 - 09/95	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	08/72 - 09/95	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	08/72 - 09/95	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	08/72 - 09/95	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	08/72 - 09/95	Portland Cement		65997-15-1	All Sections
	08/72 - 09/95	Crystalline Silicon Dioxide		13397-24-5	All Sections
	08/72 - 09/95	Calcium Hydroxide		001-305-620	All Sections
	08/72 - 09/95	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	08/72 - 09/95	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	08/72 - 09/95	Polyglycols	60 - 100%	Mixture (2)	15 W
	08/72 - 09/95	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	08/72 - 09/95	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	08/72 - 09/95	Polyester Resin	5 - 15%	Not Reported	All Sections
	08/72 - 09/95	Styrene Monomer	3 - 7%	100-42-5	All Sections
	08/72 - 09/95	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	08/72 - 09/95	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	08/72 - 09/95	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	08/72 - 09/95	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	08/72 - 09/95	Isobutane	2 - 10%	75-28-5	All Sections
	08/72 - 09/95	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	08/72 - 09/95	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	08/72 - 09/95	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	08/72 - 09/95			64742-48-9	All Sections
	08/72 - 09/95			64742-88-7	All Sections
	08/72 - 09/95	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	08/72 - 09/95	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	08/72 - 09/95	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	08/72 - 09/95	Lubricant base oil	>99	Various	All Sections
	08/72 - 09/95	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	08/72 - 09/95	Lubricant base oil	87 - 91%	Various	All Sections
	08/72 - 09/95	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	08/72 - 09/95	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	08/72 - 09/95	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-040151
Partial Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

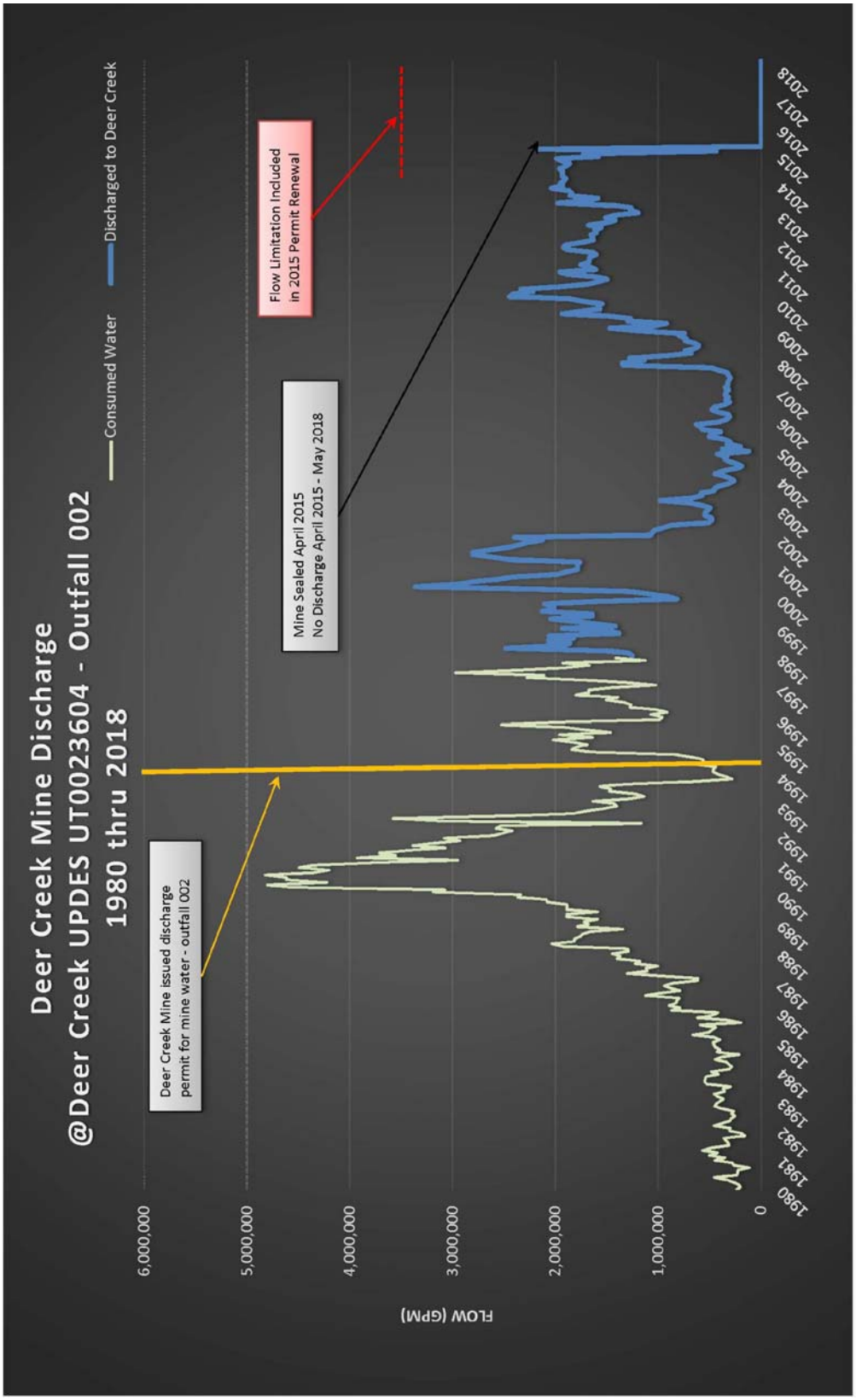
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



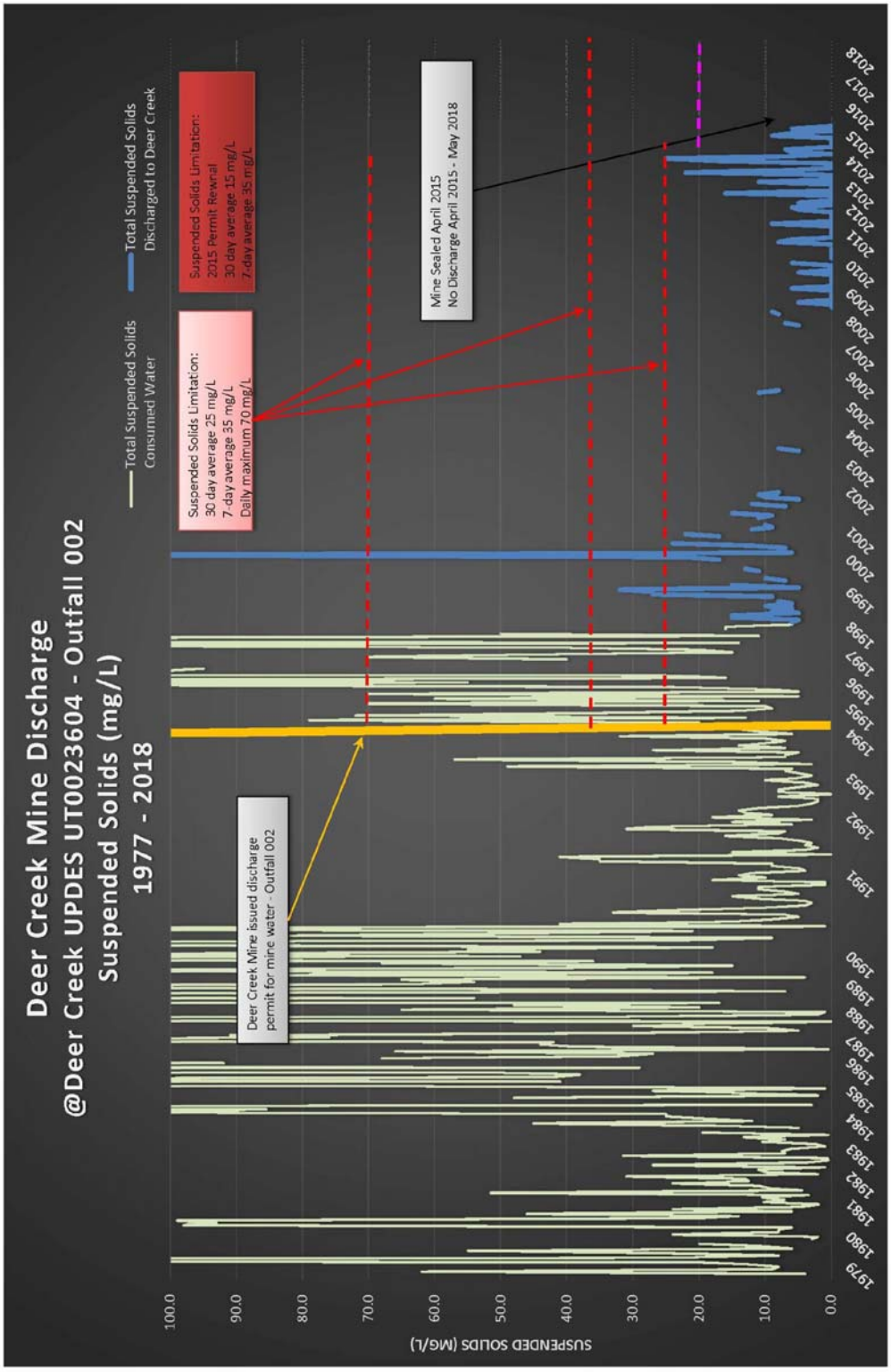
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



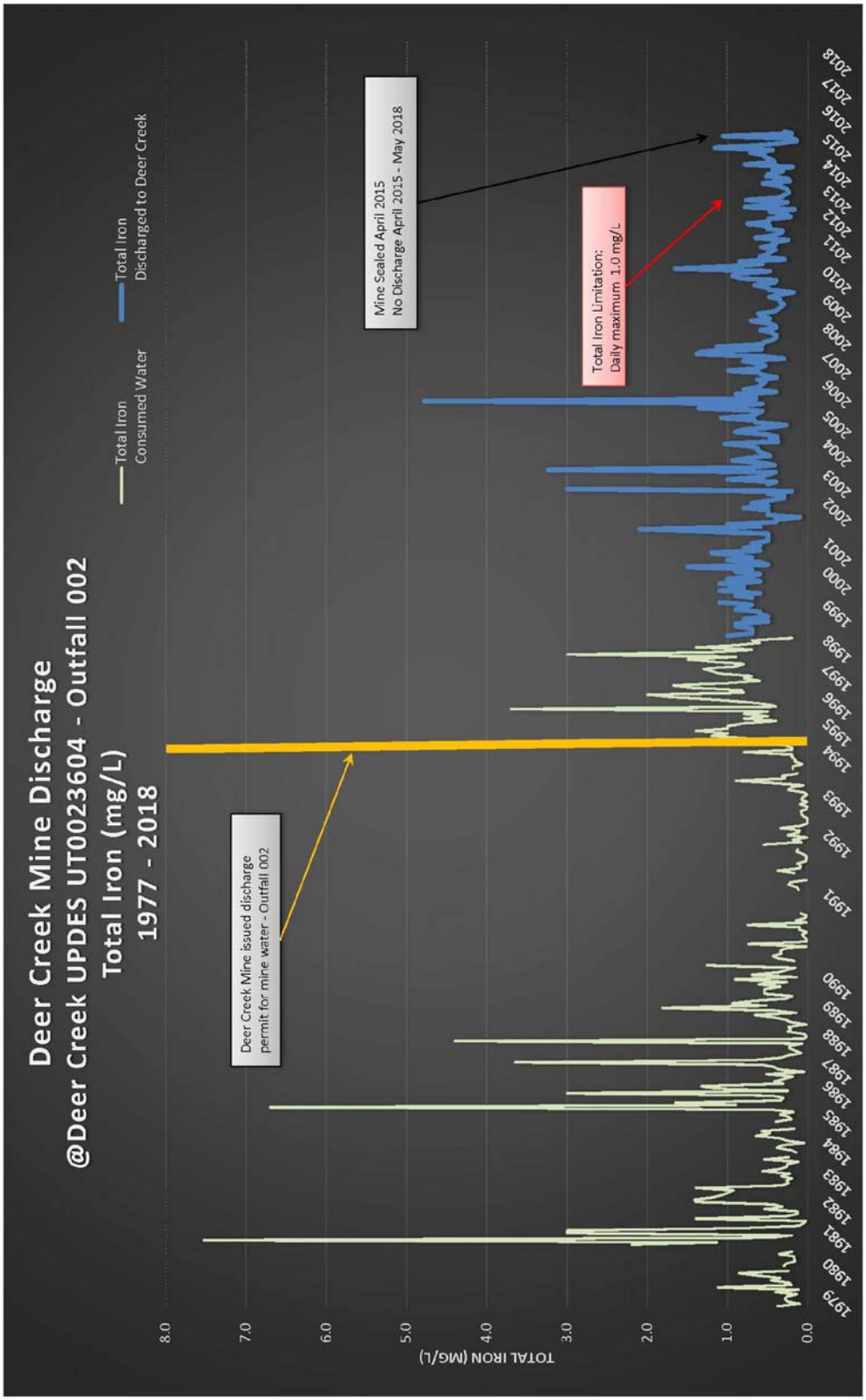
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



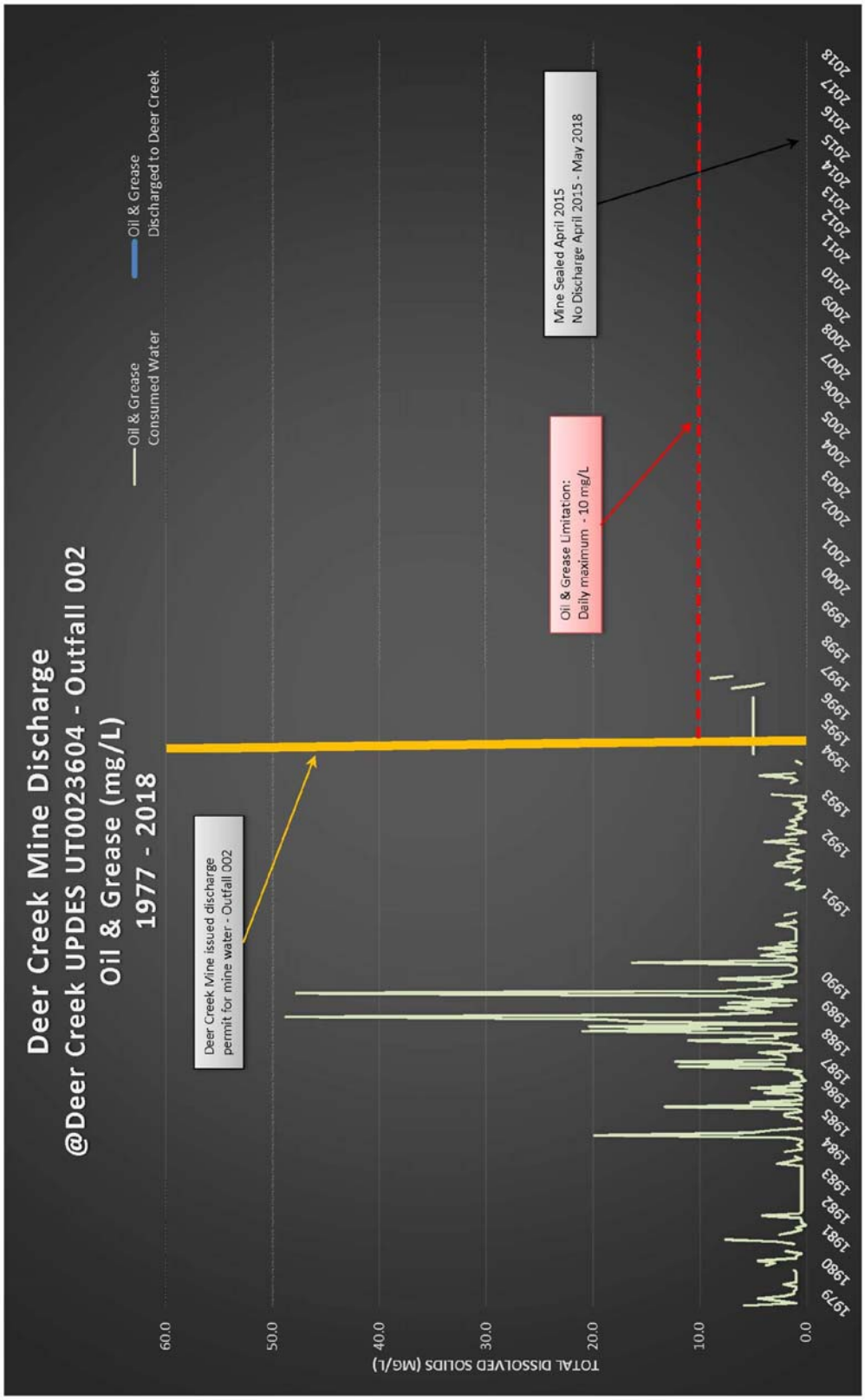
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



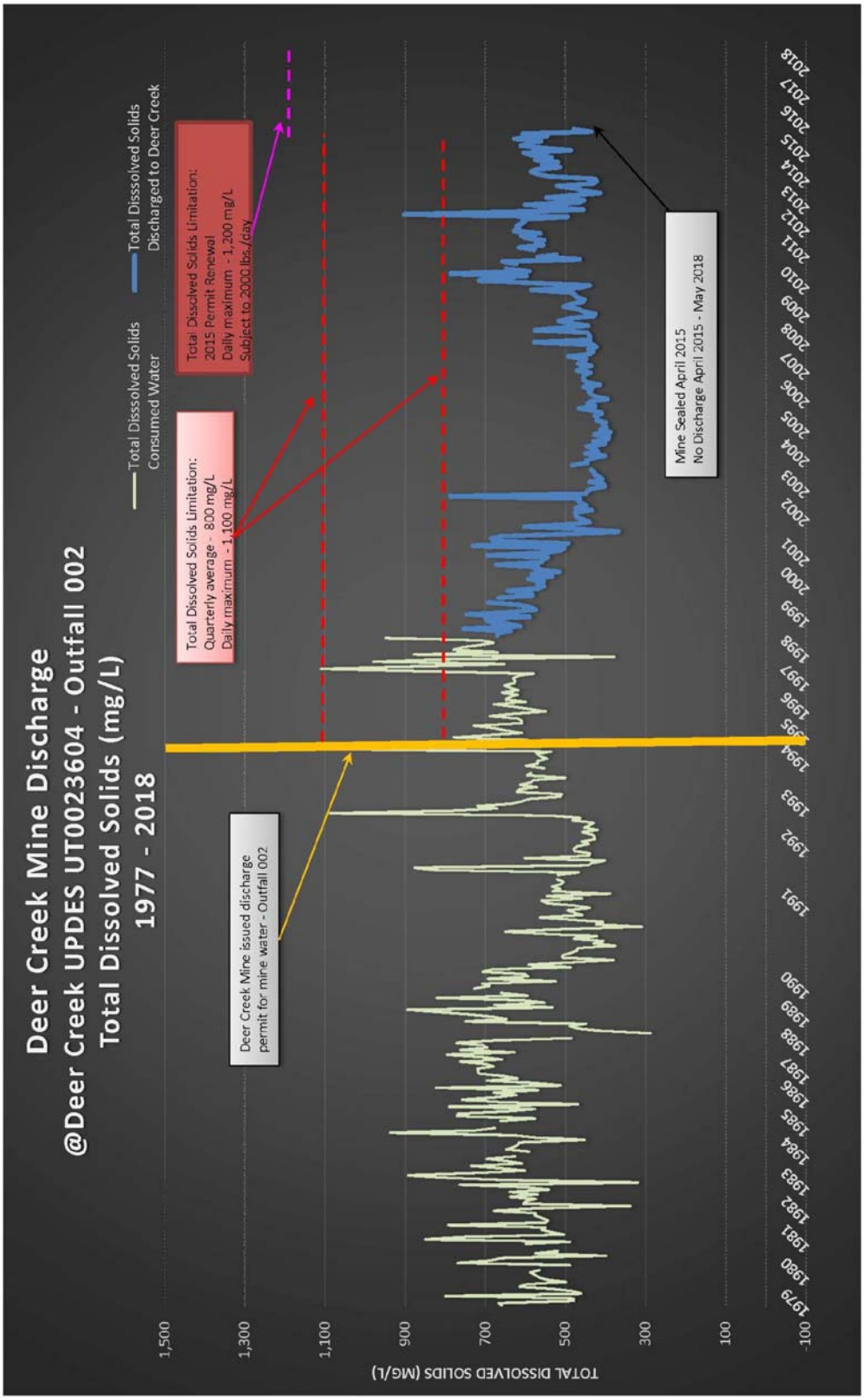
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



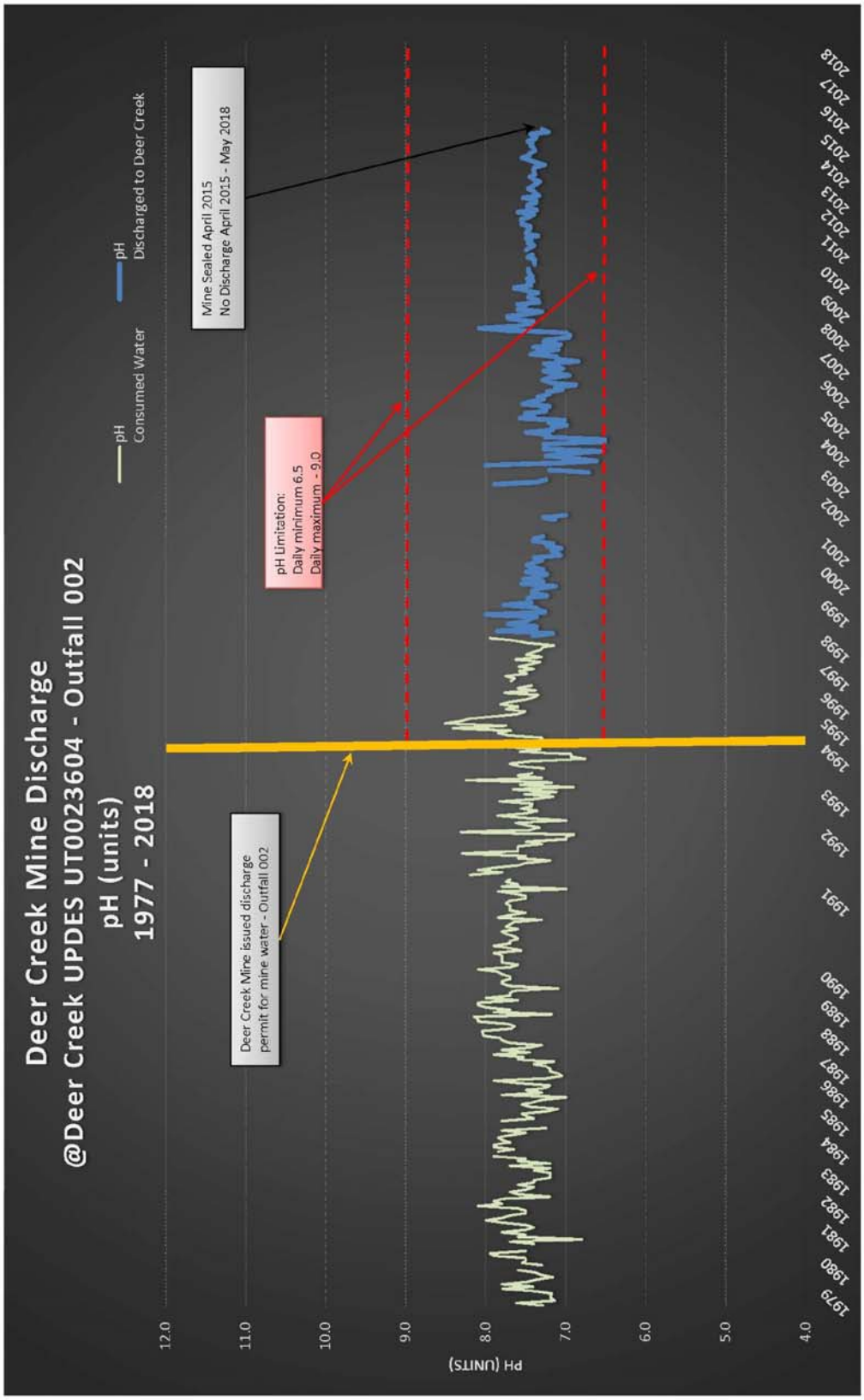
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTU-1358

November, 2018

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Prepared by:

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-1358, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-1358. The total acreage being surrendered is 120.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTU-1358 is described below:

Federal Coal Lease UTU-1358		
Lease Readjustment Effective Date:		8/1/2017 to 8/1/2027
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**120.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 22:	E½SW¼NW¼, SE¼NW¼, E½NW¼SW¼, SW¼SW¼	120.00
	Total Lease Acres for Full Relinquishment:	**120.00**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-1358

LEASE ACTIVITIES

1) Coal Lease Number: UTU-1358 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine) and C/015/0019 (Cottonwood Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 120.00; Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of area relinquished. No areas retained. See also Figure 1 (a map depicting the area to be relinquished in its entirety).*

Original Lease Acreage: 320.00 Relinquished to date: 200.00 acres Remaining: 120.00 acres
- *Partial relinquishment: 160 acres – Accepted effective: 4/24/1992 & 6/12/1995*
- *Partial relinquishment: 40 acres – Accepted effective: 4/30/1997*

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)? YES ☐ NO ☒ (If "YES", describe:

11) Date of initial mining: September 1975; last mining: July 1989.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-1358

12) Number of coal beds mined: 2 coal seams (Blind Canyon and Hiawatha)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to explanation of spring monitoring reduction*

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to DOGM write up*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-1358

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
   - *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities? YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐ (If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

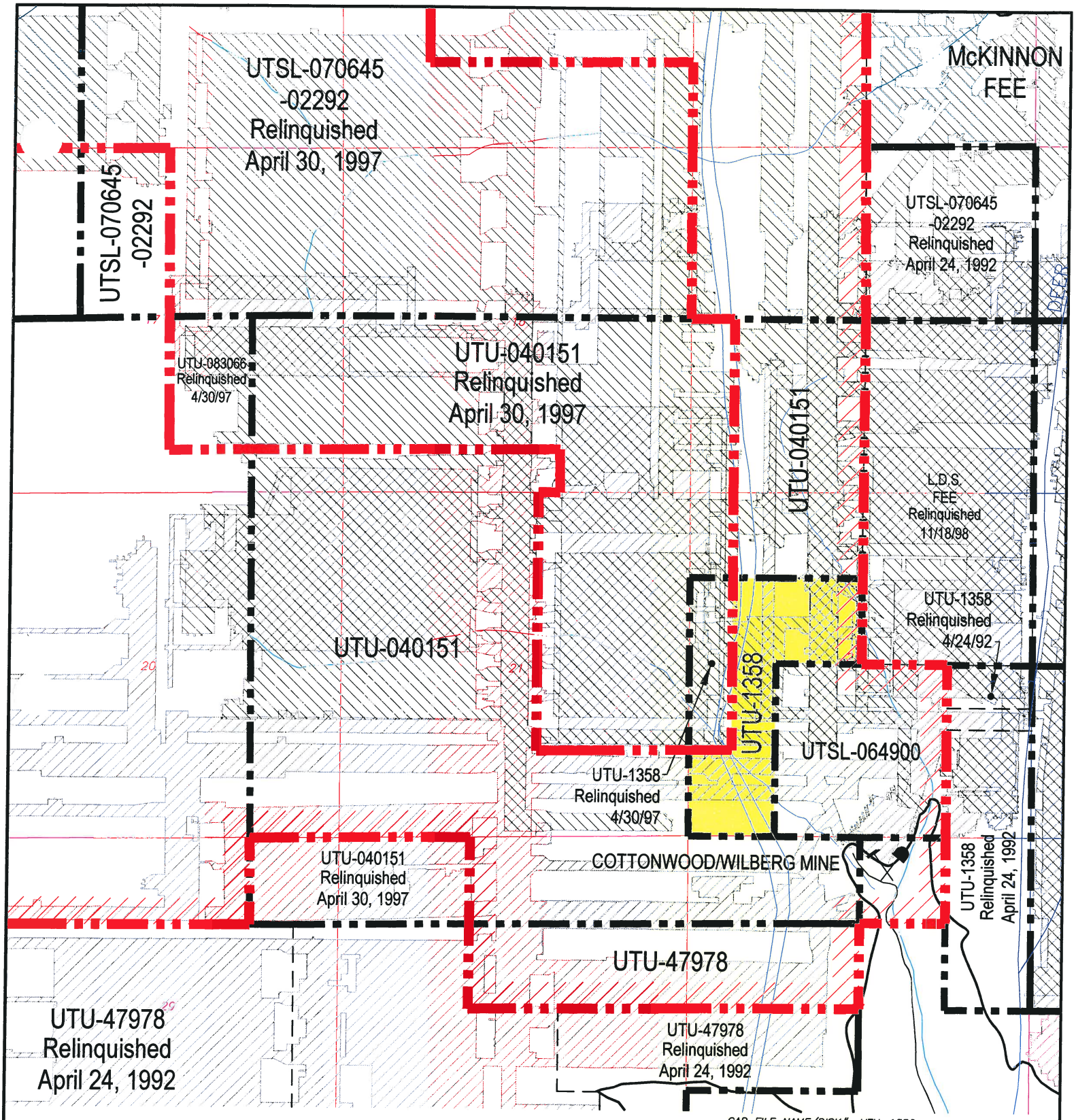
Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-1358

Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTU-1358 is described below:

Federal Coal Lease UTU-1358		
Lease Readjustment Effective Date:		8/1/2017 to 8/1/2027
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**120.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 22:	E½SW¼NW¼, SE¼NW¼, E½NW¼SW¼, SW¼SW¼	120.00
	Total Lease Acres for Full Relinquishment:	**120.00**
	Total Lease Acres Remaining:	**0.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-1358 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

CAD FILE NAME/DISK#: UTU-1358

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-1358

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

FEDERAL COAL LEASE UTU-1358
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-1358 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Blind Canyon and Hiawatha seams. Coal reserves were recovered by room-and-pillar and longwall methods. Mining in the Blind Canyon seam took place between 9/1975 and 8/1984. Mining in the Hiawatha seam took place between 3/1976 and 7/1989.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the Trail Mountain Area were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

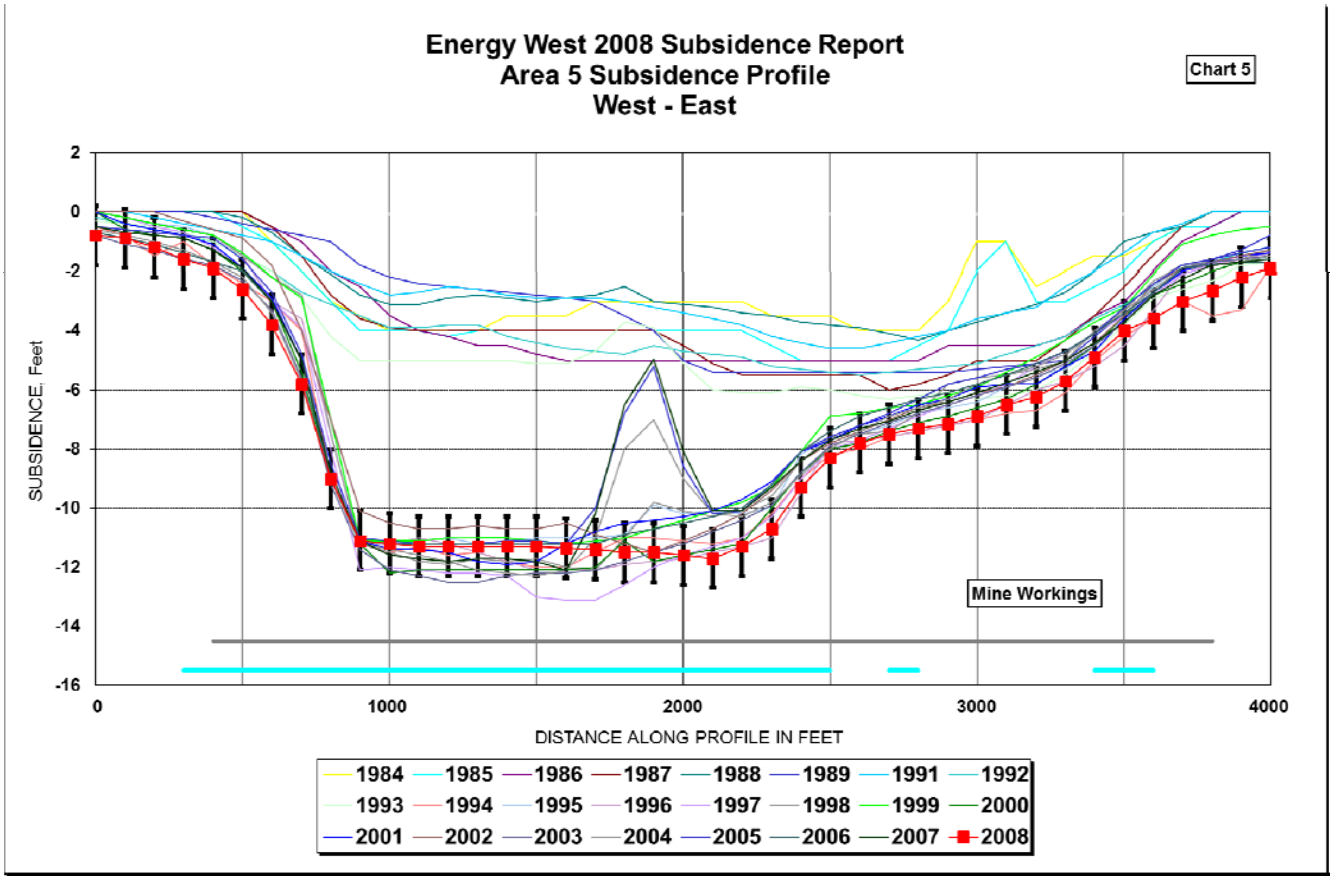
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-1358 Subsidence Data

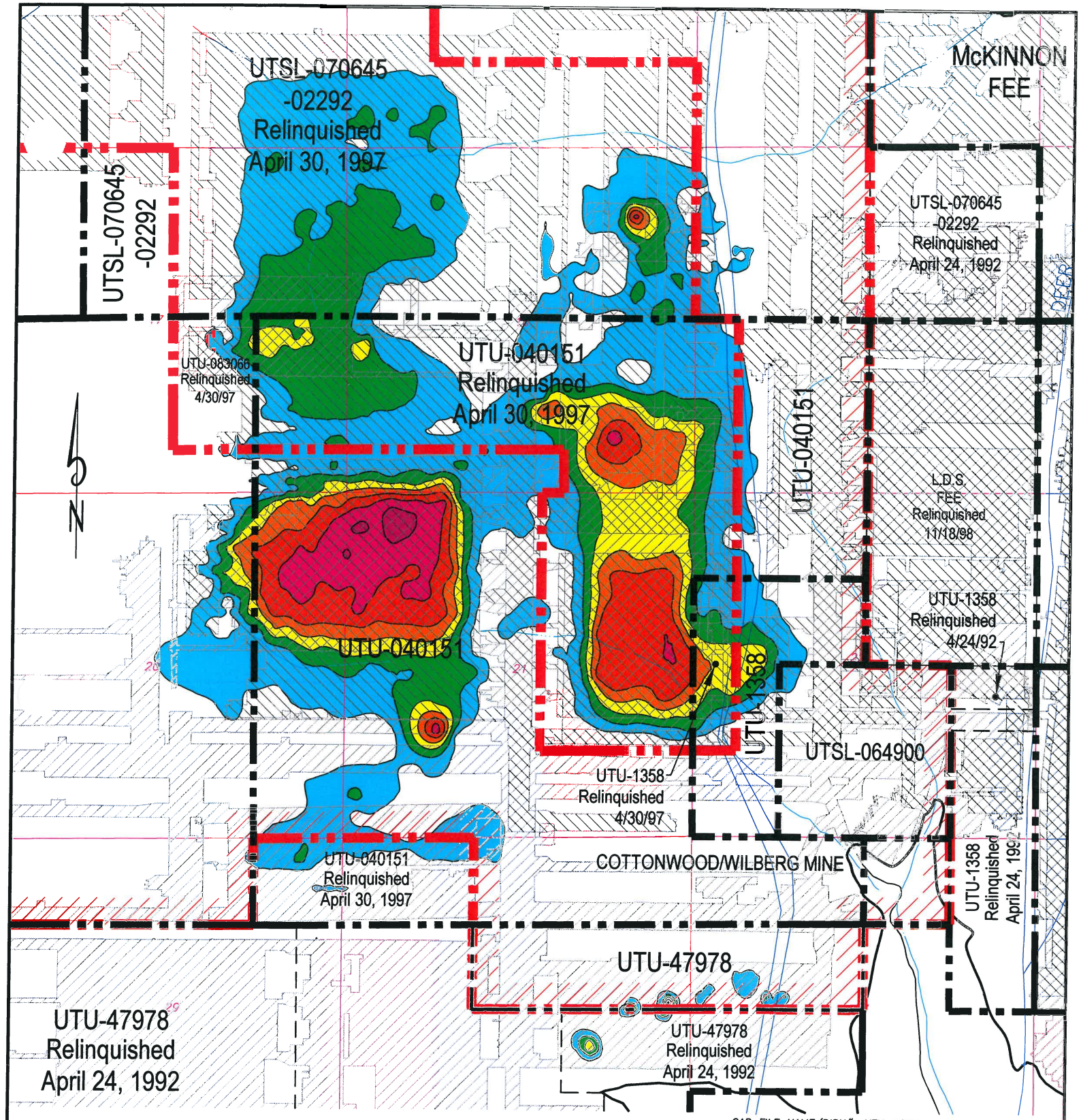
Subsidence in the lease UTU-1358 area was monitored from 1985 to 2008. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1999 and 2009. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

PacifiCorp delineated a profile (Area 5, East - West) covering the mains room-and-pillar sections and the east ends of two Deer Creek Mine Blind Canyon Longwalls in Lease UTU-1358, including the dual-seam mining overlay area, are shown on the following figure and accompanying map. Subsidence within this area has reached a maximum of just over 8 feet. No change in subsidence has occurred since 2008, and the area is stable (see following figures and map).



Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-1358.

The proposed relinquishment area of Lease UTU-1358 is stable and subsidence is substantially complete.



LEGEND

- LMU BOUNDARY UTU–73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-1358 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

Subsidence Legend

- 2'-4' Subsidence
- 4'-6' Subsidence
- 6'-8' Subsidence
- 8'-10' Subsidence
- 10'-12' Subsidence
- 12'-14' Subsidence
- 14'-16' Subsidence
- 16'-18' Subsidence

CAD FILE NAME/DISK#: UTU–1358

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

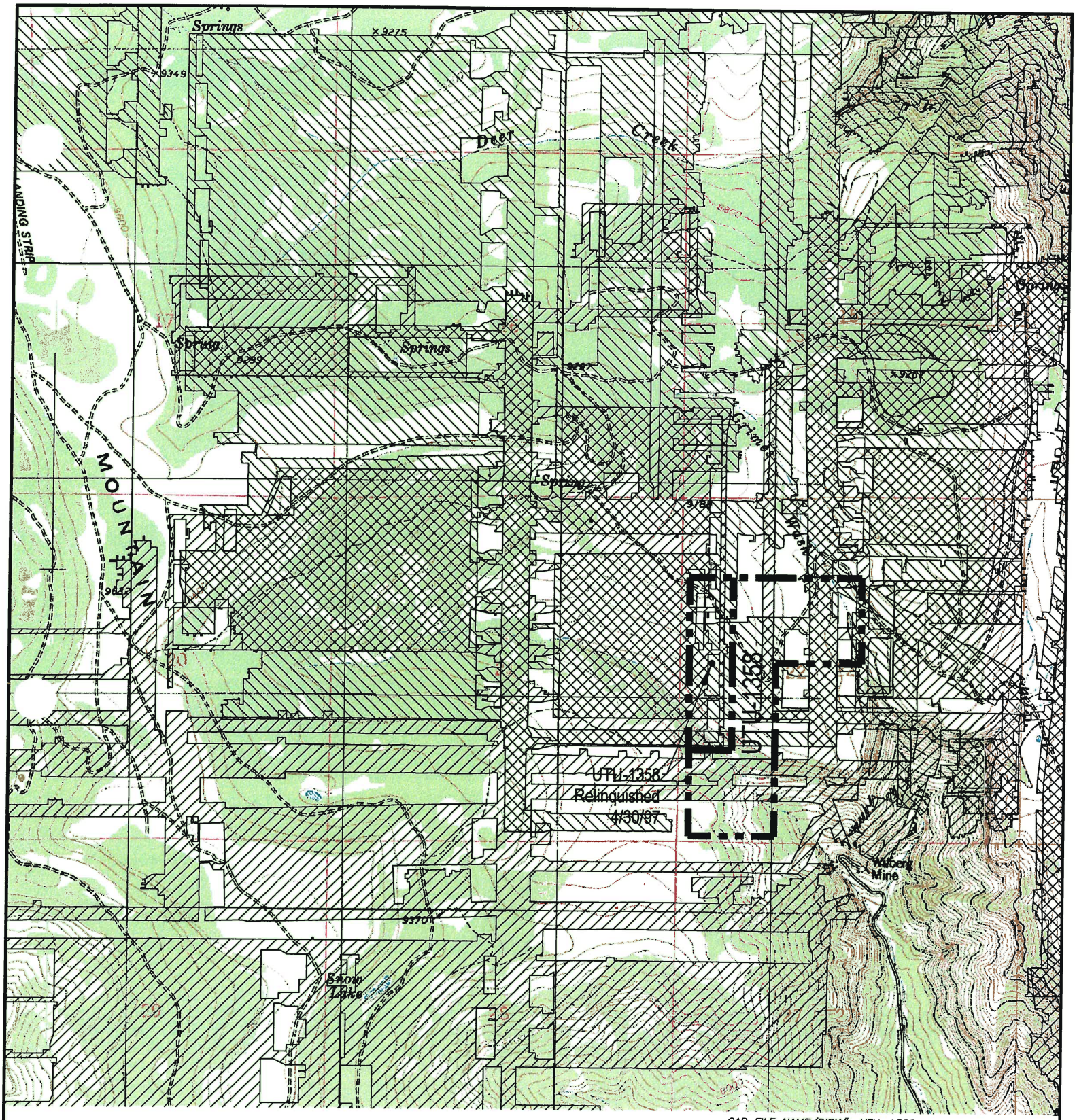
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU–1358
SUBSIDENCE BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX A	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-1358 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-1358 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-1358. No restoration and/or mitigation efforts are required for Lease UTU-1358. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-1358 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTU-1358

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-1358
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-1358 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Statement concerning Hydrologic Monitoring Reduction Amendment, submitted May 03, 2013, and approved by UDOGM November 25, 2014 and previous reduction amendments and relinquishments.

The purpose of this amendment was to reduce the hydrologic monitoring responsibilities of PacifiCorp for the following reasons:

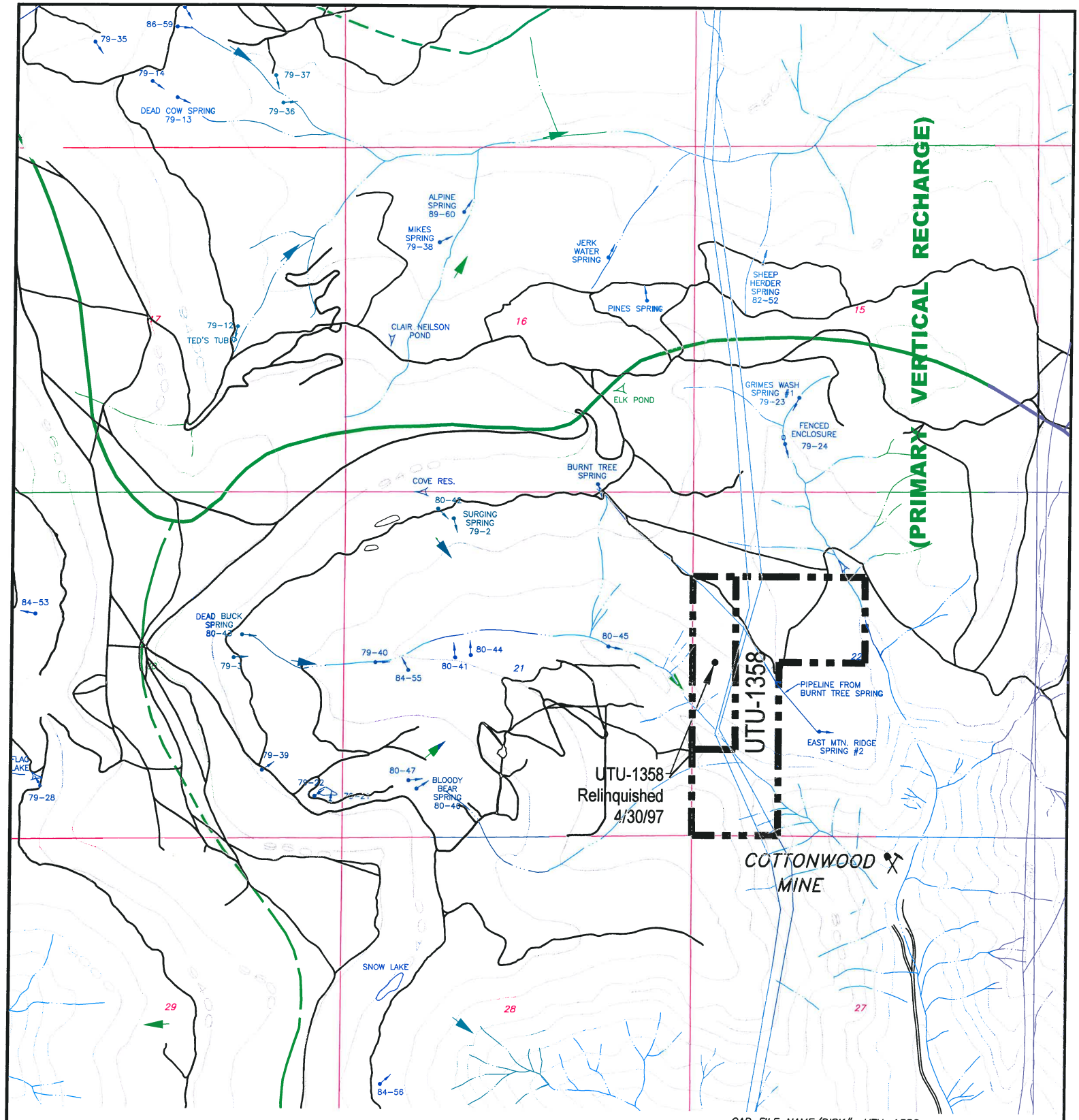
To eliminate sites outside of existing permit boundaries,
To eliminate sites outside of federal lease boundaries,
To eliminate sites in areas that were mined out and stabilized,
To eliminate sites in areas that will not be mined.

Two investigations are referred to in the amendment which conclude that there is no significant relationship between underground mining and intercepted groundwater and changes in surface and groundwater quantity or quality.

PacifiCorp submitted the first of three phases of lease relinquishment to the BLM for areas in the southern part of the LMU that had been mined out and where subsidence was considered to be substantially complete, or would not be mined. These relinquishment phases were approved by BLM and its Memorandum Of Understanding (MOU) partners (UDOGM, USDA Forest Service) in 1992, 1997 (East Mountain LMU UTU-73336), and 2009 (Trail Mountain LMU).

The approval of the monitoring reduction amendment by DOGM in 2014 is an indication of agreement by all parties involved that there have been no impacts to surface or groundwater from the mining in these leases. The fact that PacifiCorp is no longer required by the MOU participant agencies to monitor surface or groundwater in this area is sufficient documentation for the remainder of the leases to be relinquished.

Mining in the southern half of the East Mountain LMU has been essentially complete since the year 2001, when the Cottonwood Mine ceased production and the portals were closed. In the intervening years, as those areas have stabilized, monitoring of subsidence and hydrology were terminated as those areas were considered to be stable and not impacted by mining.



CAD FILE NAME/DISK#: UTU-1358

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-1358
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-1358 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Vegetation of Lease UTU-1358 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-1358:

Aspen/Conifer	AS/C
Barren/Sparse Vegetation	BR/SV
Black Sagebrush	BLSB
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

Stat. of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR
OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

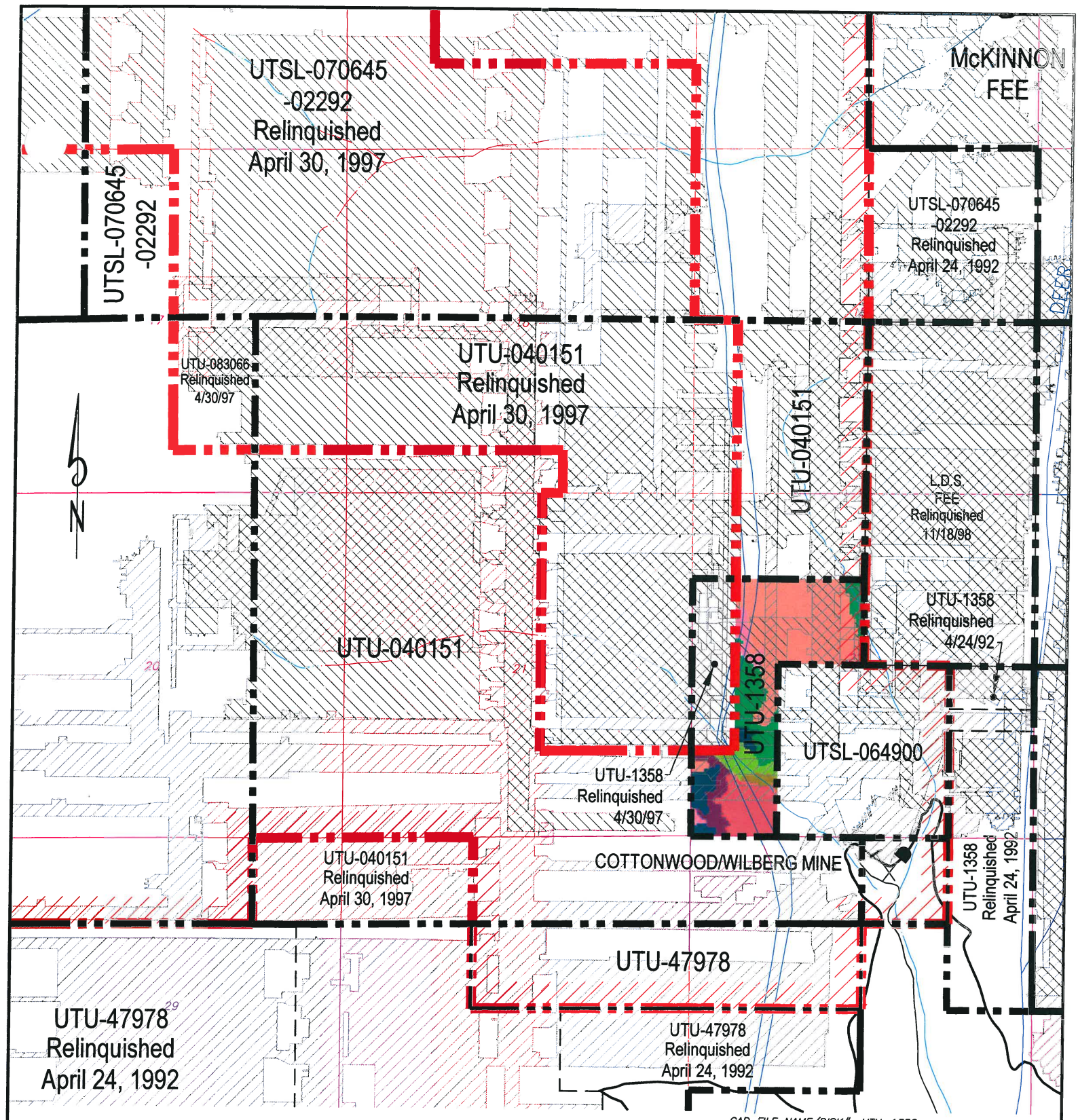
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-1358 area. There were no surface facilities or installations on this lease.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-1358 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

VEG TYPE CLASS

- Aspen/Conifer, AS/C
- Barren/Sparse Vegetation, BR/SV
- Black Sagebrush, BLSB
- Bristlecone Pine/Limber Pine, BC/LM
- Douglas-fir Mix, DFmix
- Mountain Big Sagebrush, MSB
- Spruce/Fir, SF
- Upland Herbaceous, UHE

CAD FILE NAME/DISK#: UTU-1358

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-1358
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-1358 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in Lease UTU-1358.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-1358 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTU-1358 took place on May 7, 2001, prior to sealing of the Cottonwood/Wilberg Mine.. CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-1358 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st South, 1st - 3rd Left, 4th West, Main West, 1st East, 1st North, 1.5 North, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-1358 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st South, 1st - 3rd Left, 4th West, Main West, 1st East, 1st North, 1.5 North, and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-1358 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st South, 1st - 3rd Left, 4th West, Main West, 1st East, 1st North, 1.5 North, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) #UTU-1358 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st South, 1st - 3rd Left, 4th West, Main West, 1st East, 1st North, 1.5 North, and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-1358 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st South, 1st - 3rd Left, 4th West, Main West, 1st East, 1st North, 1.5 North, and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-1358 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st South, 1st - 3rd Left, 4th West, Main West, 1st East, 1st North, 1.5 North, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 09/75 – 07/89

Submittal Date: Nov. 7, 2018

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Price Field Office
125 South 600 West
Price, Utah 84501

3482
SL-064900
(UT-070)

Pamela Grubaugh-Littig
Permit Supervisor
Utah Division of Oil, Gas and Mining
1594 West North Temple Street
Salt Lake City, Utah 84114-5801

AUG 30 2001

Re: Temporary Closure, Cottonwood/Wilberg Mines, PacifiCorp

Dear Mrs. Grubaugh-Littig:

Enclosed is a copy of two inspection reports of joint onsites at the subject mines conducted by field personnel from both our agencies. The report was to document findings at the said mine during temporary closure. Along with these reports are our recommendations on the closure plan received from the company.

PacifiCorp, through its wholly owned subsidiary Energy West, Inc., sent a notice to us on February 8, 2001, of "Temporary Cessation of Operations for the Trail Mountain, Cottonwood and Wilberg Mines". We have previously commented on the Trail Mountain Mine portion of the cessation plan. An underground inspection of the Cottonwood/Wilberg Mine was held which we could not attend. However, we have visited the mine portal areas and participated in the underground inspection of the area to be sealed in the Deer Creek/ Wilberg shaft area. The Deer Creek/Wilberg shaft area was inspected from the Deer Creek Mine, as the company had to seal the 1st South Mains as access to the top of the shaft. This was far more practical than trying to seal at the shaft. These two inspection reports are enclosed. The inspections verify the closure plan and support our findings for the proposed cessation plan.

The application for "Temporary Cessation of Operations" submitted by PacifiCorp details the plans for putting the Cottonwood/Wilberg Mine in a temporarily closed condition with temporary portal seals and documents what items will be left in the mine. Most of the items to be left are belt structure, power cable and pipe. Should the mine be re-opened much of these items will be used or replaced. Should the mine never re-open and reclamation occurs, these items of themselves should not cause any impacts to the hydrologic regime in the mine. These items are inert metals with no liquids or oils. No other items potentially hazardous or toxic were noted during the inspection. We therefore have no objections to leaving the listed items underground should the mine never be opened again.

With regard to temporary sealing of the portals, the plan is adequate to protect the unmined coal resource and bar access to the resource. The seals meet standards set by MSHA and are acceptable to us for compliance with rules under the Mineral Leasing Act for abandonment and protection of the unmined coal and other mineral resource (43 CFR 3484.2 (b)).

Pursuant to the Mineral Leasing Act of 1920, as amended, and in conjunction with the rules at 43 CFR 3400, and the lease terms, PacifiCorp's plan for temporary abandonment of the Cottonwood/Wilberg Mine is acceptable and confirmed by us. Should you have further questions, please contact Stephen Falk of my staff at (435) 636-3600.

Sincerely,

/S/ THOMAS E. RASMUSSEN

Acting FOR Richard L. Manus
Field Manager

Enclosure
Inspection Reports (2)

cc: UT-921, SD, Utah (w/enclosure)
Manti-LaSal National Forest (w/enclosure)
599 West Price River Road
Price, Utah 84501
Energy West Mining Company (w/enclosure)
P. O. Box 310
Huntington, Utah 84528
Utah Division of Oil, Gas and Mining (w/enclosure)
Price Field Office
451 East 400 North
Price, Utah 84501

Bureau of Land Management
Inspection Report For Coal Operations

Inspection Number swf06/20/01

Thursday, August 09, 2001

Inspection Date 6/20/01

Quarter 3rd *Fiscal Year* FY2001

Mine Cottonwood *Purpose* Special

SL-064900 Lead lease
U-044025 Portal location

Current Mine Status

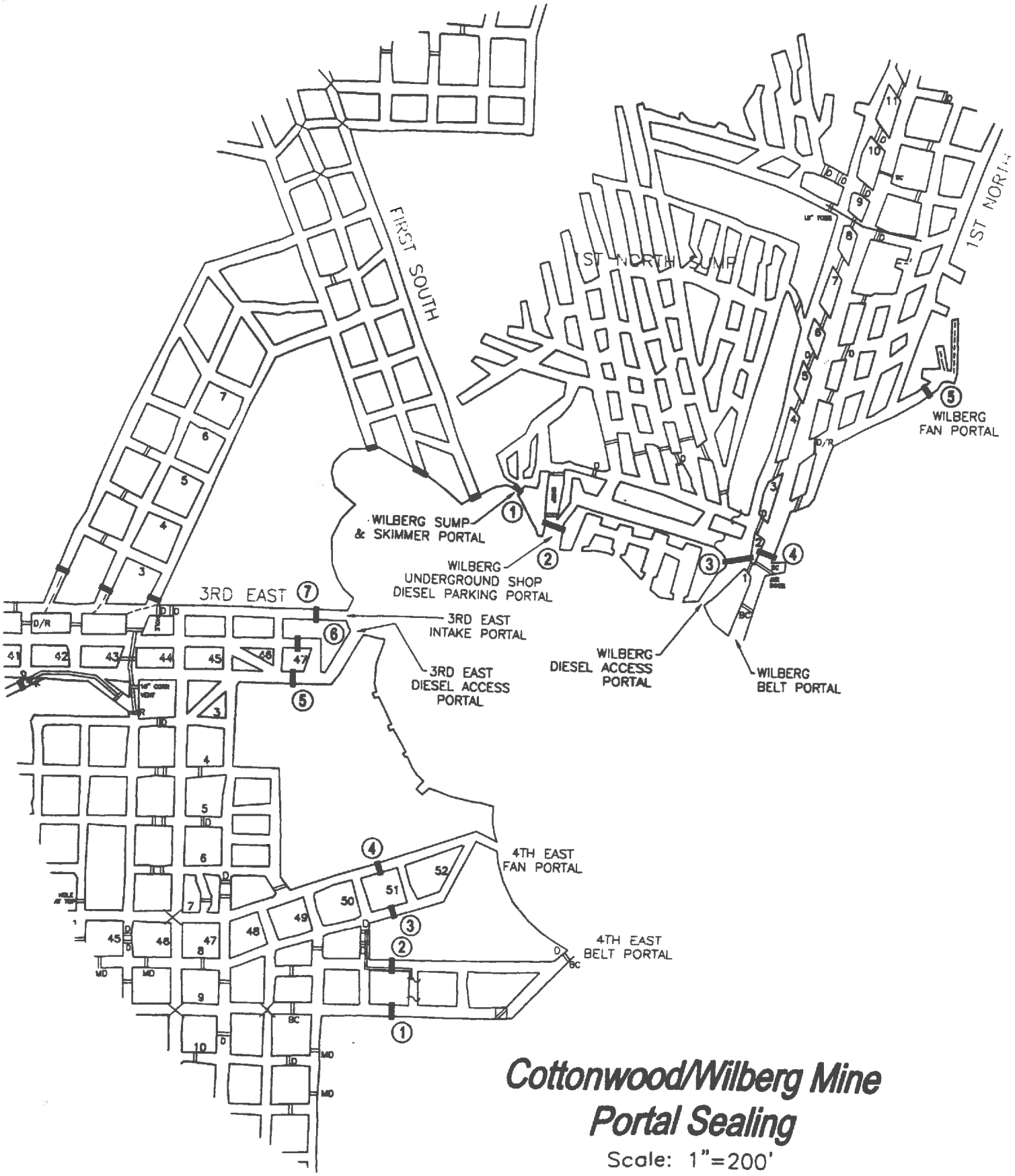
On June 20. 2001, I (Stephen Falk) and Sue Burger (summer intern) inspected the erected temporary seals at the Cottonwood/Wilberg Mine portal area. Seth McCourt was our company representative. The purpose of the inspection was to verify the temporary seals erected by Energy West at all the portals at the Cottonwood/Wilberg surface facilities.

On February 8, 2001, BLM received from Energy West a notice for "Temporary cessation of operations for the Trail Mountain, Cottonwood, and Wilberg Mines". In short summary, the Trail Mountain Mine had finished longwall mining of the reserves on the Trail Mountain property. Coal was conveyed via an enclosed conveyor belt across Cottonwood Canyon from the Trail Mountain portals to the Cottonwood belt portals and conveyed through the Cottonwood Mine to the Cottonwood/Wilberg loadout facilities in Grimes Wash. This was used for many years to allow the use of the same loadout facilities and the ability to ship triple coal haul truck trailers down the existing Wilberg haul road to the Hunter Power Plant. With the cessation of coal production at Trail Mountain, Energy West has opted to idle the operations and in so doing to construct temporary seals over all portals. Also the plan noted items to be left underground. Two underground inspections with Utah Division of Oil Gas and Mining personnel were held with company officials, one for Trail Mountain and one for Cottonwood/Wilberg. BLM attended the Trail Mountain inspection but were not able to attend the Cottonwood/Wilberg inspection. This inspection (June 20, 2001) was to note the seals that had been erected after the final underground inspection.

There are 12 portals at this complex. Three portals have been sealed since the Wilberg fire in 1984 (First South intakes). We checked the rest of the portal seals. From the east to the west, we first saw the Wilberg Fan portal which has the fan taken away and a block seal back behind the blast-proof fan housing. Around the corner were the Wilberg belt and roadway portals. Both were blocked sealed back 100 feet from the opening and the opening fenced off at the direct opening. The sump and shop portals next to the underground office were both blocked at the opening. At the 3rd East intake portal pad, the two portals were open with fence at the opening. Seals were 200 feet inby with three seals. 4th East fan portal had the fan housing sealed at the explosion doors. And last, the 4th East belt entry was fenced and block sealed 200 feet inby. These seals meet temporary closure standards for protection of the coal resource. One suggestion was given to Energy West was to fence off the tunnel access opening for the 3rd East pad. Energy West has plans for remote cameras for site security as the gate down the haul road does not have fencing on either side of the gate.

Close Out Discussion

The seals and fencing used on the portals meets the requirements for resource protection under a temporary closure of the mine. The items listed that would be left in the mine, we believe do not have any known substances that would be considered hazardous or would pose a problem to to hydrologic resources. We have no objections to things to be left in the mine.



Cottonwood/Wilberg Mine Portal Sealing

Scale: 1"=200'

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-1358
Deer Creek Mine - MSHA # 42-00121, Cottonwood Mine MSHA # 42-01211
Sealed Mine Sections: 1st South, 1st - 3rd Left, 4th West, Main West, 1st East, 1st North, 1.5 North, And remainder of mine workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (09/75 - 07/89) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	09/75 - 07/89	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	09/75 - 07/89	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	09/75 - 07/89	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	09/75 - 07/89	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	09/75 - 07/89	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	09/75 - 07/89	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	09/75 - 07/89	Naptha	40 - 50%	64742-94-5	All Sections
	09/75 - 07/89	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	09/75 - 07/89	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	09/75 - 07/89	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	09/75 - 07/89	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	09/75 - 07/89	Propane	14%	74-98-6	All Sections
	09/75 - 07/89	Butane	13%	106-97-8	All Sections
	09/75 - 07/89	Toluene	17%	108-88-3	All Sections
	09/75 - 07/89	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	09/75 - 07/89	Napthalene	0.40%	91-20-3	All Sections
	09/75 - 07/89	Acetone	41%	67-64-1	All Sections
	09/75 - 07/89	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	09/75 - 07/89	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	09/75 - 07/89	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	09/75 - 07/89	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	09/75 - 07/89	Mineral Oil	20 - 25%	8042-47-5	All Sections
	09/75 - 07/89	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	09/75 - 07/89	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	09/75 - 07/89	Methanol	<20%	67-56-1	All Sections
	09/75 - 07/89	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	09/75 - 07/89	Heptane	69 - 79%	142-82-5	All Sections
	09/75 - 07/89	Ethyl Ether	11 - 21%	60-29-7	All Sections
	09/75 - 07/89	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	09/75 - 07/89	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	09/75 - 07/89	Heptane	60 - 70%	142-82-5	All Sections
	09/75 - 07/89	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	09/75 - 07/89	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	09/75 - 07/89	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	09/75 - 07/89	None			All Sections
Cat Transmission and Drive Train Oil	09/75 - 07/89	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	09/75 - 07/89	Monoethanolamine	<10%	141-41-3	All Sections
	09/75 - 07/89	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	09/75 - 07/89	Mineral Oil	70 - 95%	Mixture	All Sections
	09/75 - 07/89	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	09/75 - 07/89	Lubricant base oil	87 - 91%	Various	All Sections
	09/75 - 07/89	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	09/75 - 07/89	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	09/75 - 07/89	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	09/75 - 07/89	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	09/75 - 07/89	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	09/75 - 07/89	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	09/75 - 07/89	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	09/75 - 07/89	Trichloroethylene	95 - 99%	79-01-6	All Sections
	09/75 - 07/89	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	09/75 - 07/89	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	09/75 - 07/89	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	09/75 - 07/89	Deionized Water	1 - 3%	7732-18-5	All Sections
	09/75 - 07/89	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-1358
Deer Creek Mine - MSHA # 42-00121, Cottonwood Mine MSHA # 42-01211
Sealed Mine Sections: 1st South, 1st - 3rd Left, 4th West, Main West, 1st East, 1st North, 1.5 North, And remainder of mine workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (08/72 - 09/95) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	09/75 - 07/89	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	09/75 - 07/89	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	09/75 - 07/89	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	09/75 - 07/89	Calcium sulfate	2 - 10%		All Sections
	09/75 - 07/89	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	09/75 - 07/89	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	09/75 - 07/89	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	09/75 - 07/89	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	09/75 - 07/89	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	09/75 - 07/89	Lead	34%	7439-92-1	All Sections
	09/75 - 07/89	Lead Dioxide	31%	1309-60-0	All Sections
	09/75 - 07/89	Lead Sulfate	<1%	7446-14-2	All Sections
	09/75 - 07/89	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	09/75 - 07/89	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	09/75 - 07/89	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	09/75 - 07/89	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	09/75 - 07/89	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	09/75 - 07/89	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	09/75 - 07/89	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	09/75 - 07/89	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	09/75 - 07/89	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	09/75 - 07/89	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	09/75 - 07/89	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	09/75 - 07/89	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	09/75 - 07/89	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	09/75 - 07/89	Portland Cement		65997-15-1	All Sections
	09/75 - 07/89	Crystalline Silicon Dioxide		13397-24-5	All Sections
	09/75 - 07/89	Calcium Hydroxide		001-305-620	All Sections
	09/75 - 07/89	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	09/75 - 07/89	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	09/75 - 07/89	Polyglycols	60 - 100%	Mixture (2)	15 W
	09/75 - 07/89	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	09/75 - 07/89	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	09/75 - 07/89	Polyester Resin	5 - 15%	Not Reported	All Sections
	09/75 - 07/89	Styrene Monomer	3 - 7%	100-42-5	All Sections
	09/75 - 07/89	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	09/75 - 07/89	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	09/75 - 07/89	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	09/75 - 07/89	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	09/75 - 07/89	Isobutane	2 - 10%	75-28-5	All Sections
	09/75 - 07/89	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	09/75 - 07/89	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	09/75 - 07/89	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	09/75 - 07/89			64742-48-9	All Sections
	09/75 - 07/89			64742-88-7	All Sections
	09/75 - 07/89	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	09/75 - 07/89	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	09/75 - 07/89	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	09/75 - 07/89	Lubricant base oil	>99	Various	All Sections
	09/75 - 07/89	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	09/75 - 07/89	Lubricant base oil	87 - 91%	Various	All Sections
	09/75 - 07/89	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	09/75 - 07/89	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	09/75 - 07/89	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-1358
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

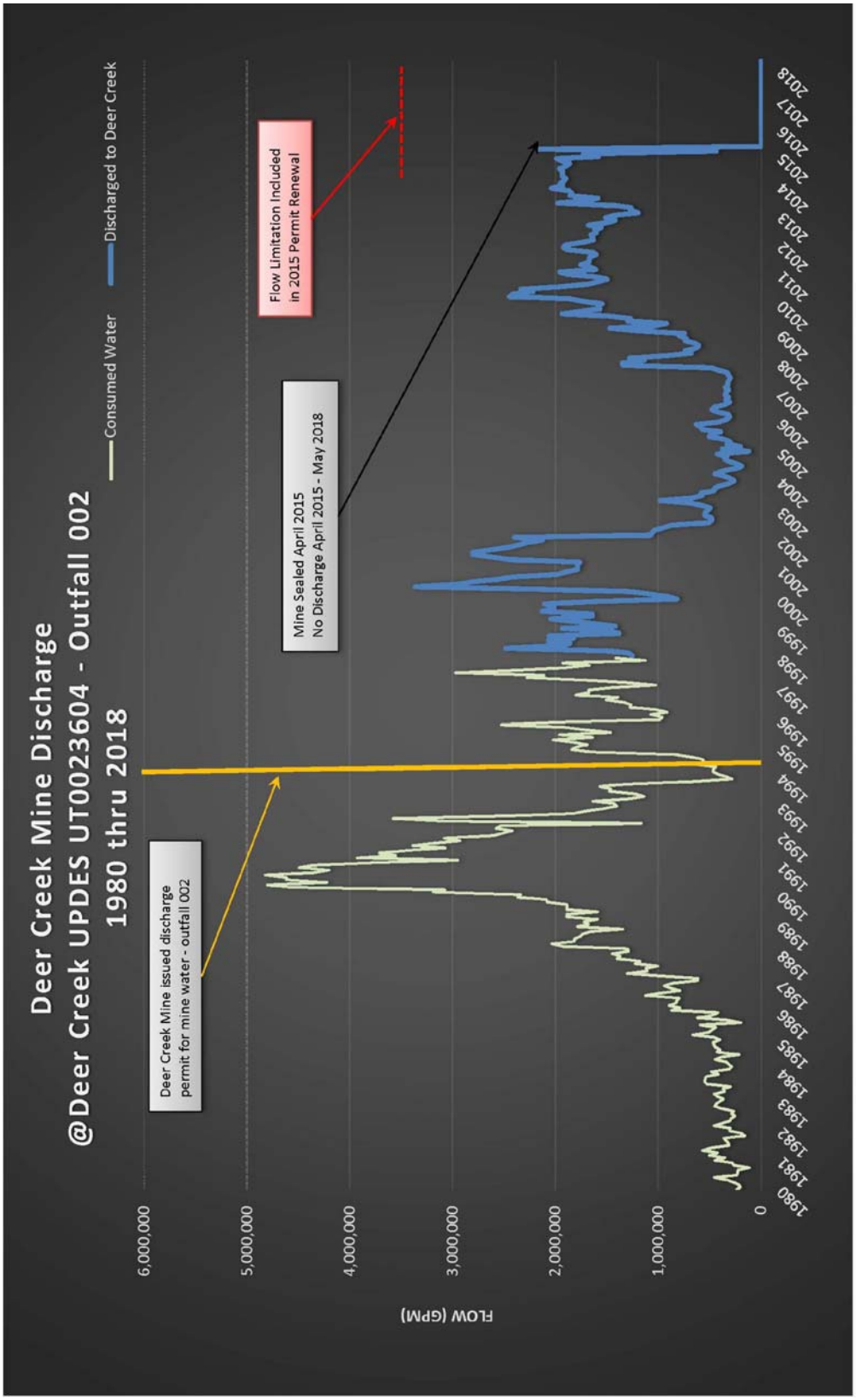
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



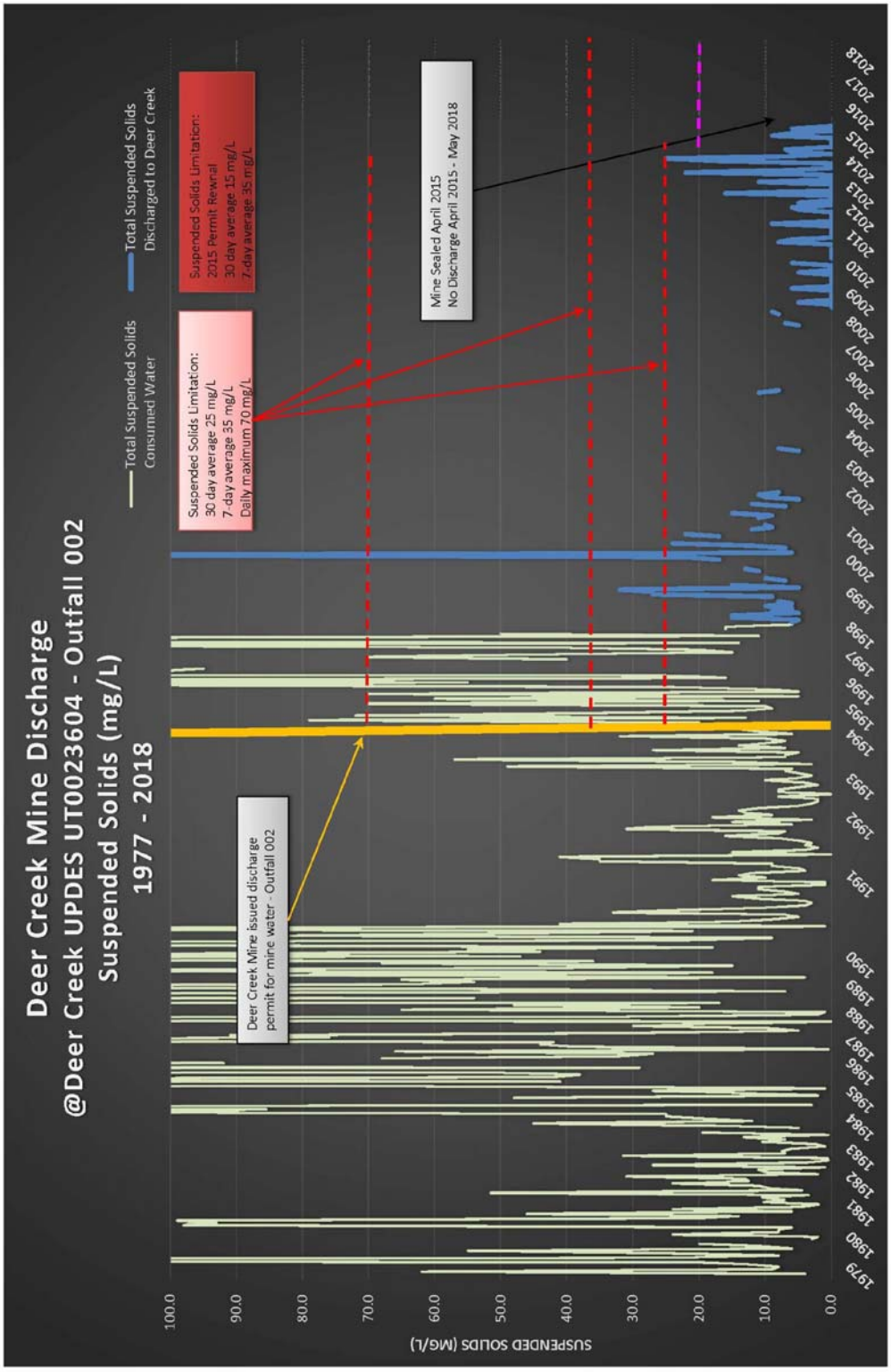
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



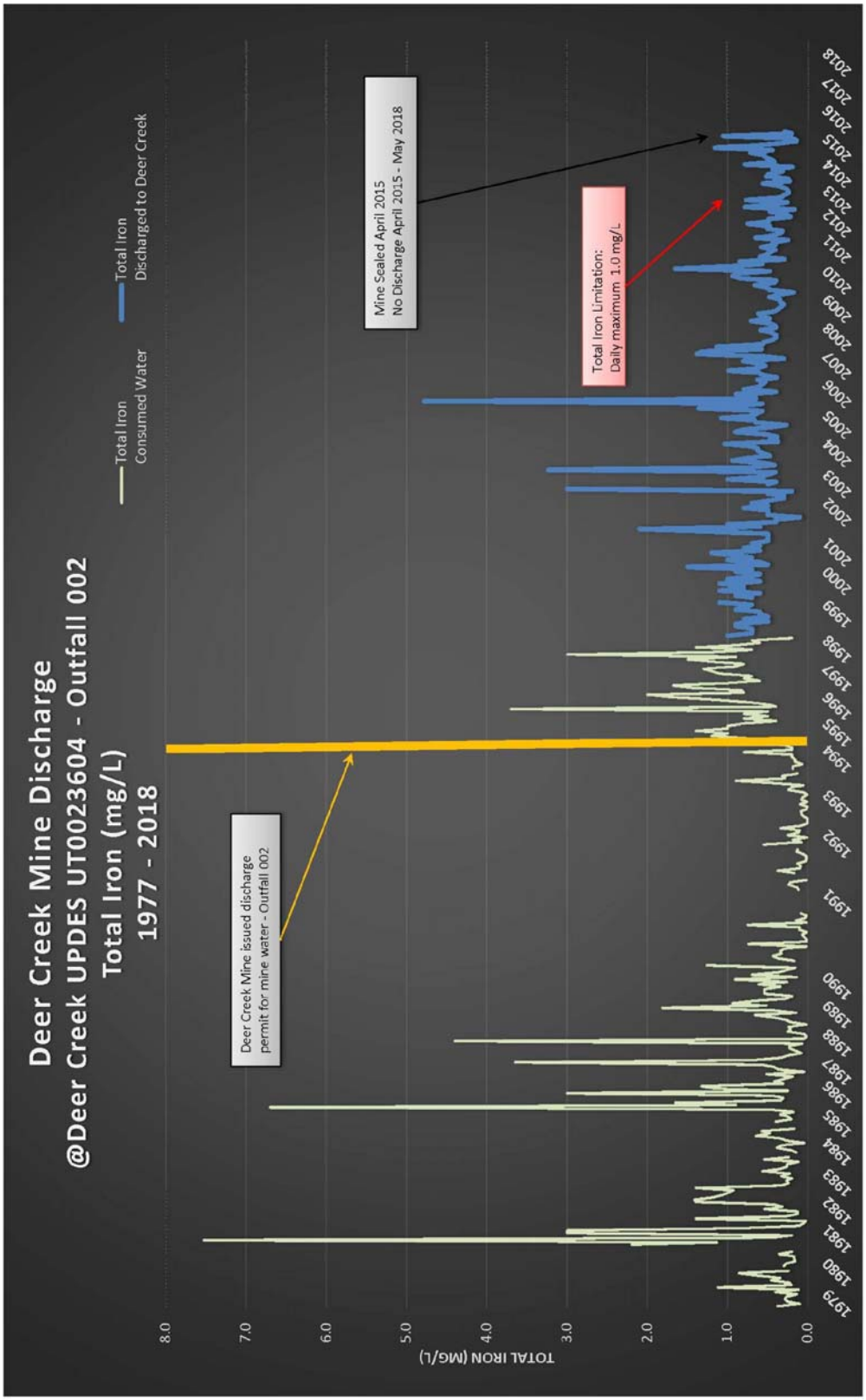
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



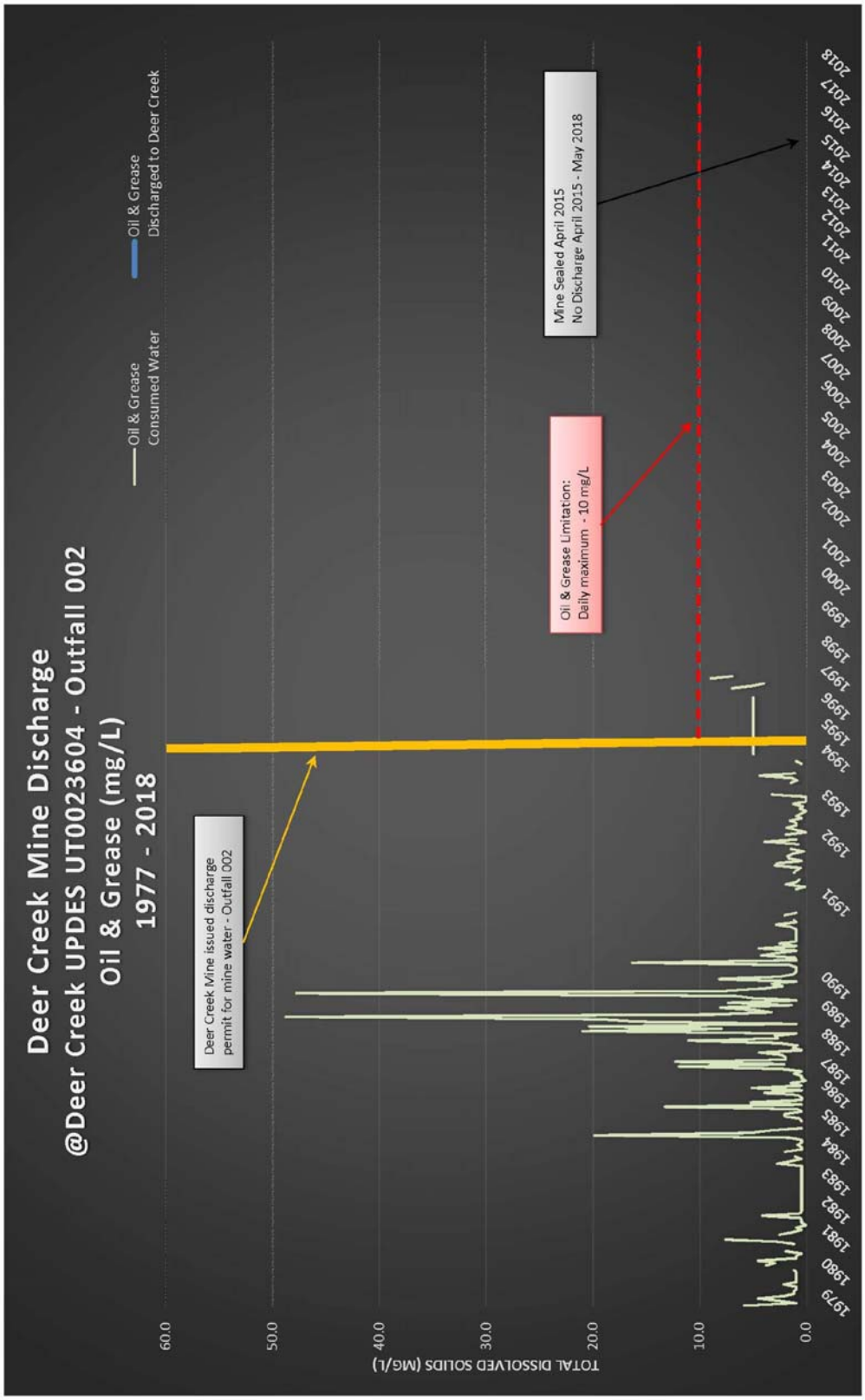
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



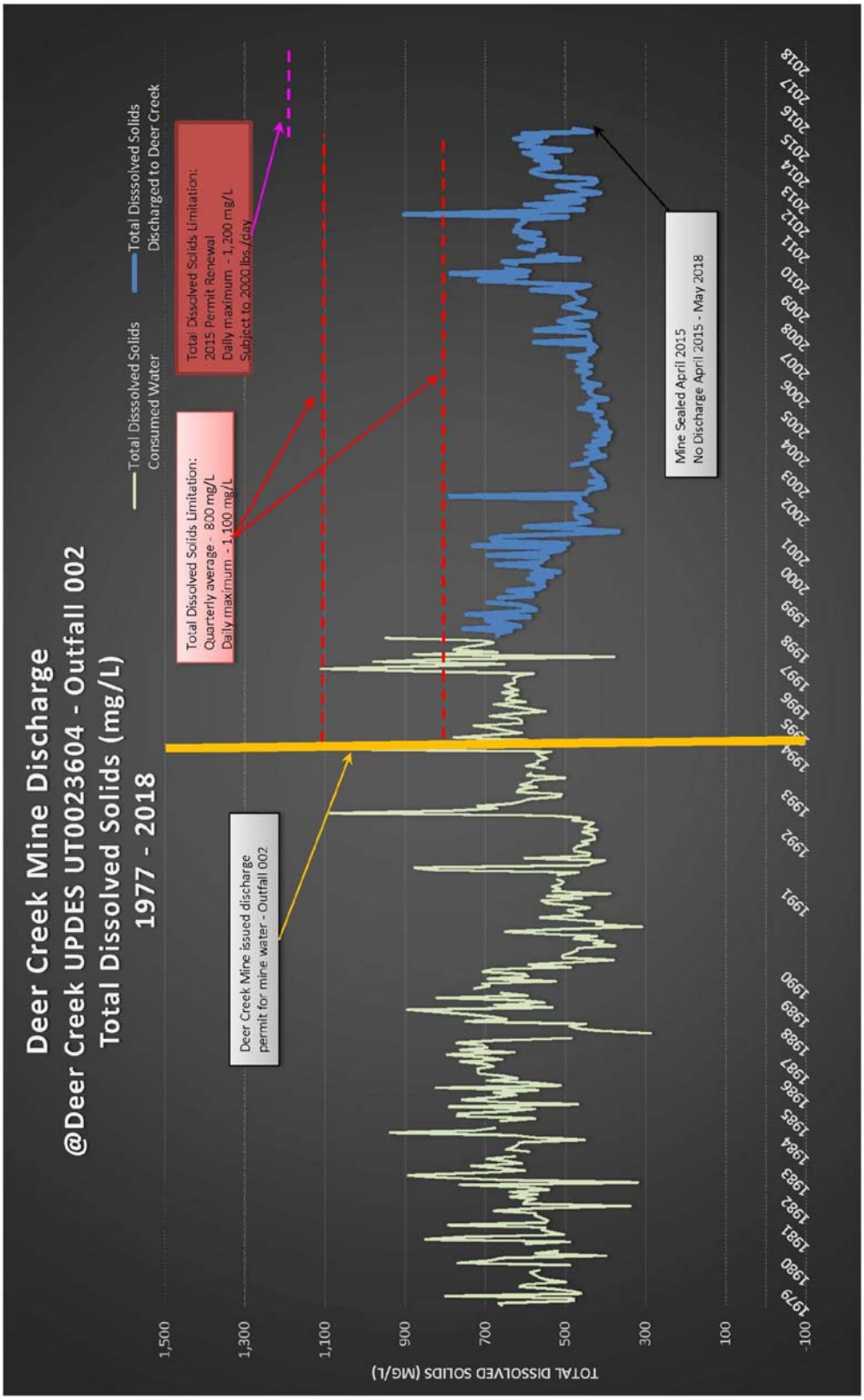
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



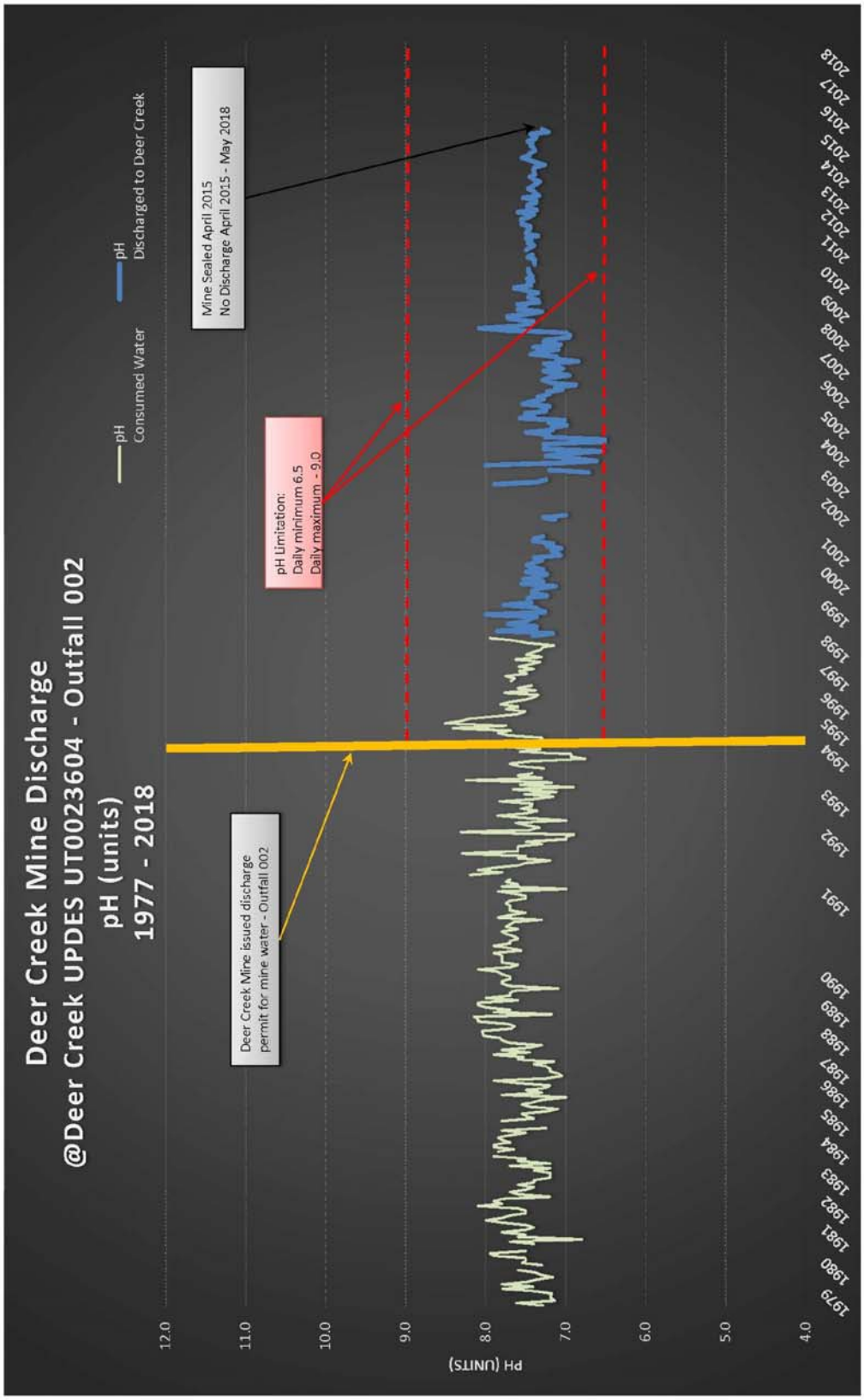
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Partial Relinquishment
Federal Coal Lease
UTU-064900

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Partial Relinquishment of Federal Coal Lease UTSL-064900, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's partial relinquishment of acreage under federal coal lease UTSL-064900. The total acreage being surrendered is 150.00 acres. The total acreage being retained for reclamation purposes is 10.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government.

Partial Relinquishment

The legal description for the area of partial relinquishment of UTSL-064900 is described below:

Federal Coal Lease UTSL-064900		
Lease Readjustment Effective Date:		2/3/2015 to 2/3/2025
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**160.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 22:	E½SW¼, NW¼SE¼, SW¼SW¼SE¼, N½SW¼SE¼	150.00
	Total Lease Acreage Being Relinquished:	**150.00**
	Total Lease Acres Remaining:	**10.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec. 22	SE¼SW¼SE¼	**10.00**
	Total Lease Acreage Being Retained:	**10.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-064900

LEASE ACTIVITIES

1) Coal Lease Number: UTSL-064900 *(Partial Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine) and C/015/0019 (Cottonwood Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 150.00; Entire lease? YES ☐ NO ☒ (See attached map.) Comments: *This is a partial relinquisment. Refer to Exhibit A for the legal descriptions of acreage relinquished and acreage retained. See also Figures 1 and 2 (a map depicting the areas to be relinquished and retained). Lease acreage to be retained: 10.00.*

Original Lease Acreage: 160.00 Relinquished to date: 0 acres Remaining: 160.00 acres

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)? YES ☒ NO ☐ (If "YES", describe: *Ventilation fan and portals with surface support facilites. All portals have been sealed on lease area to be retained for reclamation purposes. Fan and all facilities have been removed and all disturbed lands have been reclaimed in accordance with DOGM mine pmerit C/015/0019.*

11) Date of initial mining: December 1975; last mining: February 1989.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-064900

12) Number of coal beds mined: 2 coal seams (Blind Canyon and Hiawatha)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: __)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to explanation of spring monitoring reduction*

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to DOGM write up*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-064900

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
   - *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities? YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐ (If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-064900

Exhibit A

Partial Relinquishment

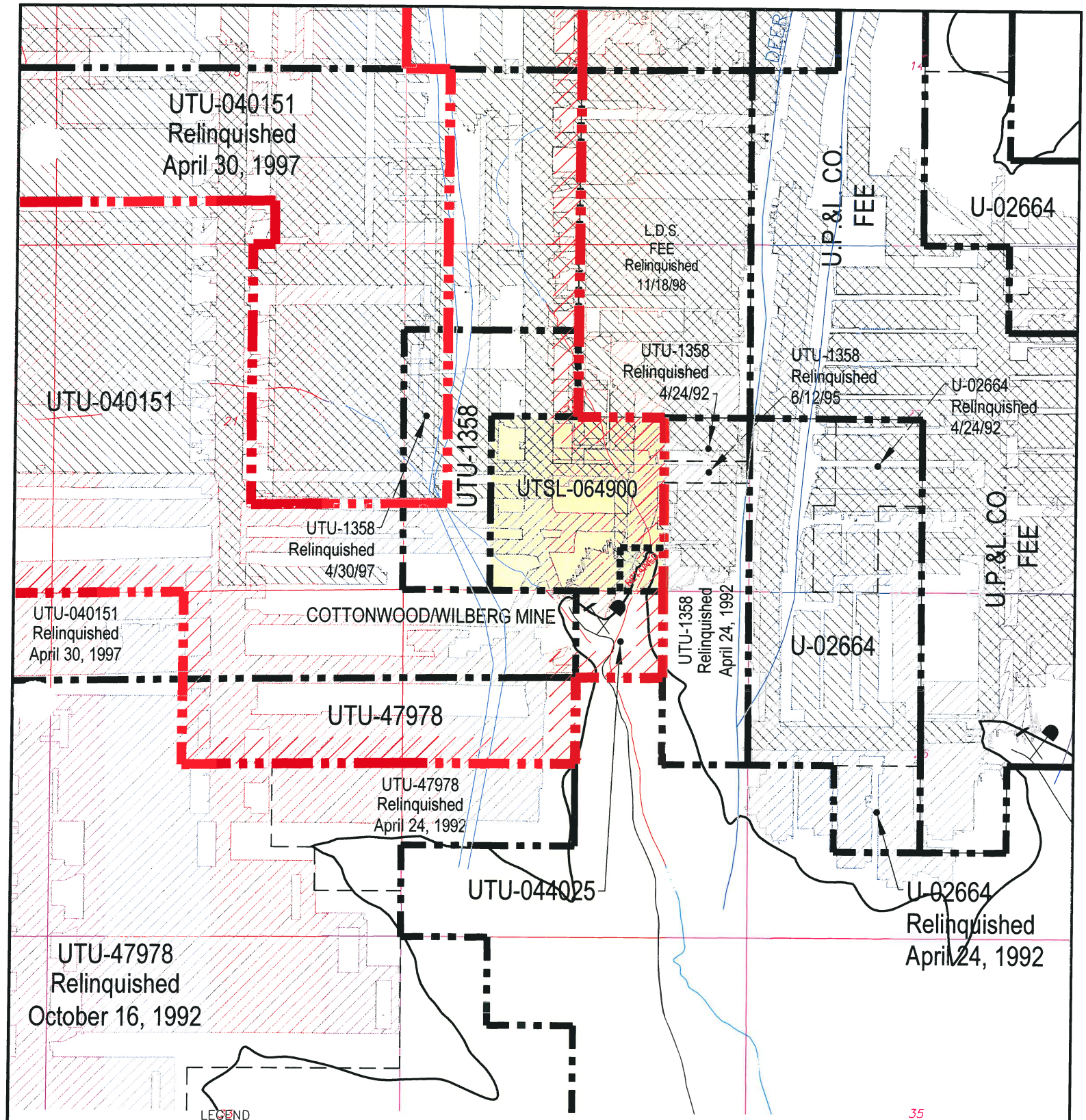
The legal description for the area of partial relinquishment of UTSL-064900 is described below:

Federal Coal Lease UTSL-064900	
Lease Readjustment Effective Date:	2/3/2015 to 2/3/2025
Lessee of Record:	PacifiCorp
Federal Coal Lease Acres:	**160.00**

Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 22:	E½SW¼, NW¼SE¼, SW¼SW¼SE¼, N½SW¼SE¼	150.00
	Total Lease Acreage Being Relinquished:	**150.00**
	Total Lease Acres Remaining:	**10.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec. 22	SE¼SW¼SE¼	**10.00**
	Total Lease Acreage Being Retained:	**10.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-064900 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA
- FEDERAL COAL LEASE RETAINMENT AREA

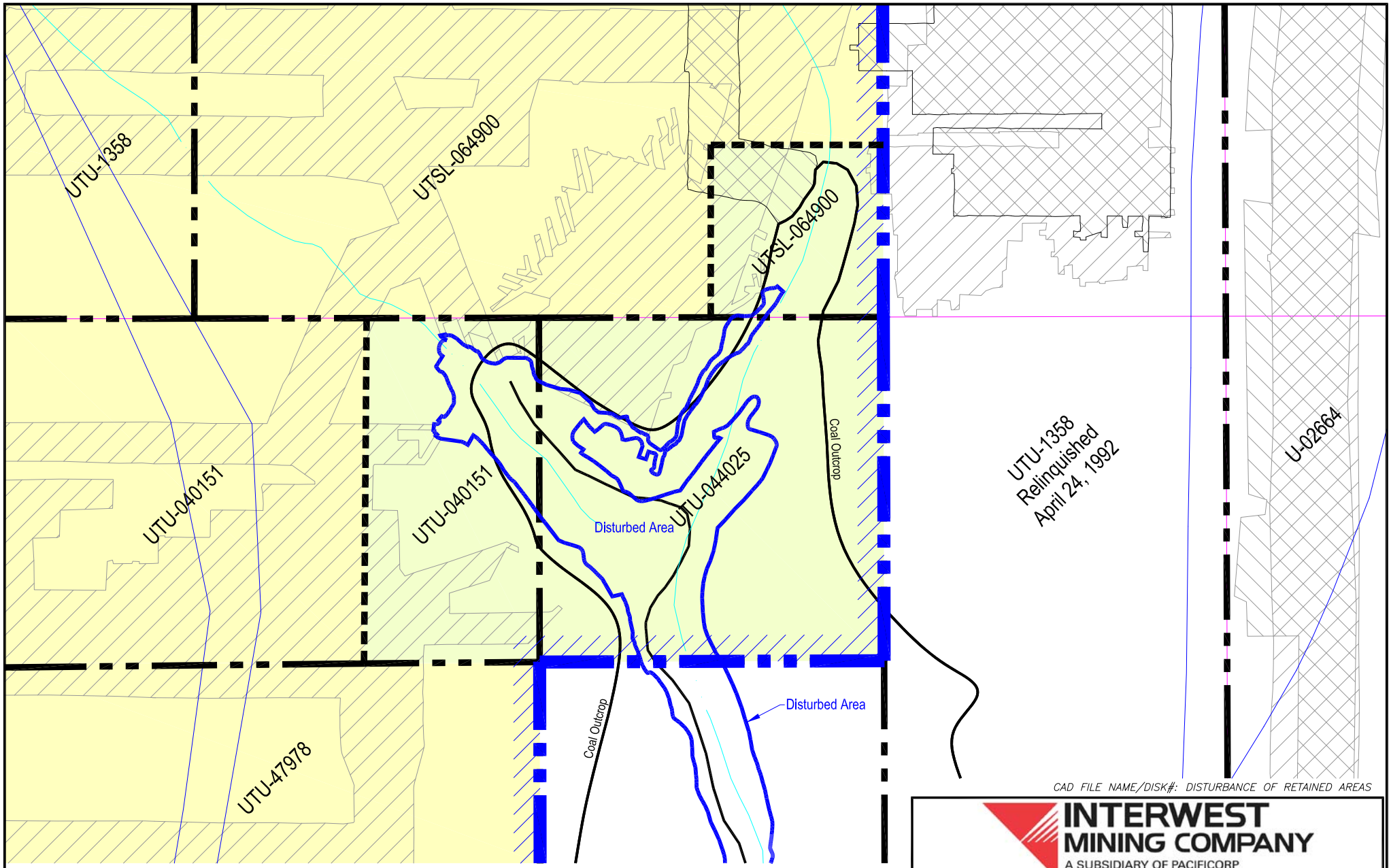
N

CAD FILE NAME/DISK#: UTSL-064900

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064900

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.



CAD FILE NAME/DISK#: DISTURBANCE OF RETAINED AREAS

LEGEND

DISTURBED AREA TO BE RECLAIMED	UTU-044025	FEDERAL LEASE NUMBER
COAL OUTCROP		FEDERAL LEASE LINE
HIAWATHA SEAM MINE WORKINGS		FEDERAL COAL LEASE ACREAGE RETAINED
BLIND CANYON SEAM MINE WORKINGS		FEDERAL COAL LEASE ACREAGE RELINQUISHED

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD MINE
FEDERAL COAL LEASE ACREAGE RETAINED
WITH DISTURBED AREA

DRAWN BY:	K. LARSEN	FIGURE 2	
SCALE:	1" =500'	DRAWING #:	
DATE:	OCTOBER 1, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTSL-064900
Checklist and Data Documentation for
Federal Coal Partial Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTSL-064900 Partial Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Blind Canyon and Hiawatha seams. Coal reserves were recovered by room-and-pillar longwall methods. Mining in the Blind Canyon seam took place between 8/1976 and 8/1984. Mining in the Hiawatha seam took place between 12/1975 and 2/1989. 40 acres of the lease, on which surface facilities were located and reclaimed, will be retained.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the East Mountain LMU area were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

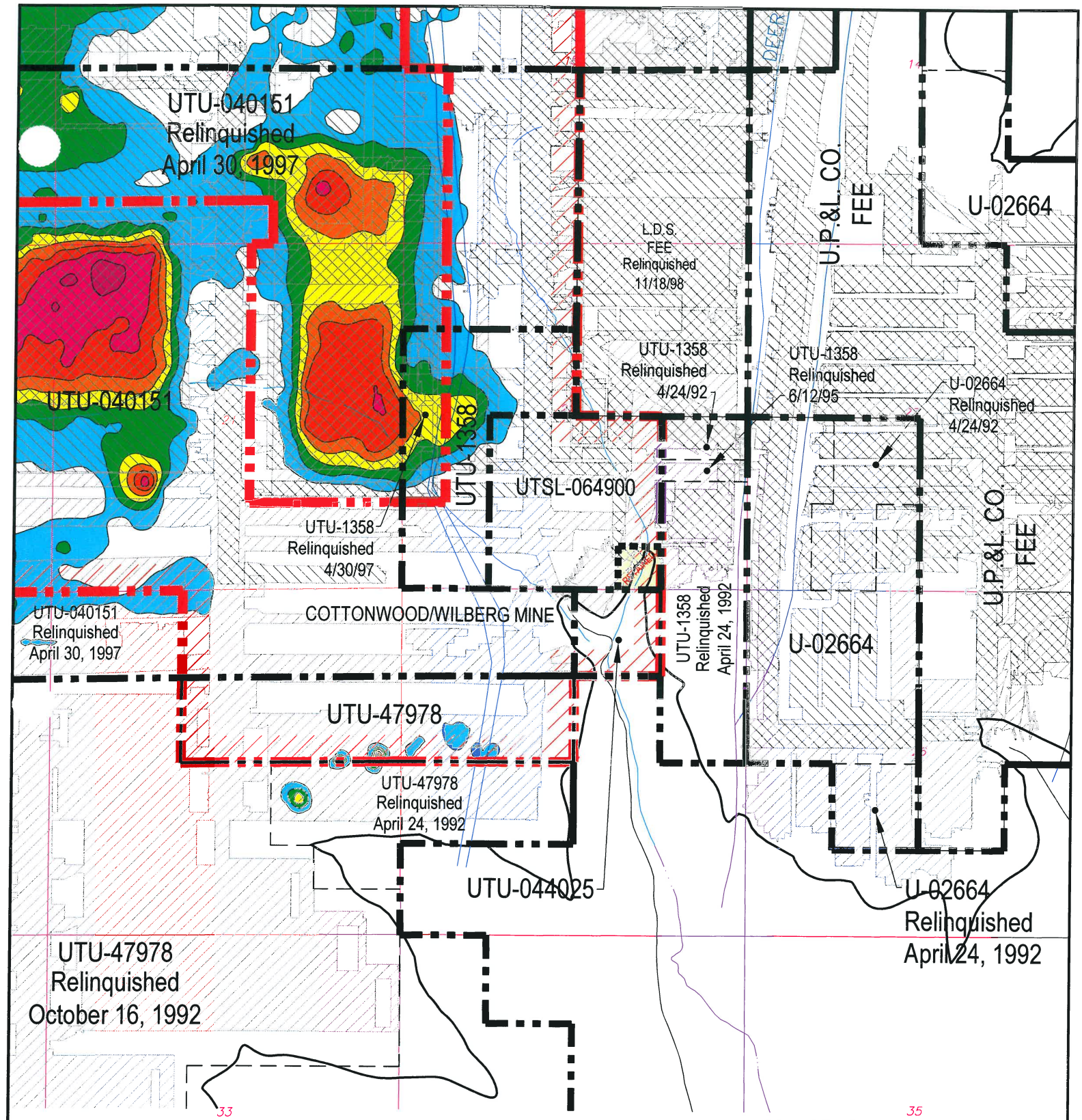
Federal Lease UTSL-064900 Subsidence Data

Subsidence in the lease UTSL-064900 area was monitored from 1999 to 2009. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1999 and 2009. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

While no subsidence profiles were specifically created to monitor subsidence in UTSL-064900, the overall subsidence contour map shows just over 2 feet of subsidence within this lease.

Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no subsidence-related effects on the surface in UTSL-064900.

The proposed relinquishment area of Lease UTSL-064900 is stable and subsidence is substantially complete.



CAD FILE NAME/DISK#: UTSL-064900

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-064900 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

Subsidence Legend

- 2'-4' Subsidence
- 4'-6' Subsidence
- 6'-8' Subsidence
- 8'-10' Subsidence
- 10'-12' Subsidence
- 12'-14' Subsidence
- 14'-16' Subsidence
- 16'-18' Subsidence

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064900
SUBSIDENCE BASE MAP

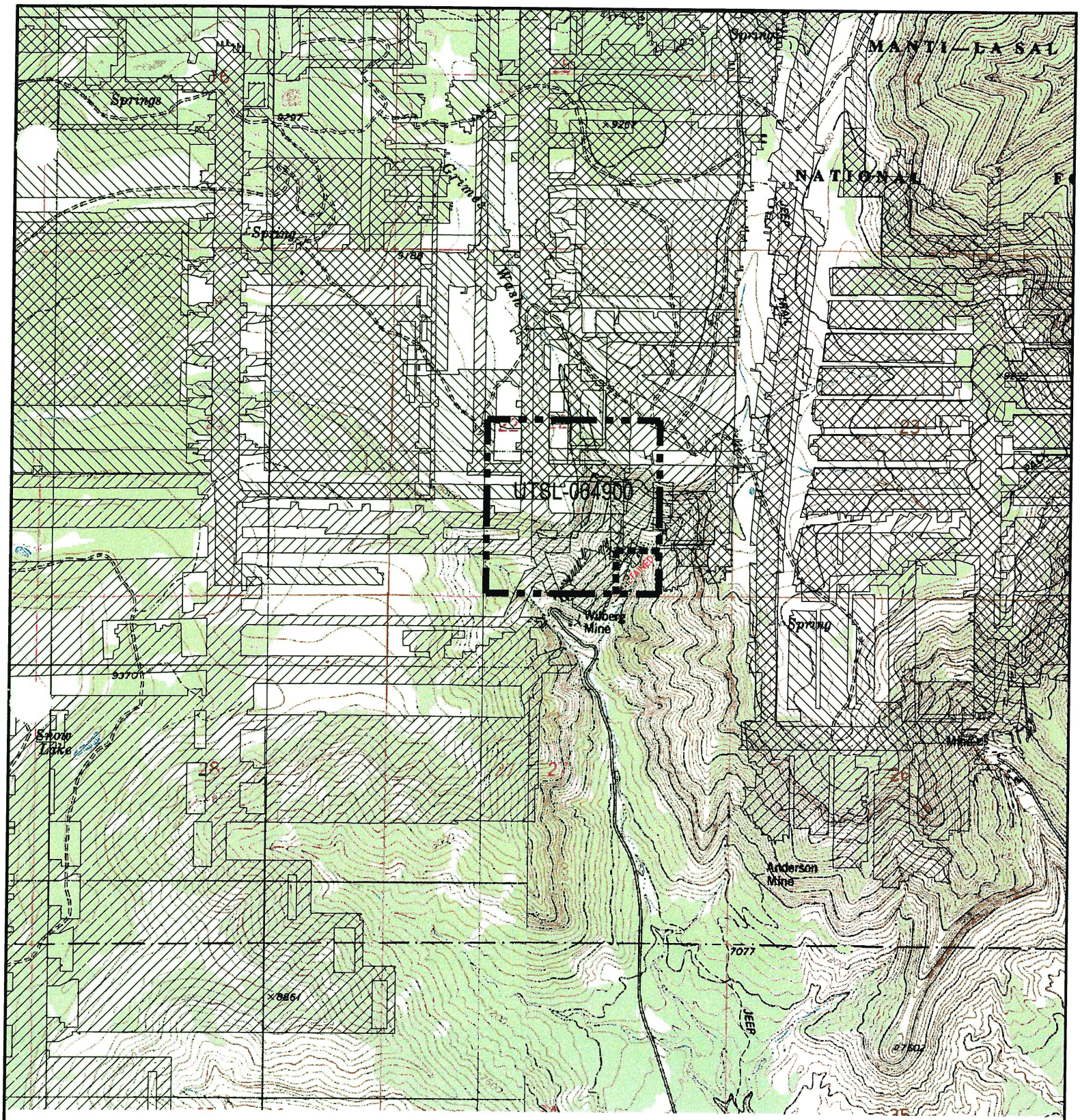
DRAWN BY:	K. LARSEN	APPENDIX A	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-064900 Partial Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTSL-064900 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTSL-064900. No restoration and/or mitigation efforts are required for Lease UTSL-064900. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTSL-064900 lease boundaries seam outcrop.

Insert Topographic Base Map



CAD FILE NAME/DISK#: UTSL-064900

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

FEDERAL LEASE ACREAGE RETAINED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064900
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" = 2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-064900 Partial Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Statement concerning Hydrologic Monitoring Reduction Amendment, submitted May 03, 2013, and approved by UDOGM November 25, 2014 and previous reduction amendments and relinquishments.

The purpose of this amendment was to reduce the hydrologic monitoring responsibilities of PacifiCorp for the following reasons:

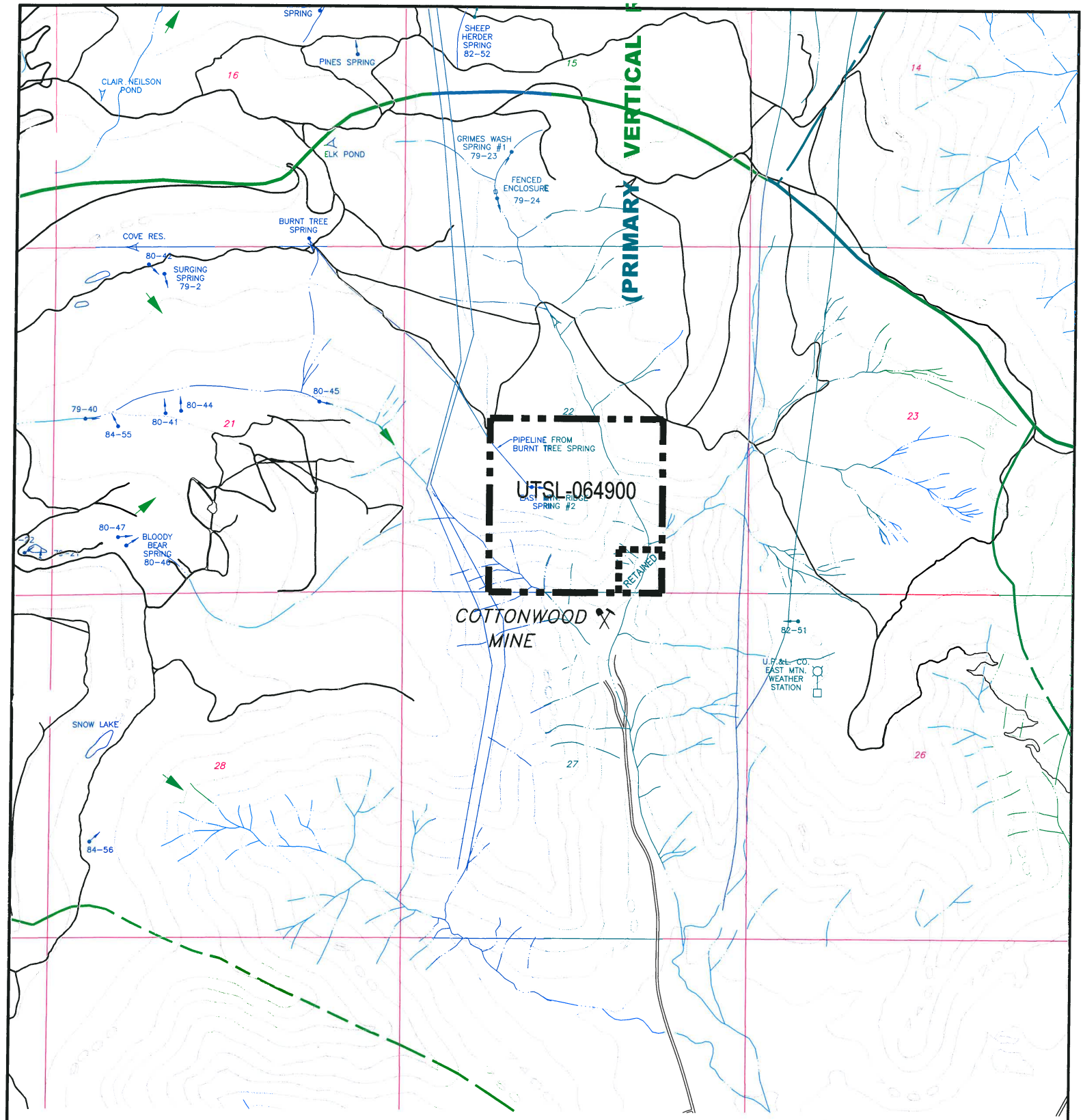
To eliminate sites outside of existing permit boundaries,
To eliminate sites outside of federal lease boundaries,
To eliminate sites in areas that were mined out and stabilized,
To eliminate sites in areas that will not be mined.

Two investigations are referred to in the amendment which conclude that there is no significant relationship between underground mining and intercepted groundwater and changes in surface and groundwater quantity or quality.

PacifiCorp submitted the first of three phases of lease relinquishment to the BLM for areas in the southern part of the LMU that had been mined out and where subsidence was considered to be substantially complete, or would not be mined. These relinquishment phases were approved by BLM and its Memorandum Of Understanding (MOU) partners (UDOGM, USDA Forest Service) in 1992, 1997 (East Mountain LMU UTU-73336), and 2009 (Trail Mountain LMU).

The approval of the monitoring reduction amendment by DOGM in 2014 is an indication of agreement by all parties involved that there have been no impacts to surface or groundwater from the mining in these leases. The fact that PacifiCorp is no longer required by the MOU participant agencies to monitor surface or groundwater in this area is sufficient documentation for the remainder of the leases to be relinquished.

Mining in the southern half of the East Mountain LMU has been essentially complete since the year 2001, when the Cottonwood Mine ceased production and the portals were closed. In the intervening years, as those areas have stabilized, monitoring of subsidence and hydrology were terminated as those areas were considered to be stable and not impacted by mining.



CAD FILE NAME/DISK#: UTSL-064900

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064900
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" = 2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-064900 Partial Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Vegetation of Lease UTSL-064900 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTSL-064900:

Barren/Sparse Vegetation	BR/SV
Bristlecone Pine/Limber Pine	BC/LM
Mountain Big Sagebrush	MSB
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Utah Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

Stat. of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

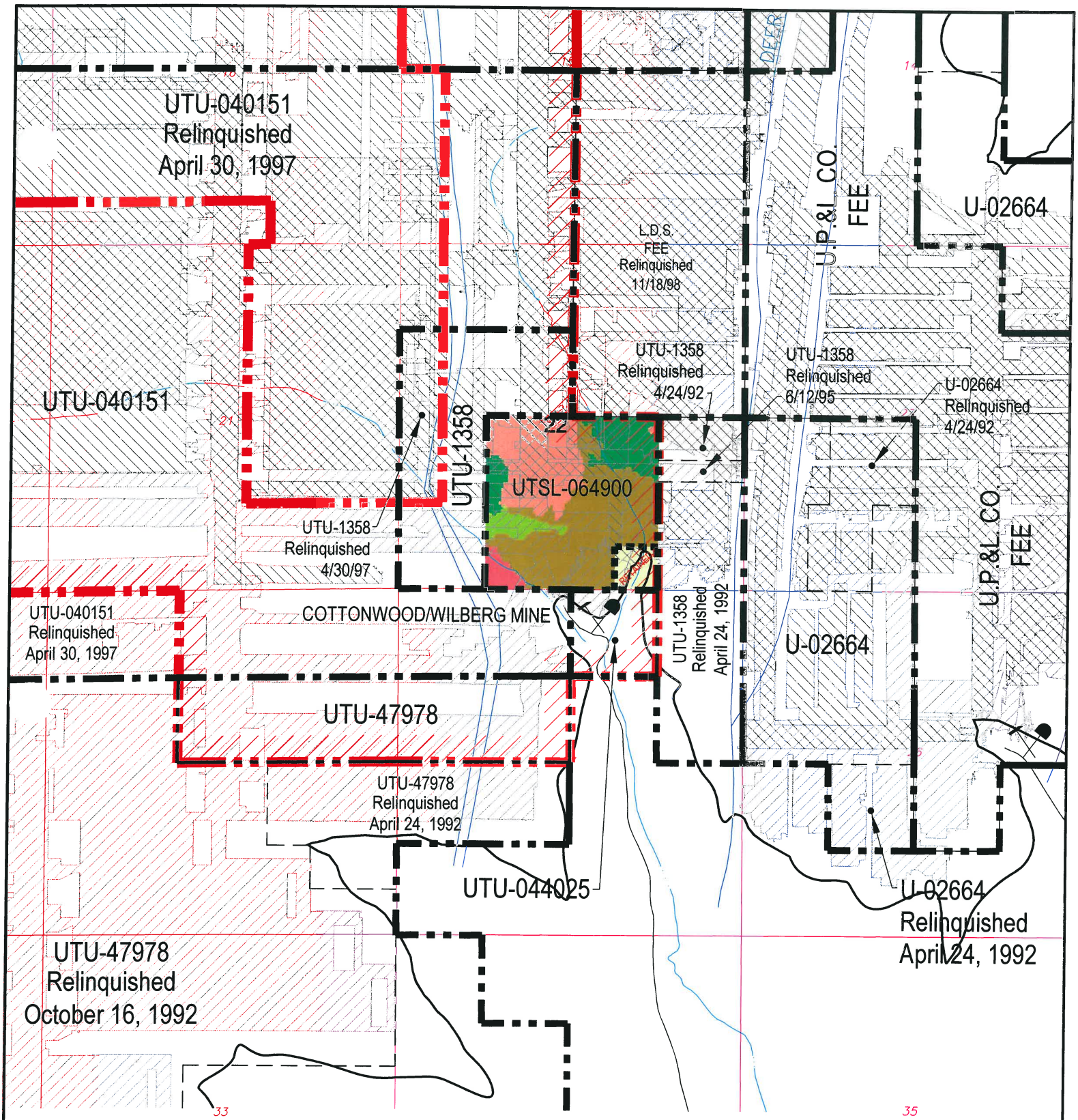
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTSL-064900 area. There were no surface facilities or installations on this lease.



CAD FILE NAME/DISK#: UTSL-064900

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-064900 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

VEG TYPE CLASS

- Barren/Sparse Vegetation, BR/SV
- Bristlecone Pine/Limber Pine, BC/LM
- Mountain Big Sagebrush, MSB
- Spruce/Fir, SF
- Upland Herbaceous, UHE

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-064900
VEGETATION BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX D	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-064900 Partial Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in the portion of Lease UTSL-064900 that will be relinquished.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTSL-064900 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTU-064900 took place on May 7, 2001, prior to sealing of the Cottonwood/Wilberg Mine. CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Partial documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-064900 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 1st S, 9th E, 1st L, 2nd L, 4th W, 1st N, 1st R, 1st S, 1st E, Main North and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-064900 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 10th West, 4th North, 6th North, Mill Fork Access #1 & 2, 7th North, 1st Right Mains and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTSL-064900 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 10th West, 4th North, 6th North, Mill Fork Access #1 & 2, 7th North, 1st Right Mains and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTSL-064900 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 10th West, 4th North, 6th North, Mill Fork Access #1 & 2, 7th North, 1st Right Mains and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-064900 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121, Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 10th West, 4th North, 6th North, Mill Fork Access #1 & 2, 7th North, 1st Right Mains and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTSL-064900 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 1st S, 9th E, 1st L, 2nd L, 4th W, 1st N, 1st R, 1st S, 1st E, Main North, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 11/05 – 04/15

Submittal Date: NOV. 7, 2018

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Price Field Office
125 South 600 West
Price, Utah 84501

3482
SL-064900
(UT-070)

Pamela Grubaugh-Littig
Permit Supervisor
Utah Division of Oil, Gas and Mining
1594 West North Temple Street
Salt Lake City, Utah 84114-5801

AUG 30 2001

Re: Temporary Closure, Cottonwood/Wilberg Mines, PacifiCorp

Dear Mrs. Grubaugh-Littig:

Enclosed is a copy of two inspection reports of joint onsites at the subject mines conducted by field personnel from both our agencies. The report was to document findings at the said mine during temporary closure. Along with these reports are our recommendations on the closure plan received from the company.

PacifiCorp, through its wholly owned subsidiary Energy West, Inc., sent a notice to us on February 8, 2001, of "Temporary Cessation of Operations for the Trail Mountain, Cottonwood and Wilberg Mines". We have previously commented on the Trail Mountain Mine portion of the cessation plan. An underground inspection of the Cottonwood/Wilberg Mine was held which we could not attend. However, we have visited the mine portal areas and participated in the underground inspection of the area to be sealed in the Deer Creek/ Wilberg shaft area. The Deer Creek/Wilberg shaft area was inspected from the Deer Creek Mine, as the company had to seal the 1st South Mains as access to the top of the shaft. This was far more practical than trying to seal at the shaft. These two inspection reports are enclosed. The inspections verify the closure plan and support our findings for the proposed cessation plan.

The application for "Temporary Cessation of Operations" submitted by PacifiCorp details the plans for putting the Cottonwood/Wilberg Mine in a temporarily closed condition with temporary portal seals and documents what items will be left in the mine. Most of the items to be left are belt structure, power cable and pipe. Should the mine be re-opened much of these items will be used or replaced. Should the mine never re-open and reclamation occurs, these items of themselves should not cause any impacts to the hydrologic regime in the mine. These items are inert metals with no liquids or oils. No other items potentially hazardous or toxic were noted during the inspection. We therefore have no objections to leaving the listed items underground should the mine never be opened again.

With regard to temporary sealing of the portals, the plan is adequate to protect the unmined coal resource and bar access to the resource. The seals meet standards set by MSHA and are acceptable to us for compliance with rules under the Mineral Leasing Act for abandonment and protection of the unmined coal and other mineral resource (43 CFR 3484.2 (b)).

Pursuant to the Mineral Leasing Act of 1920, as amended, and in conjunction with the rules at 43 CFR 3400, and the lease terms, PacifiCorp's plan for temporary abandonment of the Cottonwood/Wilberg Mine is acceptable and confirmed by us. Should you have further questions, please contact Stephen Falk of my staff at (435) 636-3600.

Sincerely,

/S/ THOMAS E. RASMUSSEN

Acting FOR Richard L. Manus
Field Manager

Enclosure
Inspection Reports (2)

cc: UT-921, SD, Utah (w/enclosure)
Manti-LaSal National Forest (w/enclosure)
599 West Price River Road
Price, Utah 84501
Energy West Mining Company (w/enclosure)
P. O. Box 310
Huntington, Utah 84528
Utah Division of Oil, Gas and Mining (w/enclosure)
Price Field Office
451 East 400 North
Price, Utah 84501

Bureau of Land Management
Inspection Report For Coal Operations

Inspection Number swf06/20/01

Thursday, August 09, 2001

Inspection Date 6/20/01

Quarter 3rd *Fiscal Year* FY2001

Mine Cottonwood *Purpose* Special

SL-064900 Lead lease
U-044025 Portal location

Current Mine Status

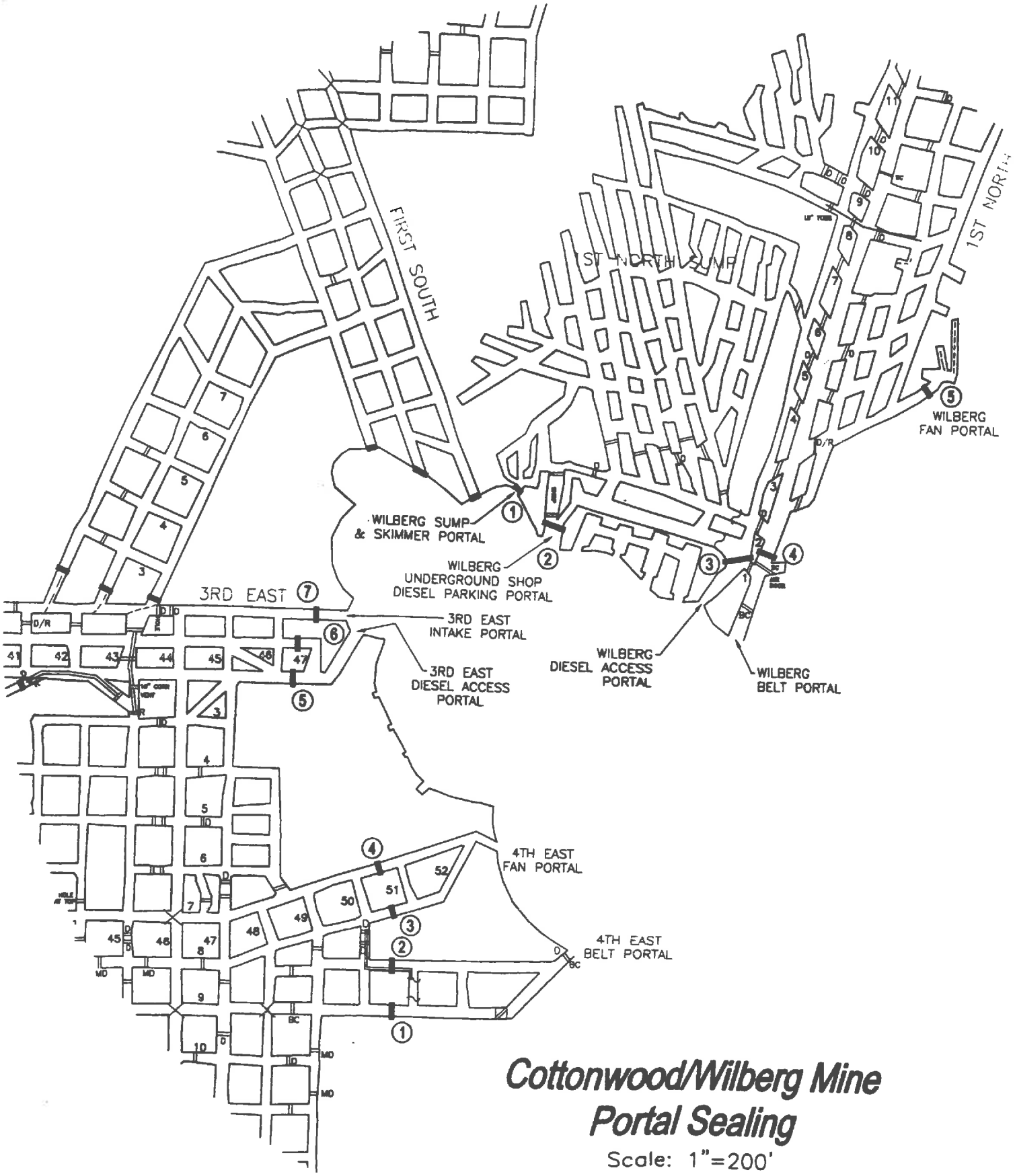
On June 20. 2001, I (Stephen Falk) and Sue Burger (summer intern) inspected the erected temporary seals at the Cottonwood/Wilberg Mine portal area. Seth McCourt was our company representative. The purpose of the inspection was to verify the temporary seals erected by Energy West at all the portals at the Cottonwood/Wilberg surface facilities.

On February 8, 2001, BLM received from Energy West a notice for "Temporary cessation of operations for the Trail Mountain, Cottonwood, and Wilberg Mines". In short summary, the Trail Mountain Mine had finished longwall mining of the reserves on the Trail Mountain property. Coal was conveyed via an enclosed conveyor belt across Cottonwood Canyon from the Trail Mountain portals to the Cottonwood belt portals and conveyed through the Cottonwood Mine to the Cottonwood/Wilberg loadout facilities in Grimes Wash. This was used for many years to allow the use of the same loadout facilities and the ability to ship triple coal haul truck trailers down the existing Wilberg haul road to the Hunter Power Plant. With the cessation of coal production at Trail Mountain, Energy West has opted to idle the operations and in so doing to construct temporary seals over all portals. Also the plan noted items to be left underground. Two underground inspections with Utah Division of Oil Gas and Mining personnel were held with company officials, one for Trail Mountain and one for Cottonwood/Wilberg. BLM attended the Trail Mountain inspection but were not able to attend the Cottonwood/Wilberg inspection. This inspection (June 20, 2001) was to note the seals that had been erected after the final underground inspection.

There are 12 portals at this complex. Three portals have been sealed since the Wilberg fire in 1984 (First South intakes). We checked the rest of the portal seals. From the east to the west, we first saw the Wilberg Fan portal which has the fan taken away and a block seal back behind the blast-proof fan housing. Around the corner were the Wilberg belt and roadway portals. Both were blocked sealed back 100 feet from the opening and the opening fenced off at the direct opening. The sump and shop portals next to the underground office were both blocked at the opening. At the 3rd East intake portal pad, the two portals were open with fence at the opening. Seals were 200 feet inby with three seals. 4th East fan portal had the fan housing sealed at the explosion doors. And last, the 4th East belt entry was fenced and block sealed 200 feet inby. These seals meet temporary closure standards for protection of the coal resource. One suggestion was given to Energy West was to fence off the tunnel access opening for the 3rd East pad. Energy West has plans for remote cameras for site security as the gate down the haul road does not have fencing on either side of the gate.

Close Out Discussion

The seals and fencing used on the portals meets the requirements for resource protection under a temporary closure of the mine. The items listed that would be left in the mine, we believe do not have any known substances that would be considered hazardous or would pose a problem to to hydrologic resources. We have no objections to things to be left in the mine.



Cottonwood/Wilberg Mine Portal Sealing

Scale: 1"=200'

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTSL-064900
Deer Creek Mine - MSHA # 42-00121, Cottonwood Mine MSHA # 42-01211
Sealed Mine Sections: 1st S, 9th E, 1st L, 2nd L, 4th W, 1st N, 1st R, 1st S, 1st E, Main North
And remainder of mine workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (12/75 - 02/89) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	12/75-02/89	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	12/75-02/89	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	12/75-02/89	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	12/75-02/89	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	12/75-02/89	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	12/75-02/89	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	12/75-02/89	Naptha	40 - 50%	64742-94-5	All Sections
	12/75-02/89	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	12/75-02/89	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	12/75-02/89	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	12/75-02/89	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	12/75-02/89	Propane	14%	74-98-6	All Sections
	12/75-02/89	Butane	13%	106-97-8	All Sections
	12/75-02/89	Toluene	17%	108-88-3	All Sections
	12/75-02/89	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	12/75-02/89	Napthalene	0.40%	91-20-3	All Sections
	12/75-02/89	Acetone	41%	67-64-1	All Sections
	12/75-02/89	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	12/75-02/89	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	12/75-02/89	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	12/75-02/89	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	12/75-02/89	Mineral Oil	20 - 25%	8042-47-5	All Sections
	12/75-02/89	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	12/75-02/89	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	12/75-02/89	Methanol	<20%	67-56-1	All Sections
	12/75-02/89	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	12/75-02/89	Heptane	69 - 79%	142-82-5	All Sections
	12/75-02/89	Ethyl Ether	11 - 21%	60-29-7	All Sections
	12/75-02/89	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	12/75-02/89	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	12/75-02/89	Heptane	60 - 70%	142-82-5	All Sections
	12/75-02/89	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	12/75-02/89	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	12/75-02/89	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	12/75-02/89	None			All Sections
Cat Transmission and Drive Train Oil	12/75-02/89	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	12/75-02/89	Monoethanolamine	<10%	141-41-3	All Sections
	12/75-02/89	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	12/75-02/89	Mineral Oil	70 - 95%	Mixture	All Sections
	12/75-02/89	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	12/75-02/89	Lubricant base oil	87 - 91%	Various	All Sections
	12/75-02/89	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	12/75-02/89	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	12/75-02/89	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	12/75-02/89	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	12/75-02/89	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	12/75-02/89	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	12/75-02/89	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	12/75-02/89	Trichloroethylene	95 - 99%	79-01-6	All Sections
	12/75-02/89	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	12/75-02/89	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	12/75-02/89	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	12/75-02/89	Deionized Water	1 - 3%	7732-18-5	All Sections
	12/75-02/89	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTSL-064900
Deer Creek Mine - MSHA # 42-00121, Cottonwood Mine MSHA # 42-01211
Sealed Mine Sections: 1st S, 9th E, 1st L, 2nd L, 4th W, 1st N, 1st R, 1st S, 1st E, Main North
And remainder of mine workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (12/75 - 02/89) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	12/75-02/89	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	12/75-02/89	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	12/75-02/89	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	12/75-02/89	Calcium sulfate	2 - 10%		All Sections
	12/75-02/89	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	12/75-02/89	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	12/75-02/89	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	12/75-02/89	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	12/75-02/89	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	12/75-02/89	Lead	34%	7439-92-1	All Sections
	12/75-02/89	Lead Dioxide	31%	1309-60-0	All Sections
	12/75-02/89	Lead Sulfate	<1%	7446-14-2	All Sections
	12/75-02/89	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	12/75-02/89	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	12/75-02/89	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	12/75-02/89	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	12/75-02/89	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	12/75-02/89	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	12/75-02/89	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	12/75-02/89	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	12/75-02/89	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	12/75-02/89	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	12/75-02/89	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	12/75-02/89	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	12/75-02/89	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	12/75-02/89	Portland Cement		65997-15-1	All Sections
	12/75-02/89	Crystalline Silicon Dioxide		13397-24-5	All Sections
	12/75-02/89	Calcium Hydroxide		001-305-620	All Sections
	12/75-02/89	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	12/75-02/89	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	12/75-02/89	Polyglycols	60 - 100%	Mixture (2)	15 W
	12/75-02/89	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	12/75-02/89	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	12/75-02/89	Polyester Resin	5 - 15%	Not Reported	All Sections
	12/75-02/89	Styrene Monomer	3 - 7%	100-42-5	All Sections
	12/75-02/89	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	12/75-02/89	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	12/75-02/89	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	12/75-02/89	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	12/75-02/89	Isobutane	2 - 10%	75-28-5	All Sections
	12/75-02/89	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	12/75-02/89	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	12/75-02/89	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	12/75-02/89			64742-48-9	All Sections
	12/75-02/89			64742-88-7	All Sections
	12/75-02/89	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	12/75-02/89	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	12/75-02/89	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	12/75-02/89	Lubricant base oil	>99	Various	All Sections
	12/75-02/89	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	12/75-02/89	Lubricant base oil	87 - 91%	Various	All Sections
	12/75-02/89	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	12/75-02/89	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	12/75-02/89	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTSL-064900
Partial Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
- **Quantity - Historical Data**
- **Quality - Historical Data (UPDES Parameters)**
  - **Total Suspended Solids**
  - **Iron (Total & Dissolved)**
  - **Oil & Grease**
  - **Total Dissolved Solids**
  - **Ph**

UPDES Permit Data:

Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

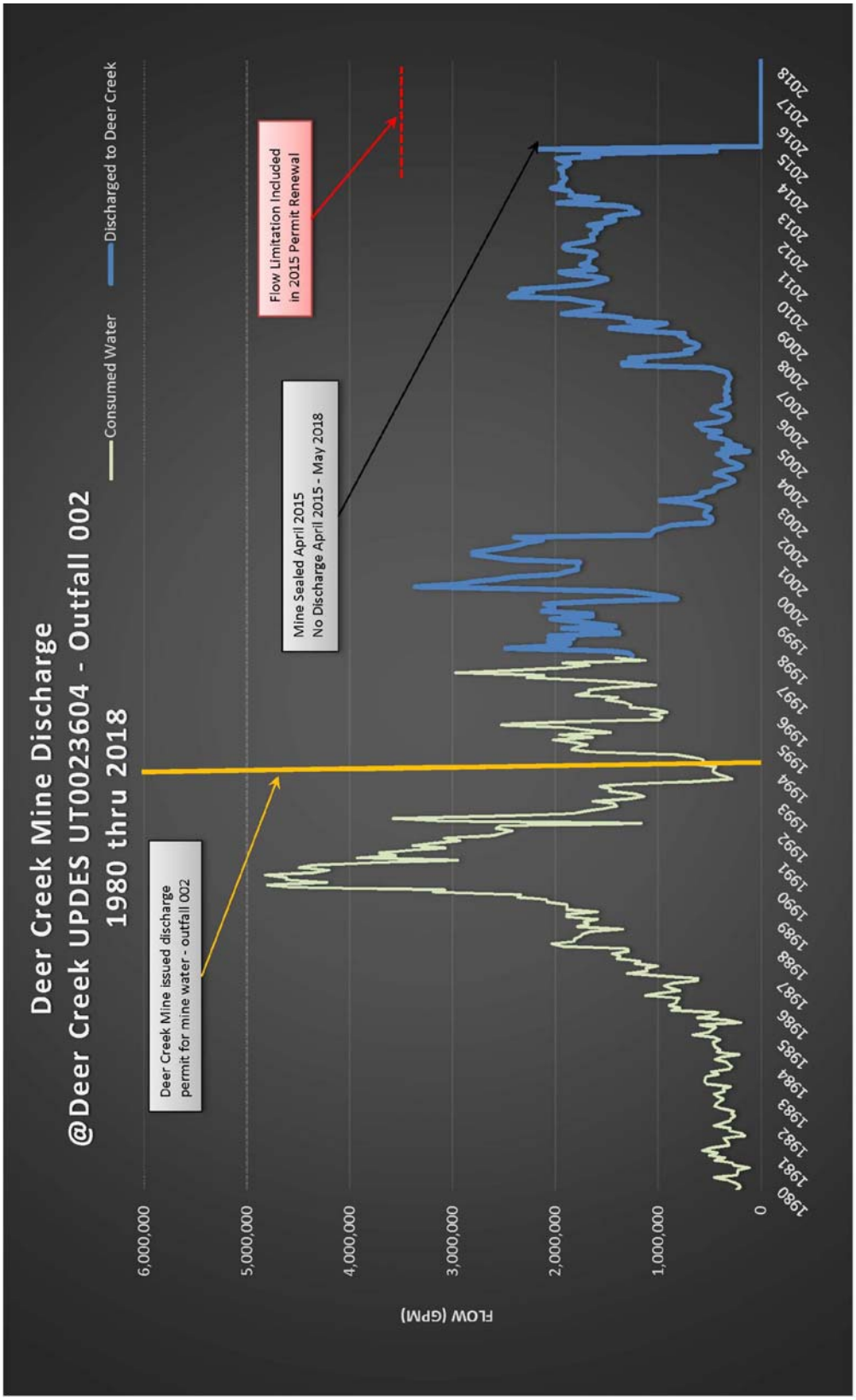
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



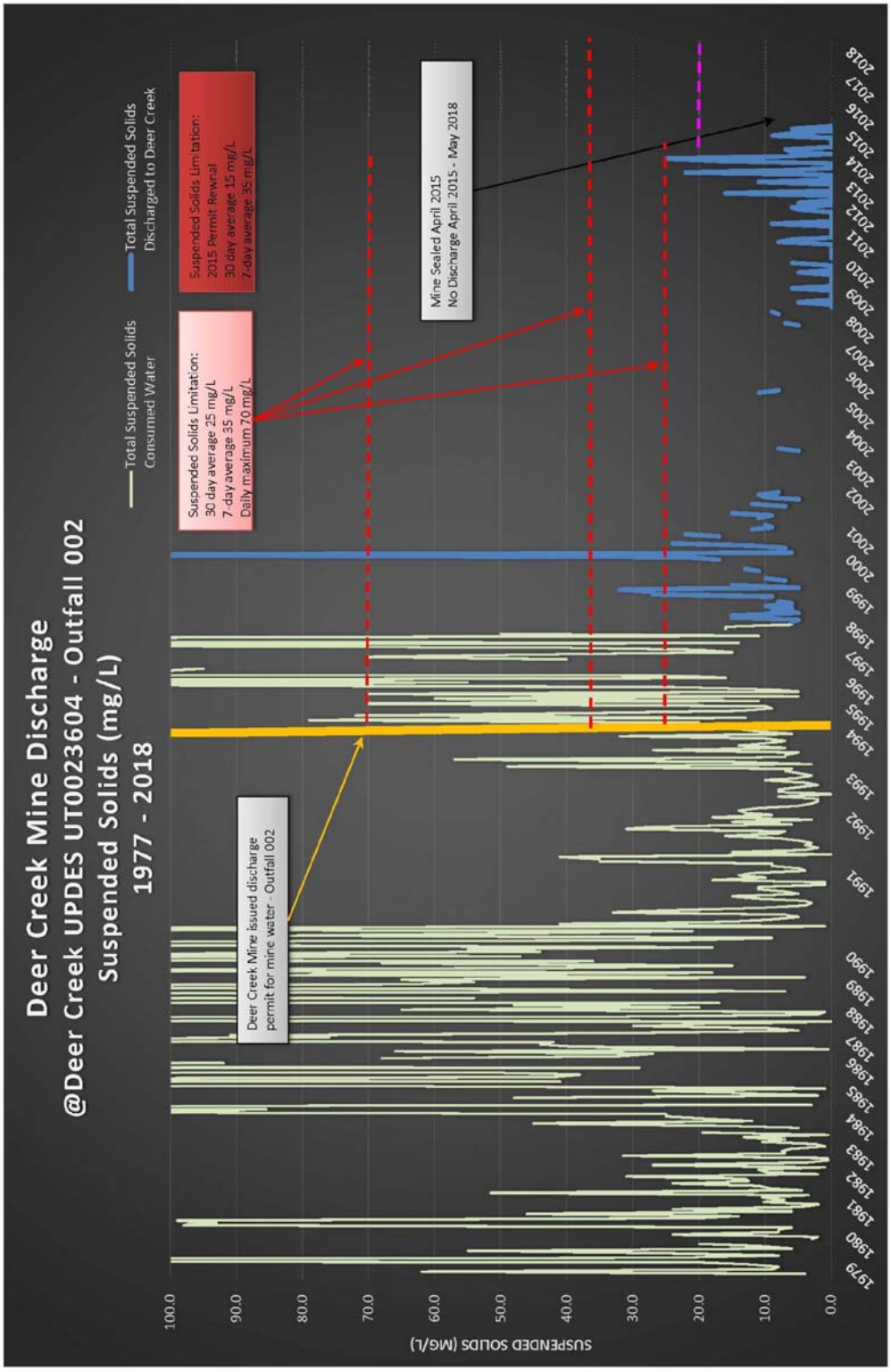
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



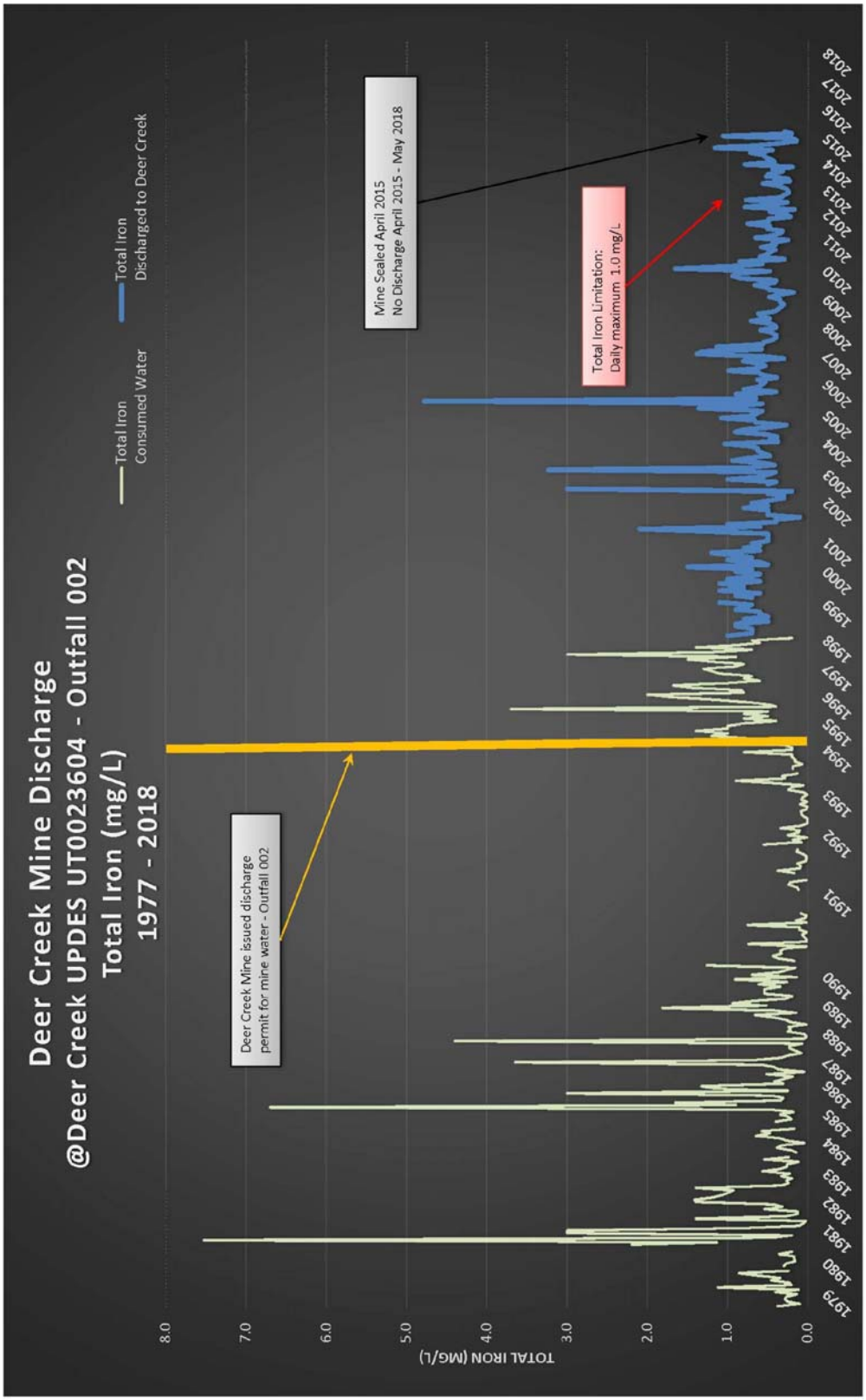
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



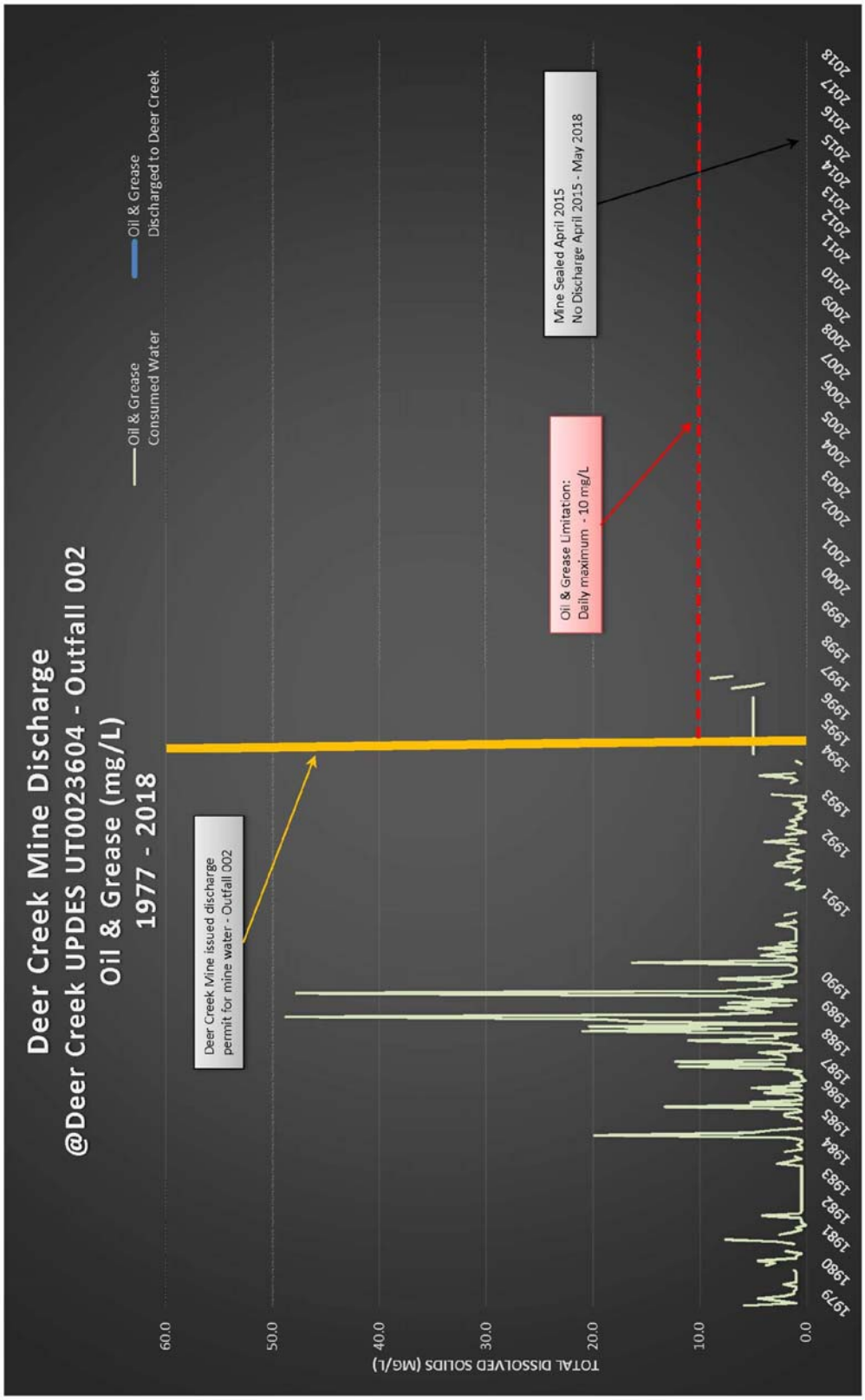
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



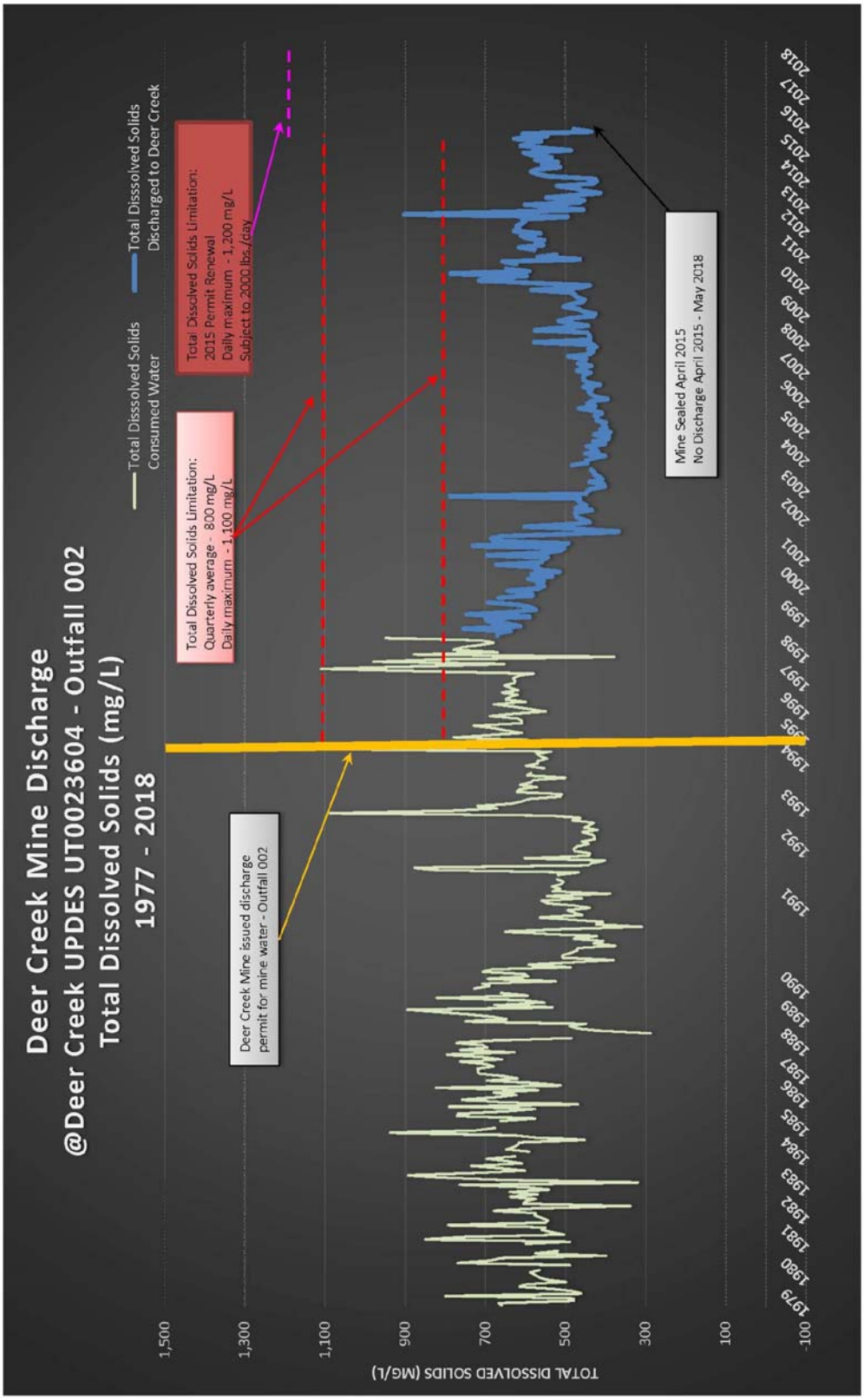
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



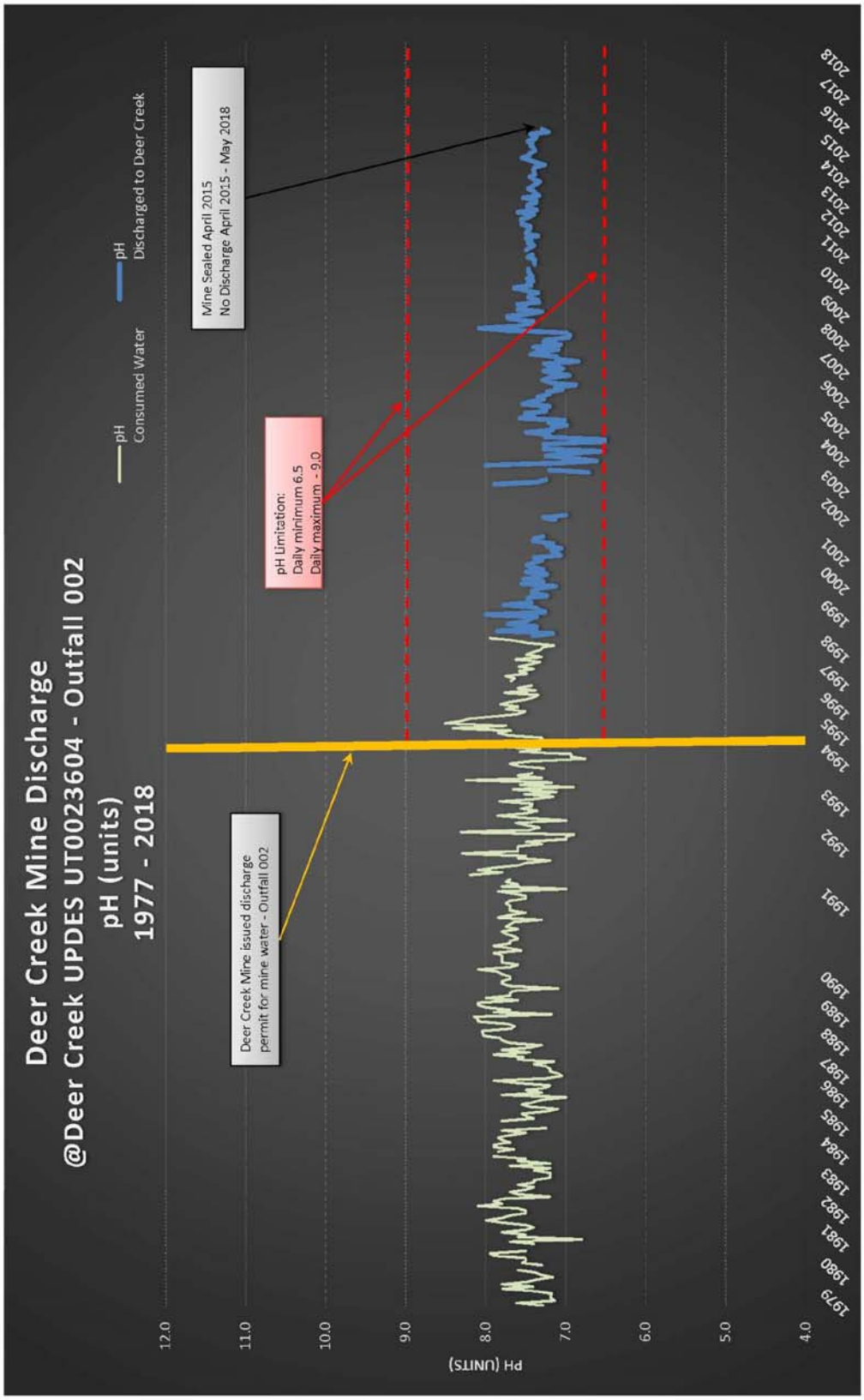
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: PacifiCorp

Mine: Deer Creek Mine, Cottonwood Mine **Permit Number:** C/015/0018, 0019

Title: Amendment to Add Supplemental Volume, 18 Lease Relinquishments, PacifiCorp Deer Creek Mine C/015/0018, Cottonwood Mine C/015/0019 Emery County, Utah

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

Copies of Federal Lease Relinquishments Submitted to BLM Dated November 7, 2018 for Reference Purposes

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

☐ Yes ☒ No 1. Change in the size of the Permit Area? Acres: _____ ☐ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes ☒ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # _____
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☐ Yes ☒ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes ☒ No 15. Does the application require or include soil removal, storage or placement?
☐ Yes ☒ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes ☒ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes ☒ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☒ Yes ☐ No 19. Does the application require or include certified designs, maps or calculation?
☒ Yes ☐ No 20. Does the application require or include subsidence control or monitoring?
☐ Yes ☒ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

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

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

Kenneth Fleck — Kenneth S. Fleck — Manager of Environmental Affairs DEC. 3, 2018
Print Name — Sign Name, Position, Date

Subscribed and sworn to before me this 3rd day of December, 2018

Miranda Lofley
Notary Public

My commission Expires: 03-26, 2022

Attest: State of Utah } ss:
County of Emery

MIRANDA LOFLEY
NOTARY PUBLIC
STATE OF UTAH
COMMISSION # 699728
COMM. EXP. 03/26/2022

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining

Form DOGM- C1 (Revised March 12, 2002)

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

Permittee: PacifiCorp
Mine: Deer Creek Mine, Cottonwood Mine **Permit Number:** C/015/0018, 0019
Title: Amendment to Add Supplemental Volume, 18 Lease Relinquishments, PacifiCorp Deer Creek Mine C/015/0018, Cottonwood Mine C/015/0019, Emery County, Utah)

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	Supplemental Volume, Lease Relinquishments, PacifiCorp Deer Creek Mine C/015/0018, Cottonwood Mine C/015/0019, Emery County, Utah.
☐ Add	☐ Replace	☐ Remove	
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☐ Add	☐ Replace	☐ Remove	

Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	**Received by Oil, Gas & Mining**
This is a new volume of supplemental information related to partial and full relinquishments of 18 Federal Leases in the East Mountain LMU UTU-73336 for reference purposes.	

Full Relinquishment
Federal Coal Lease
UTU-47978

November, 2018

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Prepared by:

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-47978, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-47978. The total acreage being surrendered is 180.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTU-47978 is described below:

Federal Coal Lease UTU-47978		
Lease Readjustment Effective Date:		10/1/2011 to 10/1/2021
Lessee of Record:		PacifiCorp
Total Federal Coal Lease Acres:		**180.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 27:	S½NW¼	80.00
Sec 28:	S½NE¼, E½SE¼NW¼	100.00
	Total Lease Acres for Full Relinquishment:	**180.00**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov, 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47978

LEASE ACTIVITIES

1) Coal Lease Number: UTU-47978 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 180.00; Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of area relinquished 180 acres. No areas retained. See also Figure 1 (a map depicting the area to be relinquished in its entirety).*

Original Lease Acreage: 3,347.31 Relinquished to date: 3,167.31 acres Remaining: 180.00 acres being relinquished.

- *Partial relinquishment: 1,347.31 acres – Accepted effective: 4/24/1992*
- *Partial relinquishment: 1,820.00 acres – Accepted effective: 10/16/1992*

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)? YES ☐ NO ☒ (If "YES", describe:

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47978

11) Date of initial mining: August 1984; last mining: July 1992.

12) Number of coal beds mined: 1 coal seam (Hiawatha)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to explanation of spring monitoring reductions*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47978

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D?
YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *Refer to DOGM write up*

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F?
YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
- *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities?
YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐
(If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

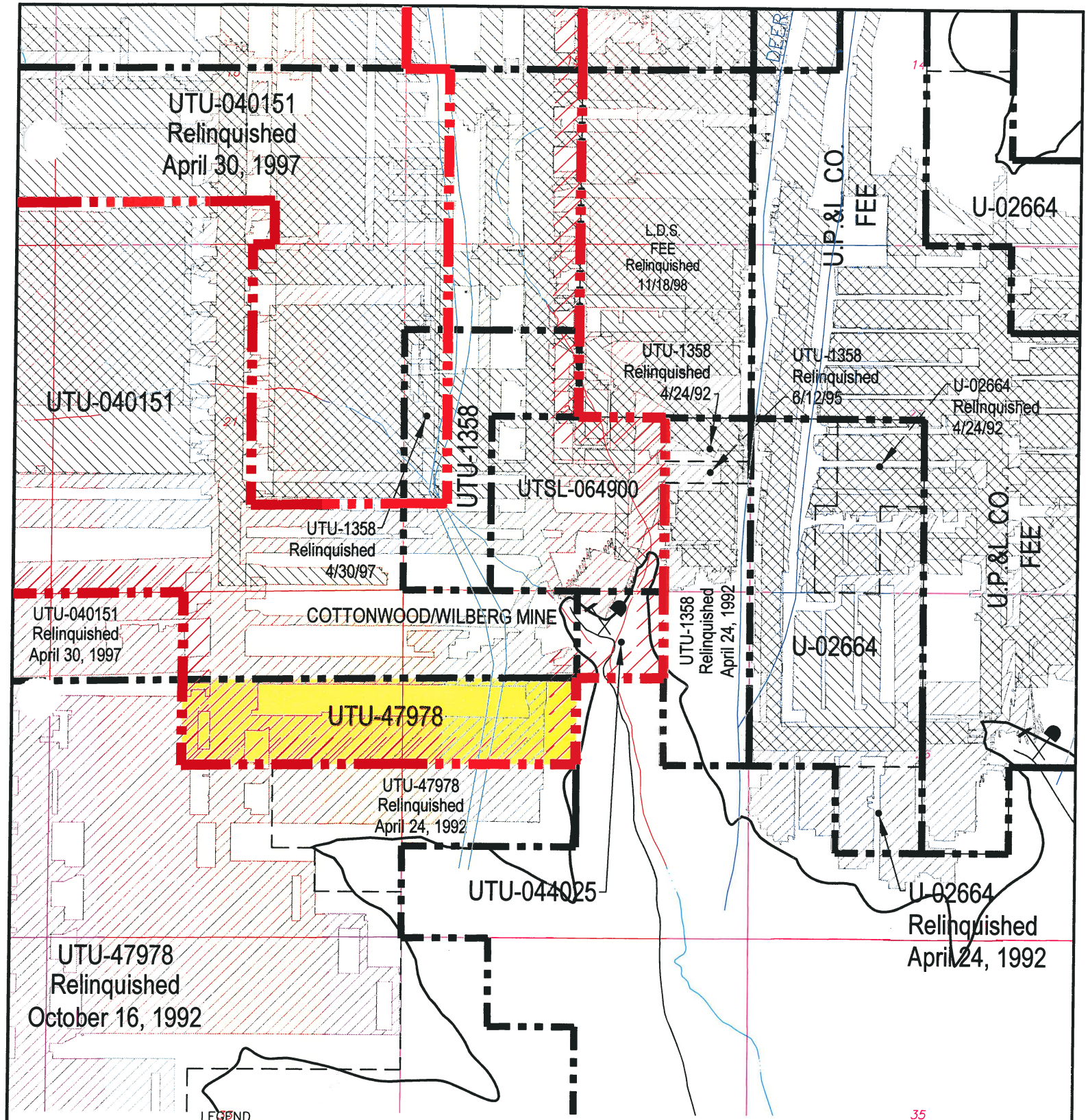
Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-47978

Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTU-47978 is described below:

Federal Coal Lease UTU-47978		
Lease Readjustment Effective Date:		10/1/2011 to 10/1/2021
Lessee of Record:		PacifiCorp
Total Federal Coal Lease Acres:		**180.00**
Description of Lease Acreage Being Relinquished		**Acres**
T17S, R7E, SLB&M Emery County, UT		
Sec 27:	S½NW¼	80.00
Sec 28:	S½NE¼, E½SE¼NW¼	100.00
	Total Lease Acres for Full Relinquishment:	**180.00**
	Total Lease Acres Remaining:	**0.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-47978 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA
- FEDERAL COAL LEASE RETAINMENT AREA

N

CAD FILE NAME/DISK#: UTU-47978

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47978

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1"=2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

FEDERAL COAL LEASE UTU-47978
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-47978 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Hiawatha seam. Coal reserves were recovered by longwall methods. Mining in the Hiawatha seam took place between 8/1984 and 7/1992.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In

steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the East Mountain LMU area were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

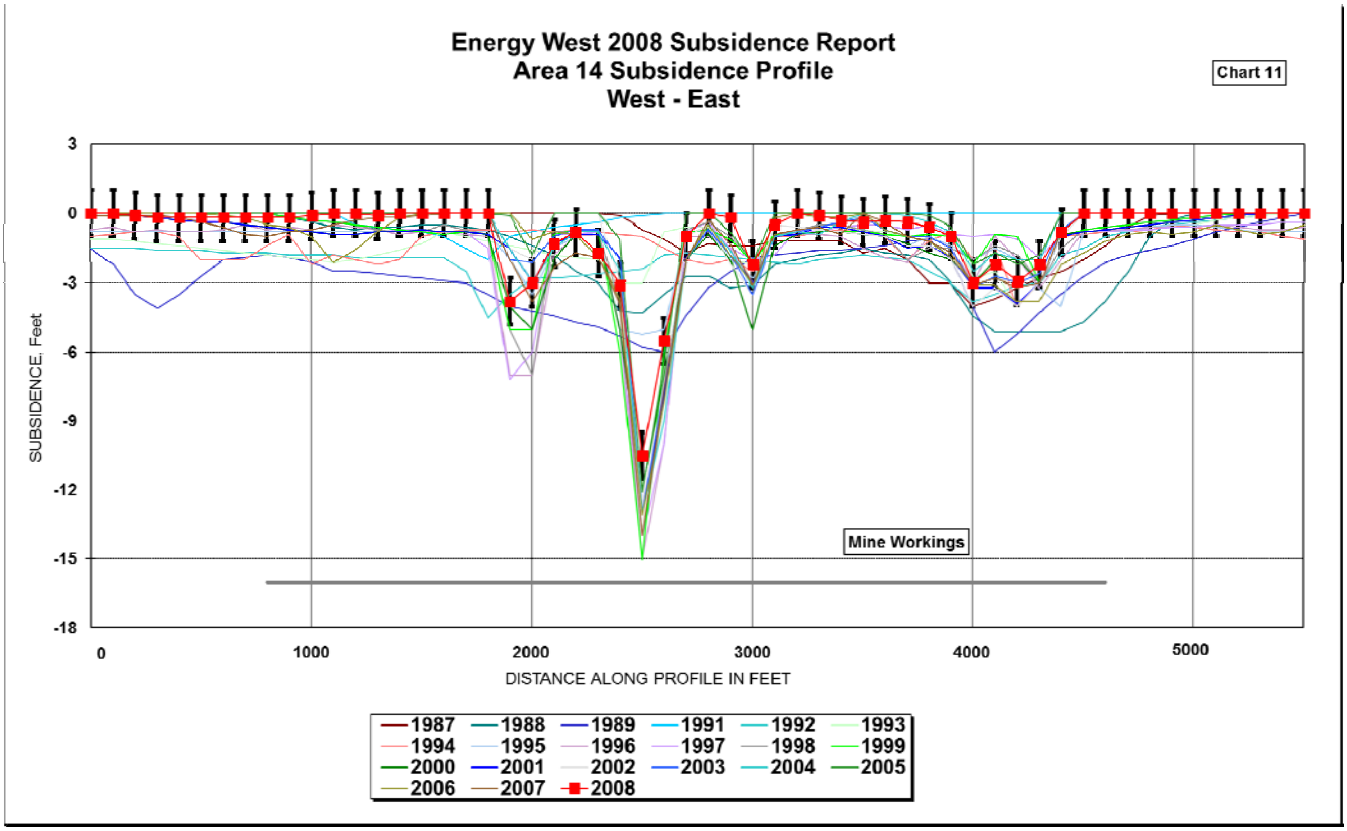
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

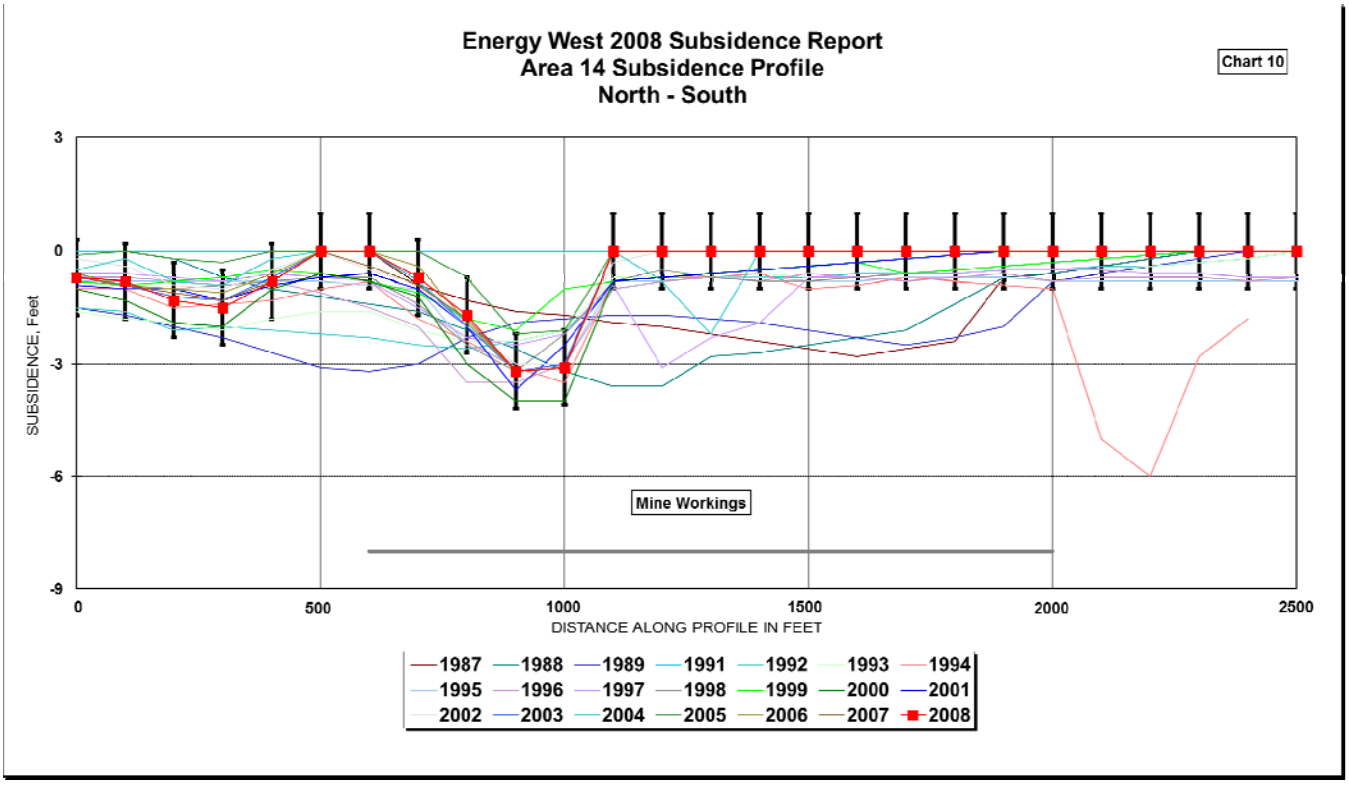
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-47978 Subsidence Data

Subsidence in the lease UTU-47978 area was monitored from 1987 to 2008. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1999 and 2009. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

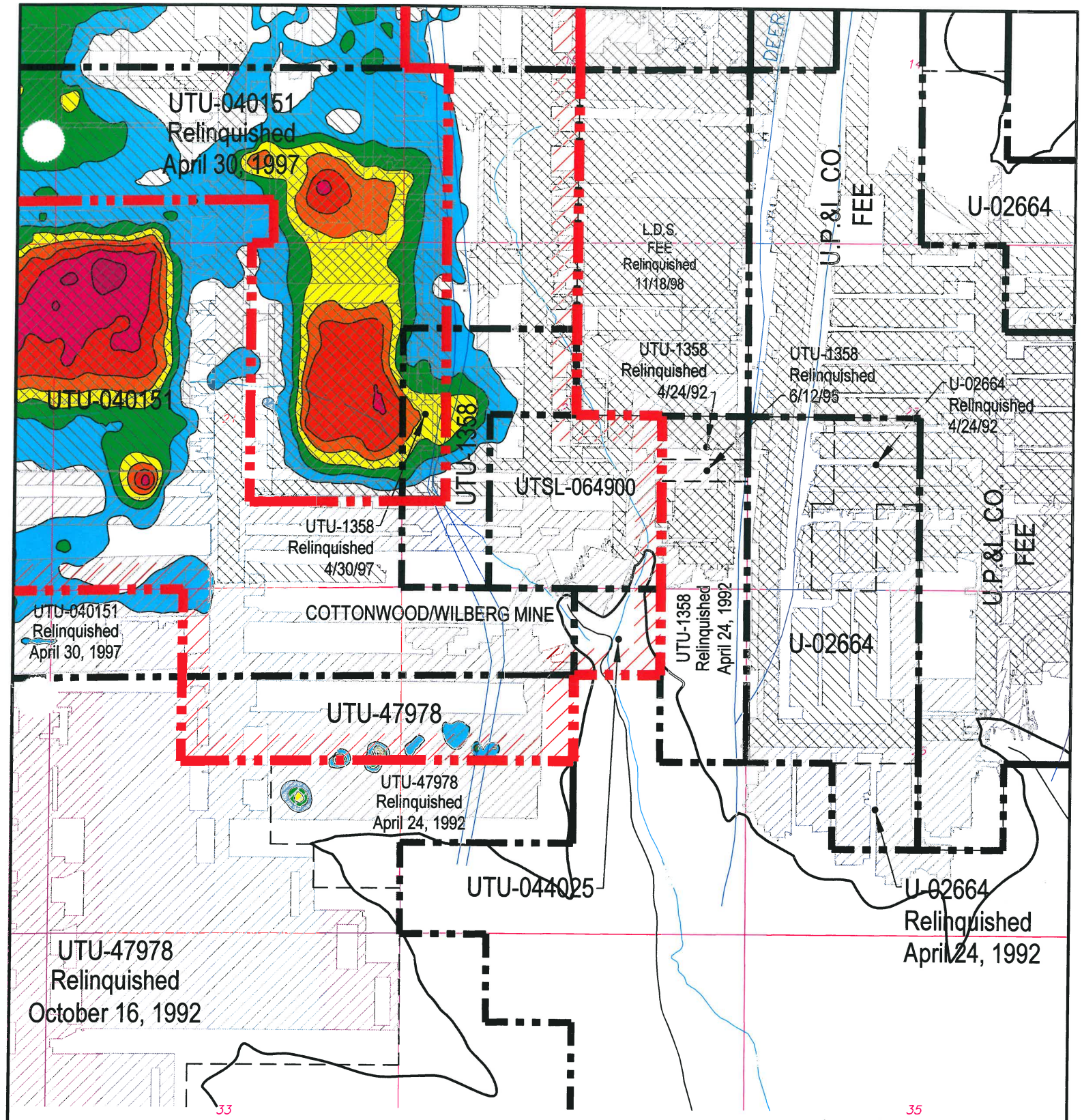
PacifiCorp delineated a series of two profiles (Area 14) covering the main longwall panel district in Lease UTU-47978, shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 15 feet. Some minor cliff spalling of the Castlegate Sandstone occurred during undermining. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-47978.

The proposed relinquishment area of Lease UTU-47978 is stable and subsidence is substantially complete.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-47978 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

Subsidence Legend

- 2'-4' Subsidence
- 4'-6' Subsidence
- 6'-8' Subsidence
- 8'-10' Subsidence
- 10'-12' Subsidence
- 12'-14' Subsidence
- 14'-16' Subsidence
- 16'-18' Subsidence

CAD FILE NAME/DISK#: UTU-47978

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

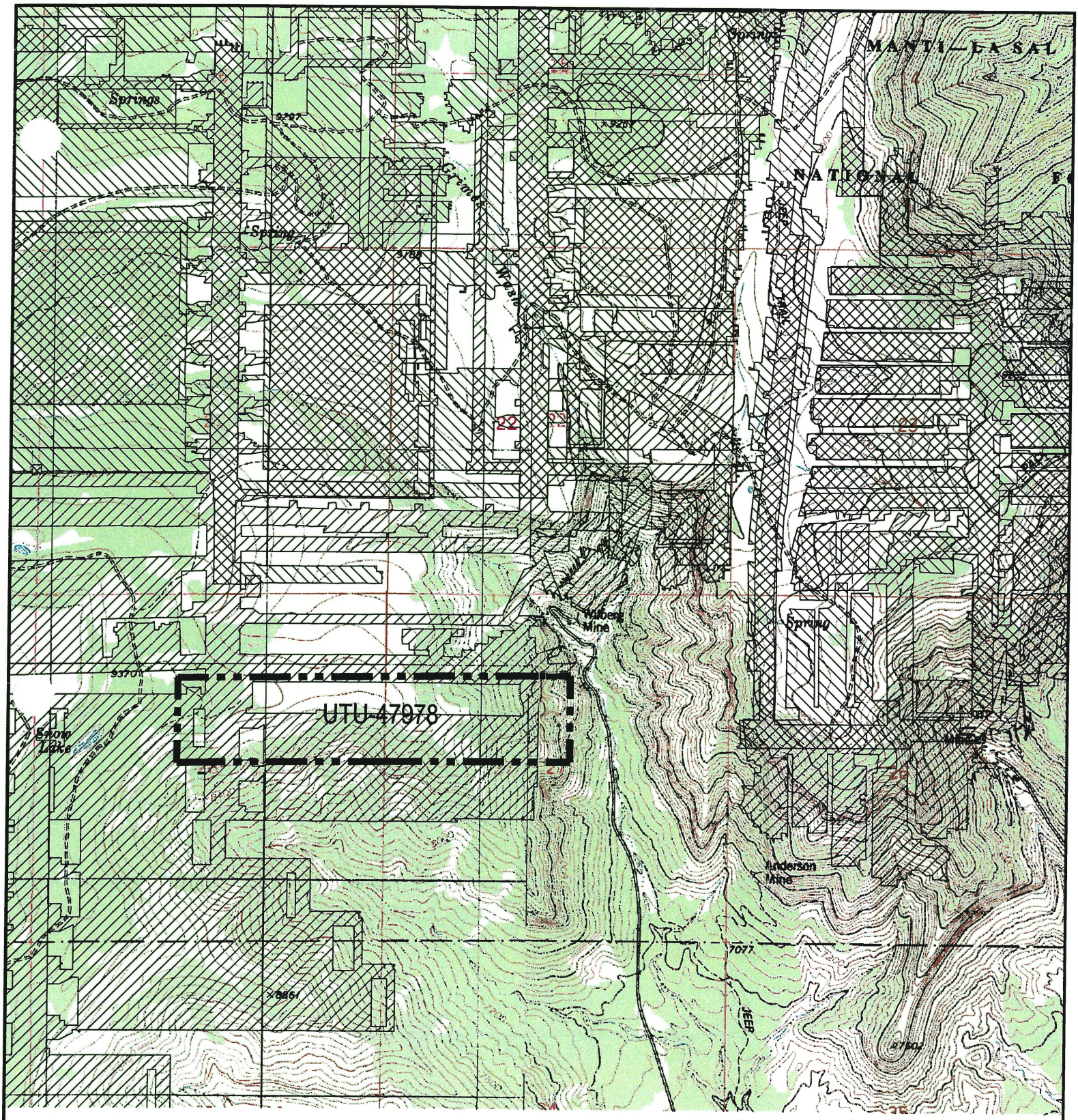
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47978
SUBSIDENCE BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX A	
SCALE:	1" =2000'	DRAWING #:	
DATE:	MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-47978 Full Lease Relinquishment
Appendix B

Evaluation of Impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-47978 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-47978. No restoration and/or mitigation efforts are required for Lease UTU-47978. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-47978 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTU-47978

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

FEDERAL LEASE ACREAGE RETAINED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47978
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-47978 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Statement concerning Hydrologic Monitoring Reduction Amendment, submitted May 03, 2013, and approved by UDOGM November 25, 2014 and previous reduction amendments and relinquishments.

The purpose of this amendment was to reduce the hydrologic monitoring responsibilities of PacifiCorp for the following reasons:

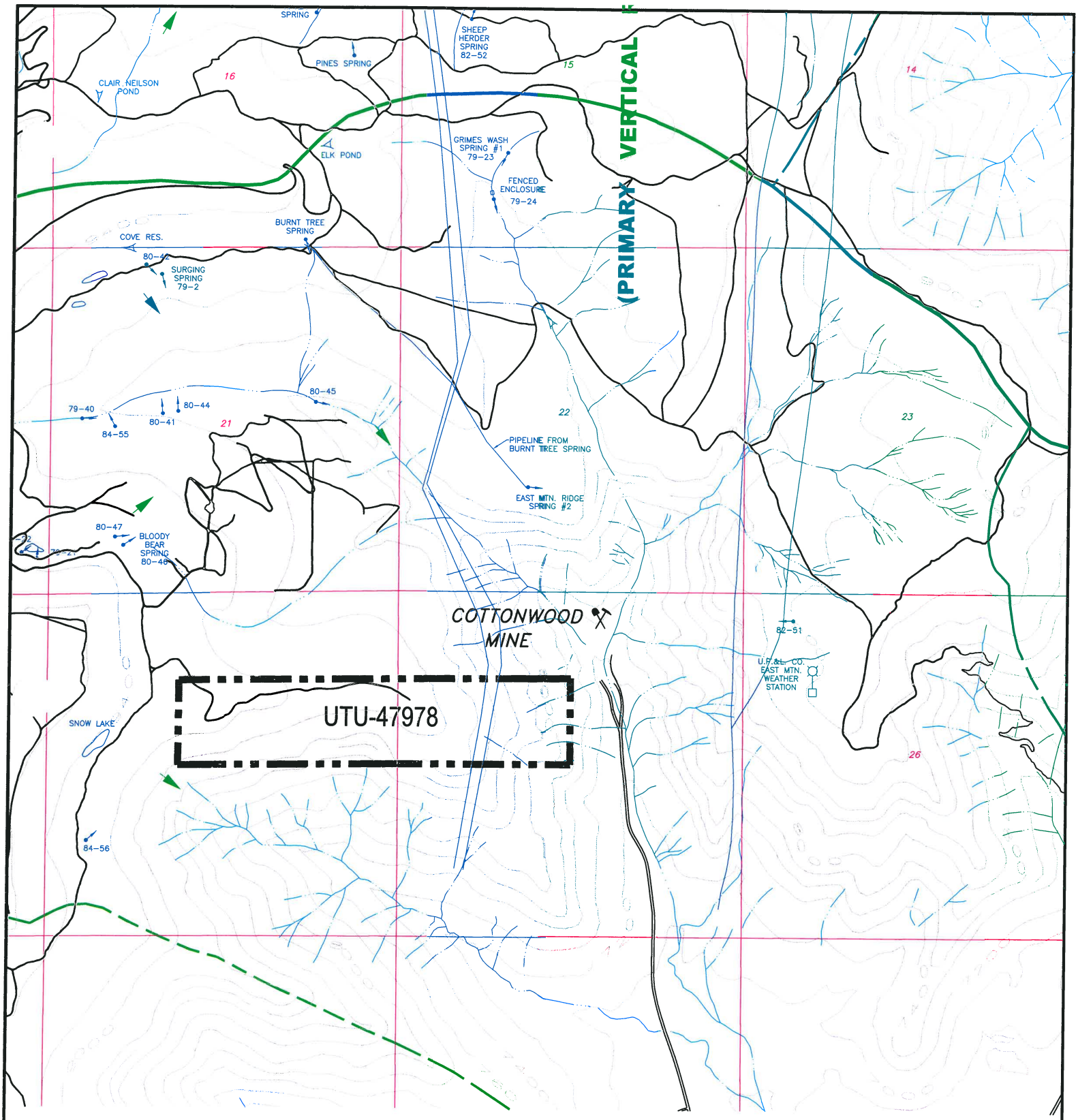
To eliminate sites outside of existing permit boundaries,
To eliminate sites outside of federal lease boundaries,
To eliminate sites in areas that were mined out and stabilized,
To eliminate sites in areas that will not be mined.

Two investigations are referred to in the amendment which conclude that there is no significant relationship between underground mining and intercepted groundwater and changes in surface and groundwater quantity or quality.

PacifiCorp submitted the first of three phases of lease relinquishment to the BLM for areas in the southern part of the LMU that had been mined out and where subsidence was considered to be substantially complete, or would not be mined. These relinquishment phases were approved by BLM and its Memorandum Of Understanding (MOU) partners (UDOGM, USDA Forest Service) in 1992, 1997 (East Mountain LMU UTU-73336), and 2009 (Trail Mountain LMU).

The approval of the monitoring reduction amendment by DOGM in 2014 is an indication of agreement by all parties involved that there have been no impacts to surface or groundwater from the mining in these leases. The fact that PacifiCorp is no longer required by the MOU participant agencies to monitor surface or groundwater in this area is sufficient documentation for the remainder of the leases to be relinquished.

Mining in the southern half of the East Mountain LMU has been essentially complete since the year 2001, when the Cottonwood Mine ceased production and the portals were closed. In the intervening years, as those areas have stabilized, monitoring of subsidence and hydrology were terminated as those areas were considered to be stable and not impacted by mining.



CAD FILE NAME/DISK#: UTU-47978

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47978
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-47978 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Vegetation of Lease UTU-47978 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-47978:

Aspen/Conifer	AS/C
Barren/Sparse Vegetation	BR/SV
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Pinyon-Juniper	PJ
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Unita Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

Stat. of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR
OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

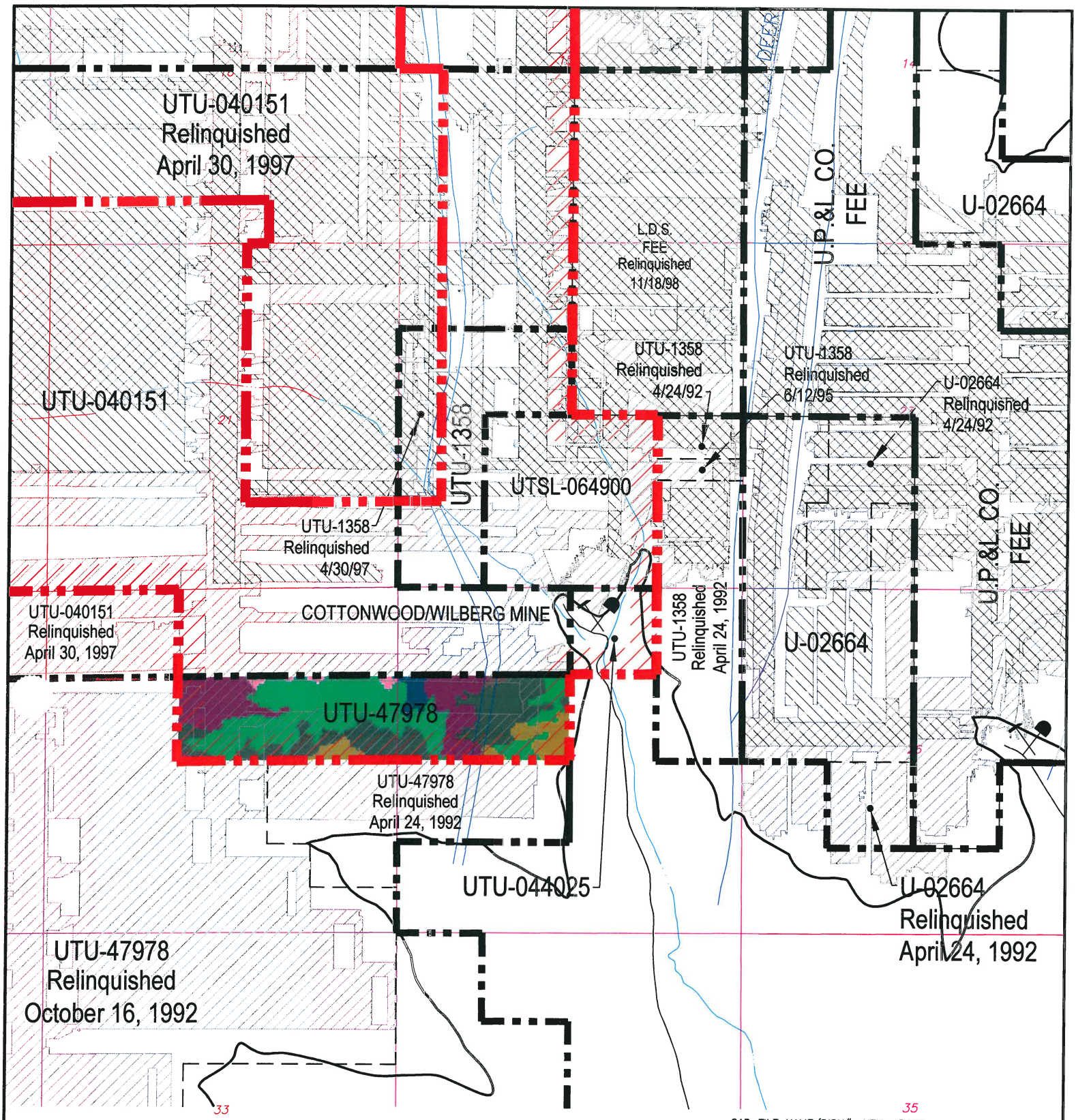
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-47978 area. There were no surface facilities or installations on this lease.



CAD FILE NAME/DISK#: UTU-47978

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-47978 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

VEG TYPE CLASS

- Barren/Sparse Vegetation, BR/SV
- Bristlecone Pine/Limber Pine, BC/LM
- Mountain Big Sagebrush, MSB
- Spruce/Fir, SF
- Upland Herbaceous, UHE

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-47978
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1"=2000'	DRAWING #:	
DATE: MAY 1, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-47978 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in Lease UTU-47978.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-47978 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTU-47978 took place on May 7, 2001, prior to sealing of the Cottonwood/Wilberg Mine. CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-47978 Full Relinquishment

Mine Name and MSHA Mine # Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 2nd S Mains, 4th - 6th E, 4th W, 5th W, and Remainder of Mine Workings

Coal Bed: Hiawatha Coal Seam

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

D-M Pl 11/7/18

(Officer of the Lessee) (Date)

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-47978 Full Relinquishment

Mine Name and MSHA Mine # Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 2nd S Mains, 4th - 6th E, 4th W, 5th W, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-47978 Full Relinquishment

Mine Name and MSHA Mine # Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 2nd S Mains, 4th - 6th E, 4th W, 5th W, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTU-47978 Full Relinquishment

Mine Name and MSHA Mine # Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 2nd S Mains, 4th - 6th E, 4th W, 5th W, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-47978 Full Relinquishment

Mine Name and MSHA Mine # Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 2nd S Mains, 4th - 6th E, 4th W, 5th W, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-47978 Full Relinquishment

Mine Name and MSHA Mine # Cottonwood Mine MSHA # 42-01211

Mine Section (if applicable) 2nd S Mains, 4th - 6th E, 4th W, 5th W, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 08/84 – 07/92

Submittal Date: NOV. 7, 2018

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Price Field Office
125 South 600 West
Price, Utah 84501

3482
SL-064900
(UT-070)

Pamela Grubaugh-Littig
Permit Supervisor
Utah Division of Oil, Gas and Mining
1594 West North Temple Street
Salt Lake City, Utah 84114-5801

AUG 30 2001

Re: Temporary Closure, Cottonwood/Wilberg Mines, PacifiCorp

Dear Mrs. Grubaugh-Littig:

Enclosed is a copy of two inspection reports of joint onsites at the subject mines conducted by field personnel from both our agencies. The report was to document findings at the said mine during temporary closure. Along with these reports are our recommendations on the closure plan received from the company.

PacifiCorp, through its wholly owned subsidiary Energy West, Inc., sent a notice to us on February 8, 2001, of "Temporary Cessation of Operations for the Trail Mountain, Cottonwood and Wilberg Mines". We have previously commented on the Trail Mountain Mine portion of the cessation plan. An underground inspection of the Cottonwood/Wilberg Mine was held which we could not attend. However, we have visited the mine portal areas and participated in the underground inspection of the area to be sealed in the Deer Creek/ Wilberg shaft area. The Deer Creek/Wilberg shaft area was inspected from the Deer Creek Mine, as the company had to seal the 1st South Mains as access to the top of the shaft. This was far more practical than trying to seal at the shaft. These two inspection reports are enclosed. The inspections verify the closure plan and support our findings for the proposed cessation plan.

The application for "Temporary Cessation of Operations" submitted by PacifiCorp details the plans for putting the Cottonwood/Wilberg Mine in a temporarily closed condition with temporary portal seals and documents what items will be left in the mine. Most of the items to be left are belt structure, power cable and pipe. Should the mine be re-opened much of these items will be used or replaced. Should the mine never re-open and reclamation occurs, these items of themselves should not cause any impacts to the hydrologic regime in the mine. These items are inert metals with no liquids or oils. No other items potentially hazardous or toxic were noted during the inspection. We therefore have no objections to leaving the listed items underground should the mine never be opened again.

With regard to temporary sealing of the portals, the plan is adequate to protect the unmined coal resource and bar access to the resource. The seals meet standards set by MSHA and are acceptable to us for compliance with rules under the Mineral Leasing Act for abandonment and protection of the unmined coal and other mineral resource (43 CFR 3484.2 (b)).

Pursuant to the Mineral Leasing Act of 1920, as amended, and in conjunction with the rules at 43 CFR 3400, and the lease terms, PacifiCorp's plan for temporary abandonment of the Cottonwood/Wilberg Mine is acceptable and confirmed by us. Should you have further questions, please contact Stephen Falk of my staff at (435) 636-3600.

Sincerely,

/S/ THOMAS E. RASMUSSEN

Acting FOR Richard L. Manus
Field Manager

Enclosure
Inspection Reports (2)

cc: UT-921, SD, Utah (w/enclosure)
Manti-LaSal National Forest (w/enclosure)
599 West Price River Road
Price, Utah 84501
Energy West Mining Company (w/enclosure)
P. O. Box 310
Huntington, Utah 84528
Utah Division of Oil, Gas and Mining (w/enclosure)
Price Field Office
451 East 400 North
Price, Utah 84501

Bureau of Land Management
Inspection Report For Coal Operations

Inspection Number swf06/20/01

Thursday, August 09, 2001

Inspection Date 6/20/01

Quarter 3rd *Fiscal Year* FY2001

Mine Cottonwood *Purpose* Special

SL-064900 Lead lease
U-044025 Portal location

Current Mine Status

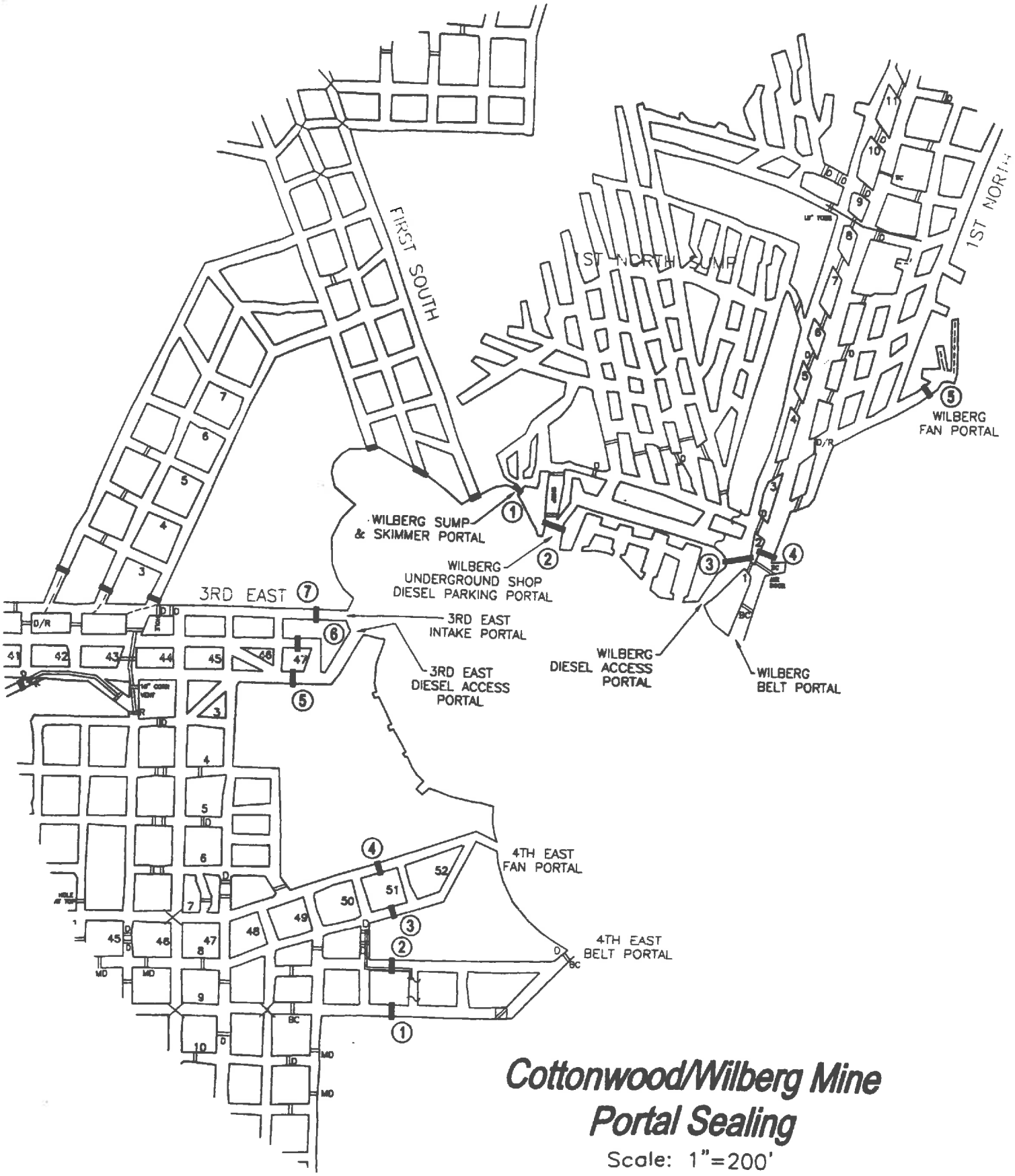
On June 20. 2001, I (Stephen Falk) and Sue Burger (summer intern) inspected the erected temporary seals at the Cottonwood/Wilberg Mine portal area. Seth McCourt was our company representative. The purpose of the inspection was to verify the temporary seals erected by Energy West at all the portals at the Cottonwood/Wilberg surface facilities.

On February 8, 2001, BLM received from Energy West a notice for "Temporary cessation of operations for the Trail Mountain, Cottonwood, and Wilberg Mines". In short summary, the Trail Mountain Mine had finished longwall mining of the reserves on the Trail Mountain property. Coal was conveyed via an enclosed conveyor belt across Cottonwood Canyon from the Trail Mountain portals to the Cottonwood belt portals and conveyed through the Cottonwood Mine to the Cottonwood/Wilberg loadout facilities in Grimes Wash. This was used for many years to allow the use of the same loadout facilities and the ability to ship triple coal haul truck trailers down the existing Wilberg haul road to the Hunter Power Plant. With the cessation of coal production at Trail Mountain, Energy West has opted to idle the operations and in so doing to construct temporary seals over all portals. Also the plan noted items to be left underground. Two underground inspections with Utah Division of Oil Gas and Mining personnel were held with company officials, one for Trail Mountain and one for Cottonwood/Wilberg. BLM attended the Trail Mountain inspection but were not able to attend the Cottonwood/Wilberg inspection. This inspection (June 20, 2001) was to note the seals that had been erected after the final underground inspection.

There are 12 portals at this complex. Three portals have been sealed since the Wilberg fire in 1984 (First South intakes). We checked the rest of the portal seals. From the east to the west, we first saw the Wilberg Fan portal which has the fan taken away and a block seal back behind the blast-proof fan housing. Around the corner were the Wilberg belt and roadway portals. Both were blocked sealed back 100 feet from the opening and the opening fenced off at the direct opening. The sump and shop portals next to the underground office were both blocked at the opening. At the 3rd East intake portal pad, the two portals were open with fence at the opening. Seals were 200 feet inby with three seals. 4th East fan portal had the fan housing sealed at the explosion doors. And last, the 4th East belt entry was fenced and block sealed 200 feet inby. These seals meet temporary closure standards for protection of the coal resource. One suggestion was given to Energy West was to fence off the tunnel access opening for the 3rd East pad. Energy West has plans for remote cameras for site security as the gate down the haul road does not have fencing on either side of the gate.

Close Out Discussion

The seals and fencing used on the portals meets the requirements for resource protection under a temporary closure of the mine. The items listed that would be left in the mine, we believe do not have any known substances that would be considered hazardous or would pose a problem to to hydrologic resources. We have no objections to things to be left in the mine.



Cottonwood/Wilberg Mine Portal Sealing

Scale: 1"=200'

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-47978
Cottonwood Mine MSHA # 42-01211
Sealed Mine Sections: 2nd S Mains, 4th - 6th E, 4th W, 5th W
And remainder of mine workings

Coal Bed Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (08/84 - 07/92) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	8/84 - 07/92	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	8/84 - 07/92	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	8/84 - 07/92	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	8/84 - 07/92	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	8/84 - 07/92	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	8/84 - 07/92	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	8/84 - 07/92	Naptha	40 - 50%	64742-94-5	All Sections
	8/84 - 07/92	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	8/84 - 07/92	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	8/84 - 07/92	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	8/84 - 07/92	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	8/84 - 07/92	Propane	14%	74-98-6	All Sections
	8/84 - 07/92	Butane	13%	106-97-8	All Sections
	8/84 - 07/92	Toluene	17%	108-88-3	All Sections
	8/84 - 07/92	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	8/84 - 07/92	Napthalene	0.40%	91-20-3	All Sections
	8/84 - 07/92	Acetone	41%	67-64-1	All Sections
	8/84 - 07/92	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	8/84 - 07/92	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	8/84 - 07/92	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	8/84 - 07/92	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	8/84 - 07/92	Mineral Oil	20 - 25%	8042-47-5	All Sections
	8/84 - 07/92	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	8/84 - 07/92	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	8/84 - 07/92	Methanol	<20%	67-56-1	All Sections
	8/84 - 07/92	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	8/84 - 07/92	Heptane	69 - 79%	142-82-5	All Sections
	8/84 - 07/92	Ethyl Ether	11 - 21%	60-29-7	All Sections
	8/84 - 07/92	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	8/84 - 07/92	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	8/84 - 07/92	Heptane	60 - 70%	142-82-5	All Sections
	8/84 - 07/92	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	8/84 - 07/92	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	8/84 - 07/92	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	8/84 - 07/92	None			All Sections
Cat Transmission and Drive Train Oil	8/84 - 07/92	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	8/84 - 07/92	Monoethanolamine	<10%	141-41-3	All Sections
	8/84 - 07/92	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	8/84 - 07/92	Mineral Oil	70 - 95%	Mixture	All Sections
	8/84 - 07/92	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	8/84 - 07/92	Lubricant base oil	87 - 91%	Various	All Sections
	8/84 - 07/92	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	8/84 - 07/92	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	8/84 - 07/92	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	8/84 - 07/92	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	8/84 - 07/92	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	8/84 - 07/92	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	8/84 - 07/92	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	8/84 - 07/92	Trichloroethylene	95 - 99%	79-01-6	All Sections
	8/84 - 07/92	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	8/84 - 07/92	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	8/84 - 07/92	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	8/84 - 07/92	Deionized Water	1 - 3%	7732-18-5	All Sections
	8/84 - 07/92	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-47978
Cottonwood Mine MSHA # 42-01211
Sealed Mine Sections: 2nd S Mains, 4th - 6th E, 4th W, 5th W
And remainder of mine workings

Coal Bed Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (08/84 - 07/92) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	8/84 - 07/92	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	8/84 - 07/92	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	8/84 - 07/92	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	8/84 - 07/92	Calcium sulfate	2 - 10%		All Sections
	8/84 - 07/92	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	8/84 - 07/92	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	8/84 - 07/92	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	8/84 - 07/92	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	8/84 - 07/92	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	8/84 - 07/92	Lead	34%	7439-92-1	All Sections
	8/84 - 07/92	Lead Dioxide	31%	1309-60-0	All Sections
	8/84 - 07/92	Lead Sulfate	<1%	7446-14-2	All Sections
	8/84 - 07/92	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	8/84 - 07/92	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	8/84 - 07/92	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	8/84 - 07/92	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	8/84 - 07/92	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	8/84 - 07/92	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	8/84 - 07/92	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	8/84 - 07/92	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	8/84 - 07/92	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	8/84 - 07/92	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	8/84 - 07/92	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	8/84 - 07/92	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	8/84 - 07/92	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	8/84 - 07/92	Portland Cement		65997-15-1	All Sections
	8/84 - 07/92	Crystalline Silicon Dioxide		13397-24-5	All Sections
	8/84 - 07/92	Calcium Hydroxide		001-305-620	All Sections
	8/84 - 07/92	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	8/84 - 07/92	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	8/84 - 07/92	Polyglycols	60 - 100%	Mixture (2)	15 W
	8/84 - 07/92	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	8/84 - 07/92	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	8/84 - 07/92	Polyester Resin	5 - 15%	Not Reported	All Sections
	8/84 - 07/92	Styrene Monomer	3 - 7%	100-42-5	All Sections
	8/84 - 07/92	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	8/84 - 07/92	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	8/84 - 07/92	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	8/84 - 07/92	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	8/84 - 07/92	Isobutane	2 - 10%	75-28-5	All Sections
	8/84 - 07/92	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	8/84 - 07/92	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	8/84 - 07/92	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	8/84 - 07/92			64742-48-9	All Sections
	8/84 - 07/92			64742-88-7	All Sections
	8/84 - 07/92	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	8/84 - 07/92	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	8/84 - 07/92	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	8/84 - 07/92	Lubricant base oil	>99	Various	All Sections
	8/84 - 07/92	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	8/84 - 07/92	Lubricant base oil	87 - 91%	Various	All Sections
	8/84 - 07/92	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	8/84 - 07/92	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	8/84 - 07/92	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-47978
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
- **Quantity - Historical Data**
- **Quality - Historical Data (UPDES Parameters)**
  - **Total Suspended Solids**
  - **Iron (Total & Dissolved)**
  - **Oil & Grease**
  - **Total Dissolved Solids**
  - **Ph**

UPDES Permit Data:

Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

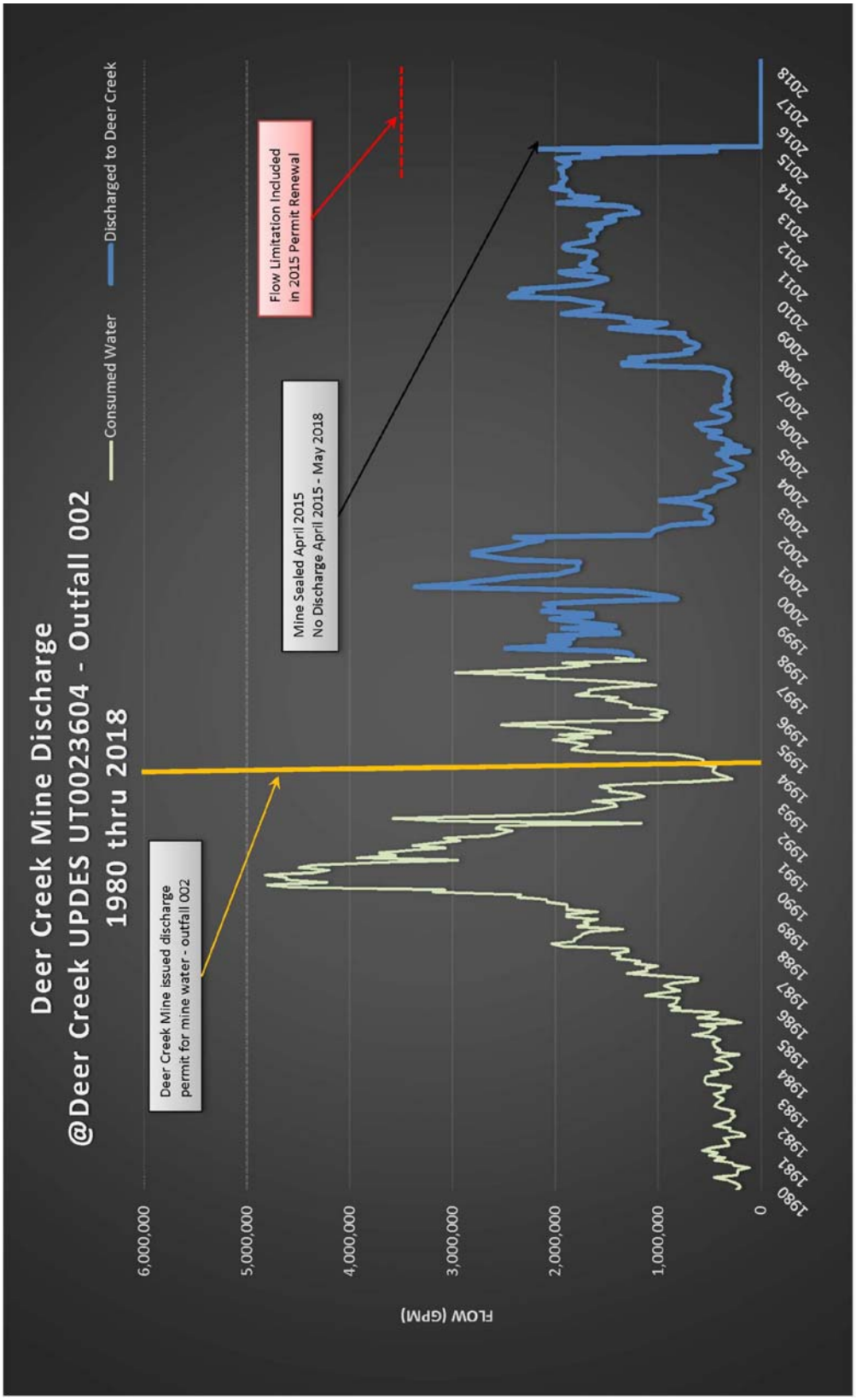
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



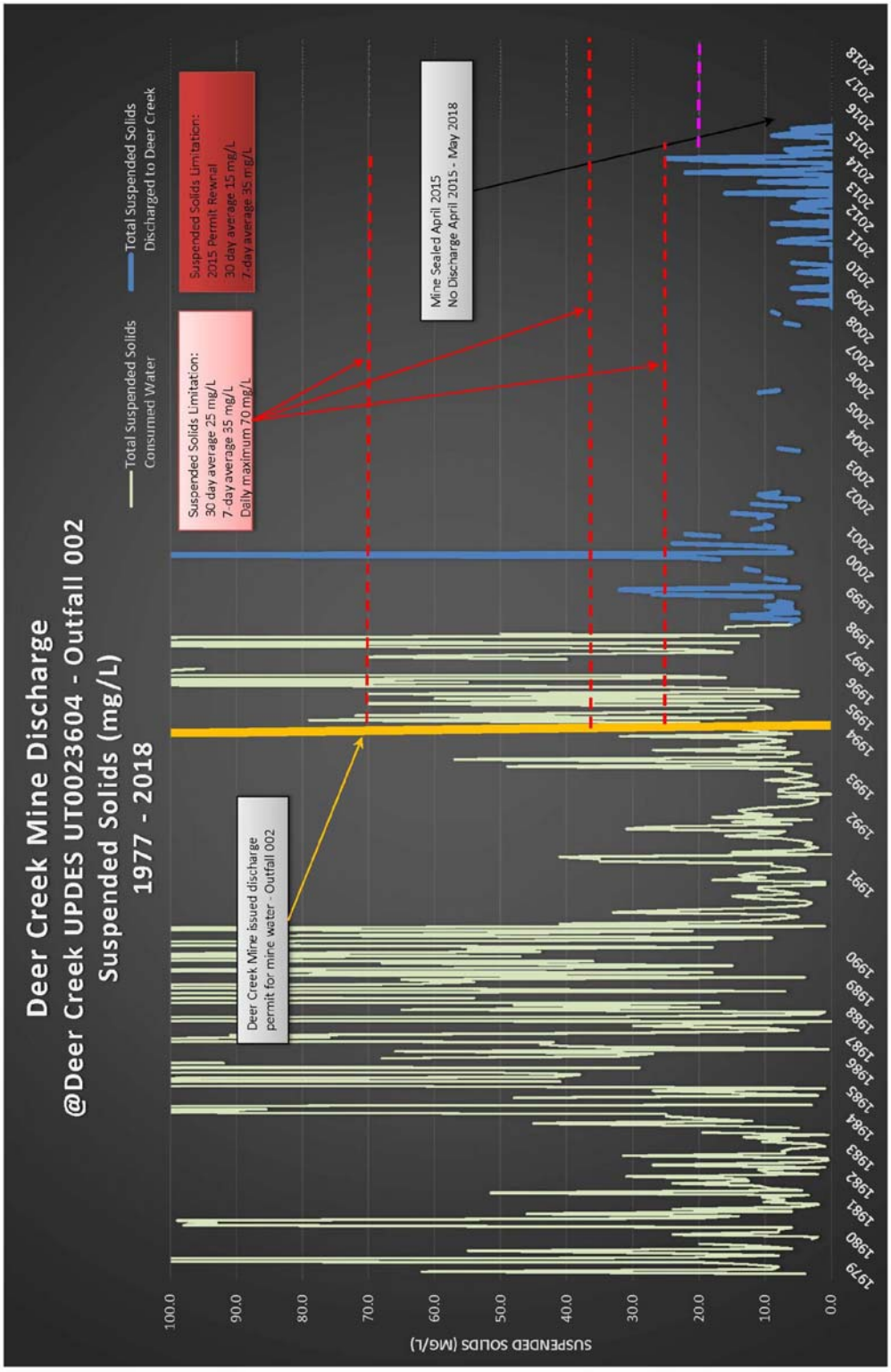
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



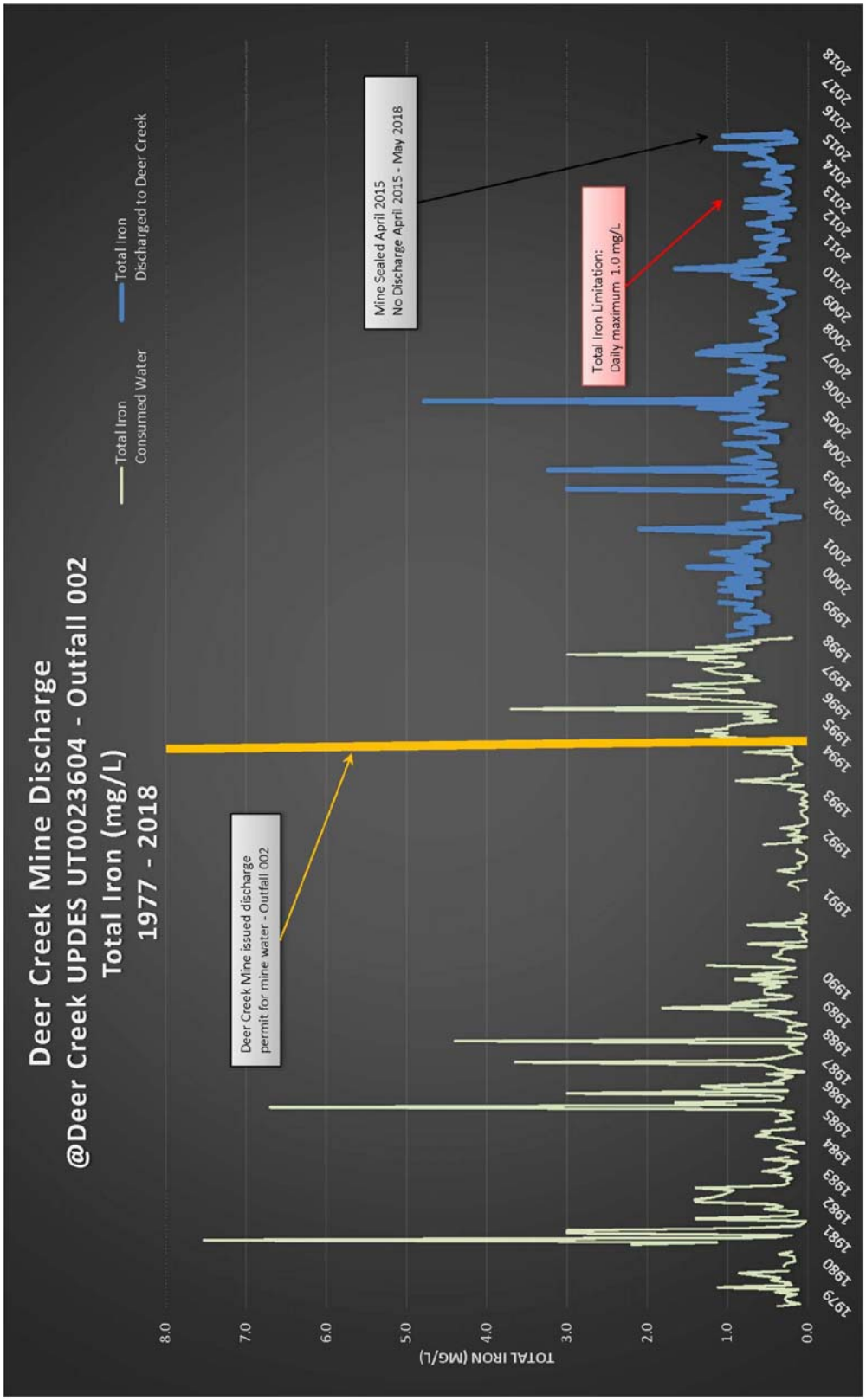
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



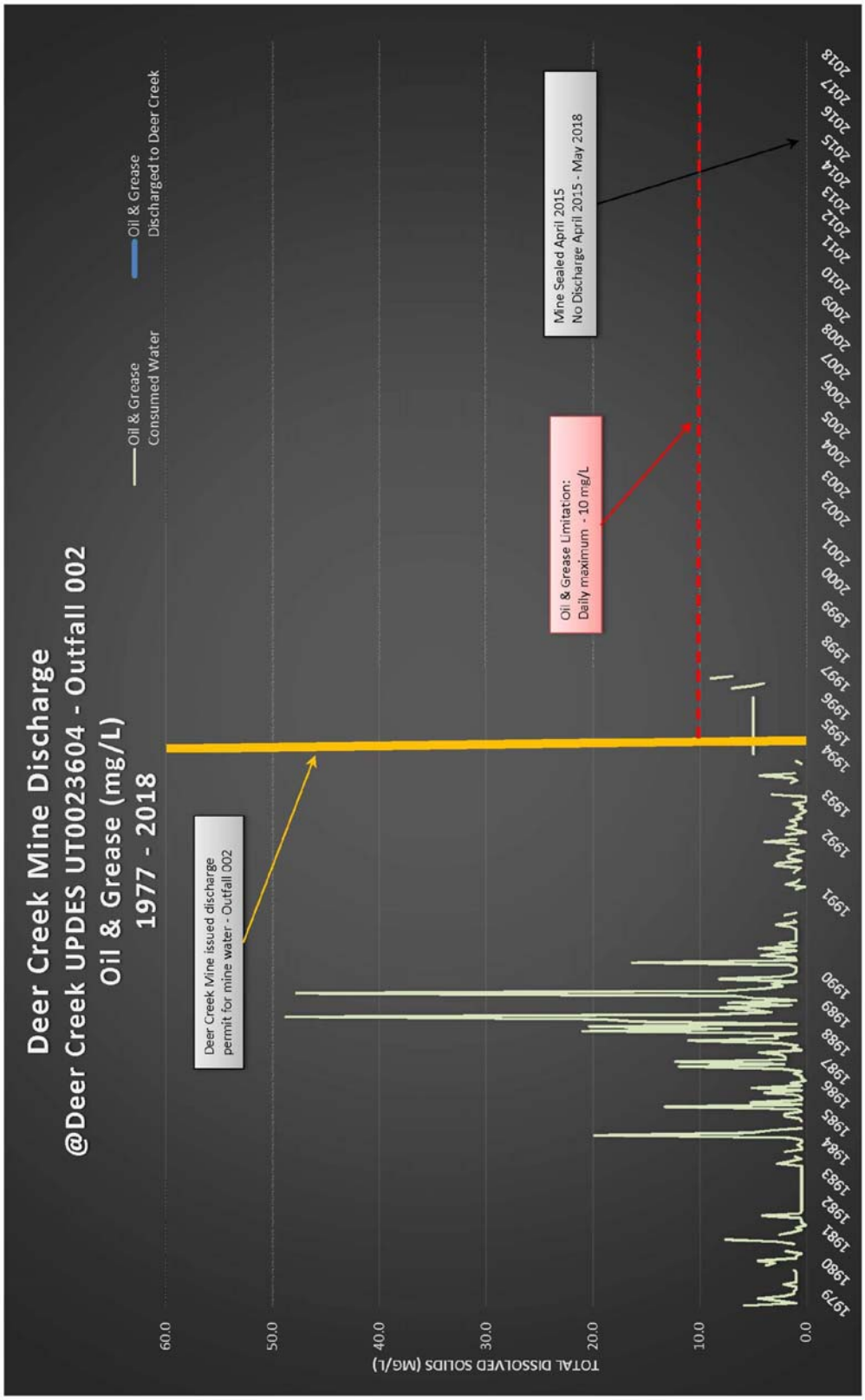
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



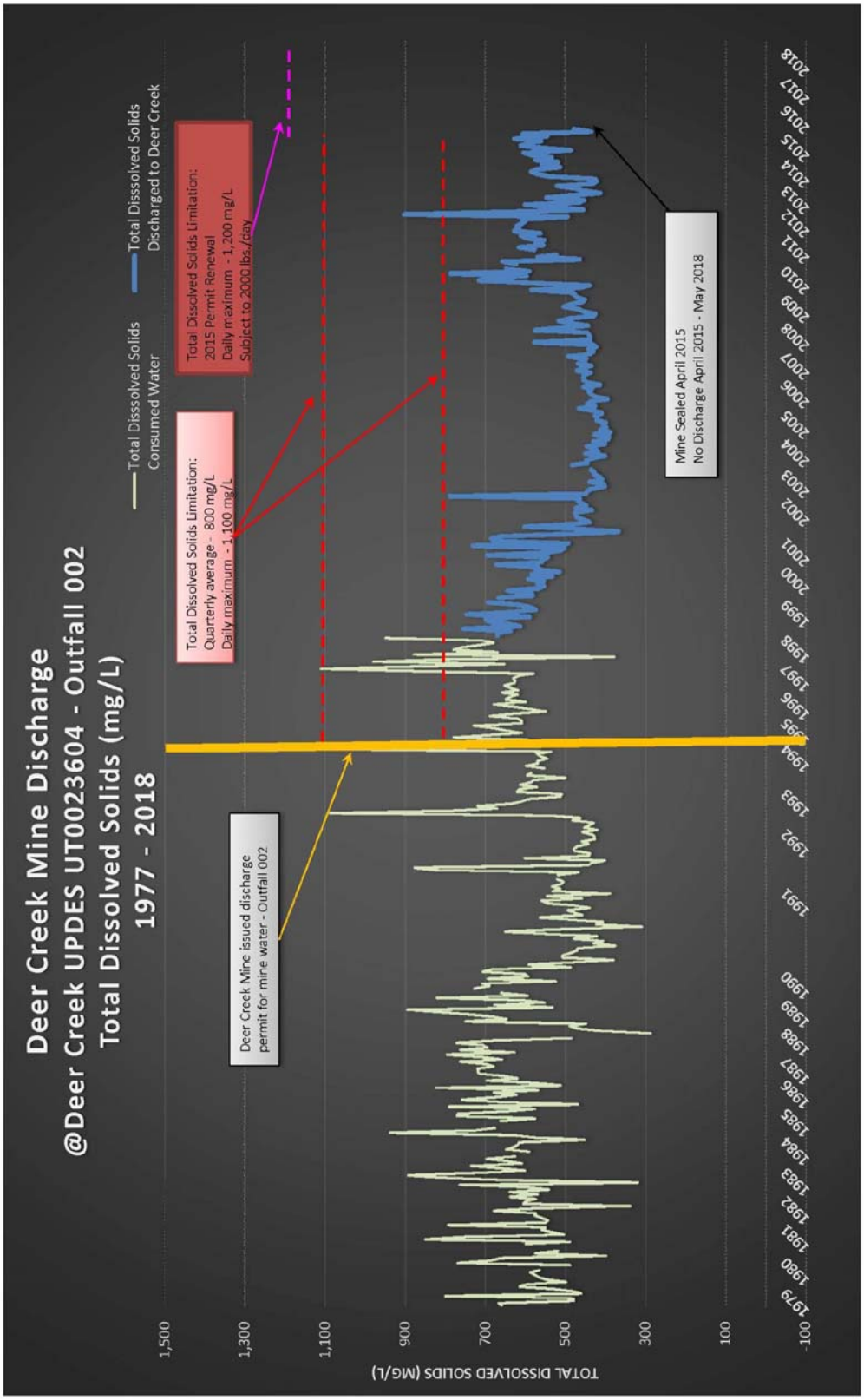
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



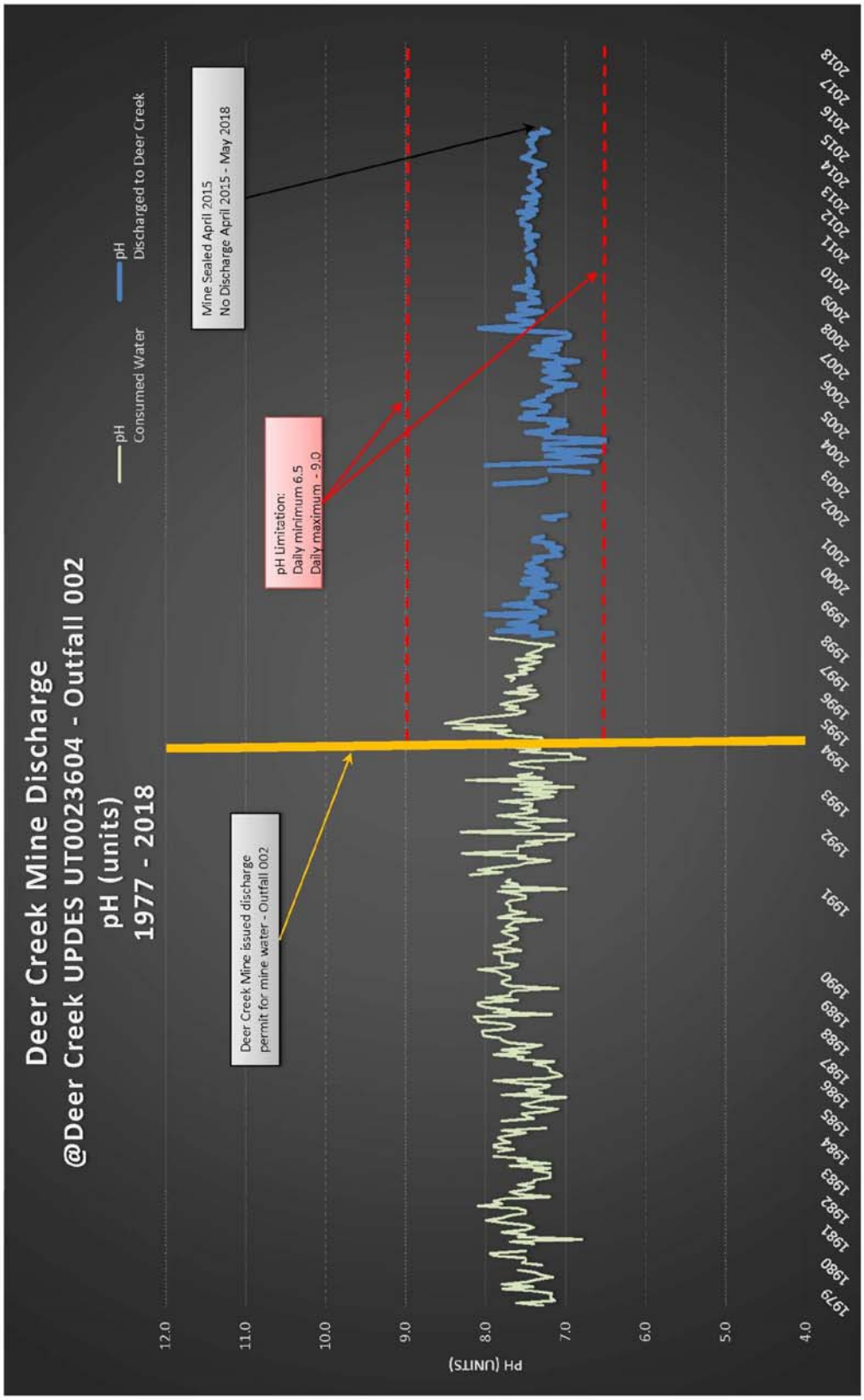
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Partial Relinquishment
Federal Coal Lease
UTU-06039

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Partial Relinquishment of Federal Coal Lease UTU-06039, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's partial relinquishment of acreage under federal coal lease UTU-06039. The total acreage being surrendered is 1,808.67 acres. The total acreage being retained for reclamation purposes is 30.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government.

Partial Relinquishment

The legal description for partial relinquishment of UTU-06039 is described below:

Federal Coal Lease UTU-06039		
Lease Readjustment Effective Date:		5/1/2013 to 5/1/2023
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,838.67**
Description of Lease Acreage to be Relinquished		**Acres**
T16S, R6E, SLB&M Emery County, UT		
Sec 25:	E½SE¼SE¼	20.00
T16S, R7E, SLB&M Emery County, UT		
Sec 19:	Lots 2-3, SE¼, W½SW¼NE¼	225.70
Sec 20:	S½, SE¼NW¼, E½E½SW¼NW¼	370.00
Sec 29:	N½N½, S½NW¼, SW¼, W½SE¼, N½S½NE¼, SW¼SW¼NE¼	530.00
Sec 30:	Lot 4, E½	342.97
T16S, R7E, SLB&M Emery County, UT		
Sec 24:	S½	320.00
	Total Lease Acres for Partial Relinquishment:	**1,808.67**
	Total Lease Acres Remaining:	**30.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec. 29	S½SE¼NE¼, SE¼SW¼NE¼	30.00
	Total Lease Acreage Being Retained:	**30.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7TH of NOV., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-06039

LEASE ACTIVITIES

1) Coal Lease Number: UTU-06039 *(Partial Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 1,808.67; Entire lease? YES ☐ NO ☒ (See attached map.) Comments: *This is a partial relinquishment. Refer to Exhibit A for the legal descriptions of acreage relinquished and acreage retained. See also Figures 1 and 2 (a map depicting the areas to be relinquished and retained). Lease acreage to be retained: 30.00.*

Original Lease Acreage: 1,838.67 Relinquished to date: 0.00 acres Remaining: 1,838.67 ac.

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)?
YES ☒ NO ☐ (If "YES", describe: *Access portals, ventilation fans, substation and surface support facilities located at Rilda Canyon 1st Right and Left Forks. All portals have been sealed. Fans and all surface support facilities have been removed and all disturbed lands are being reclaimed during 2018-2019 in accordance with DOGM mine permit C/015/0018. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-06039

11) Date of initial mining: July 1994; last mining: May 2004.

12) Number of coal beds mined: 2 coal seams (Blind Canyon and Hiawatha)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to hydrographs*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-06039

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D?
YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F?
YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
- *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities?
YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐
(If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments)

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-06039

Exhibit A

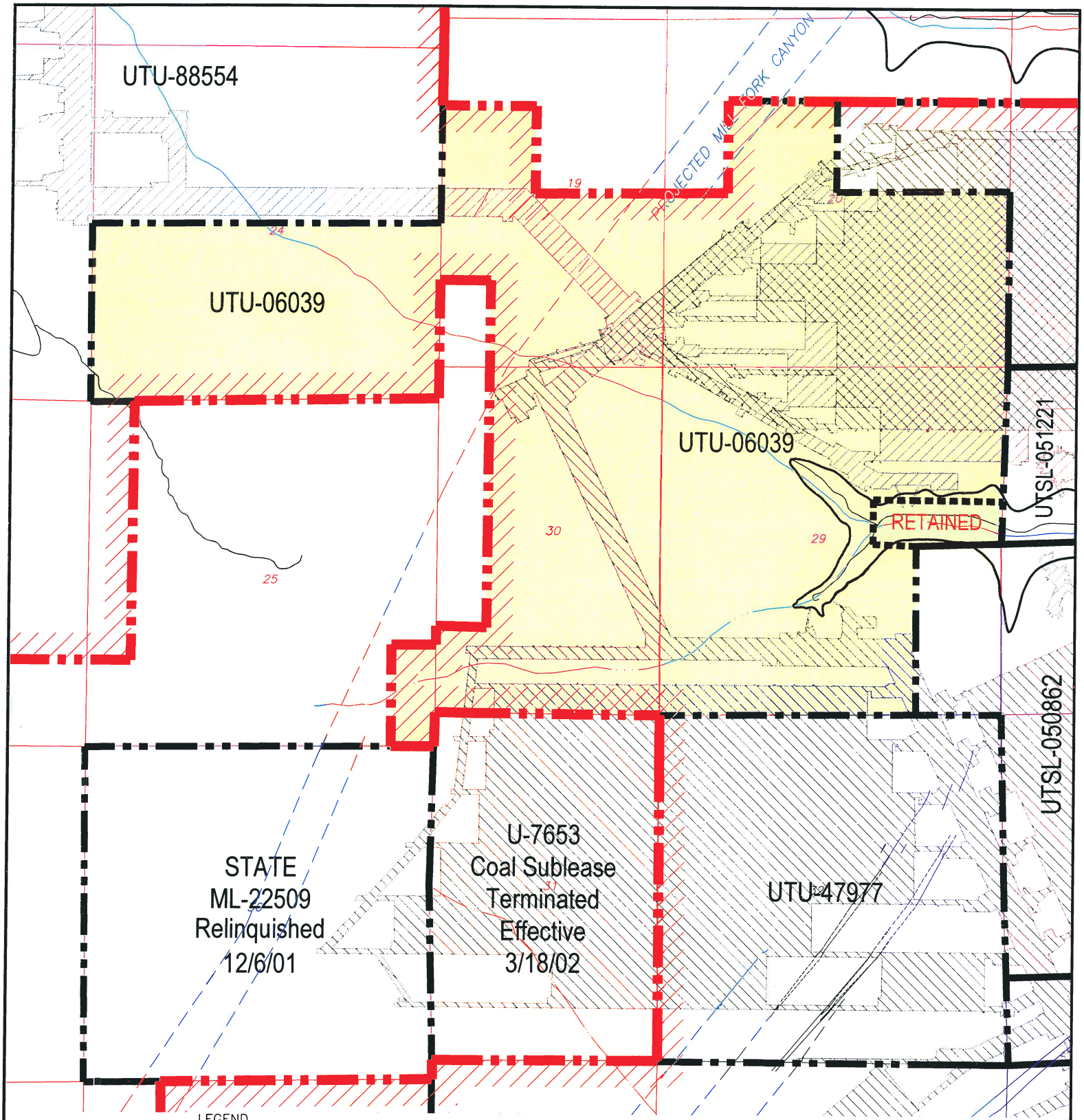
Partial Relinquishment

The legal description for partial relinquishment of UTU-06039 is described below:

Federal Coal Lease UTU-06039		
Lease Readjustment Effective Date:		5/1/2013 to 5/1/2023
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,838.67**
Description of Lease Acreage to be Relinquished		**Acres**
T16S, R6E, SLB&M Emery County, UT		
Sec 25:	E½SE¼SE¼	20.00
T16S, R7E, SLB&M Emery County, UT		
Sec 19:	Lots 2-3, SE¼, W½SW¼NE¼	225.70
Sec 20:	S½, SE¼NW¼, E½E½SW¼NW¼	370.00
Sec 29:	N½N½, S½NW¼, SW¼, W½SE¼, N½S½NE¼, SW¼SW¼NE¼	530.00
Sec 30:	Lot 4, E½	342.97
T16S, R7E, SLB&M Emery County, UT		
Sec 24:	S½	320.00
	Total Lease Acres for Partial Relinquishment:	**1,808.67**
	Total Lease Acres Remaining:	**30.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec. 29	S½SE¼NE¼, SE¼SW¼NE¼	30.00
	Total Lease Acreage Being Retained:	**30.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-06039 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA
- FEDERAL COAL LEASE RETAINMENT AREA

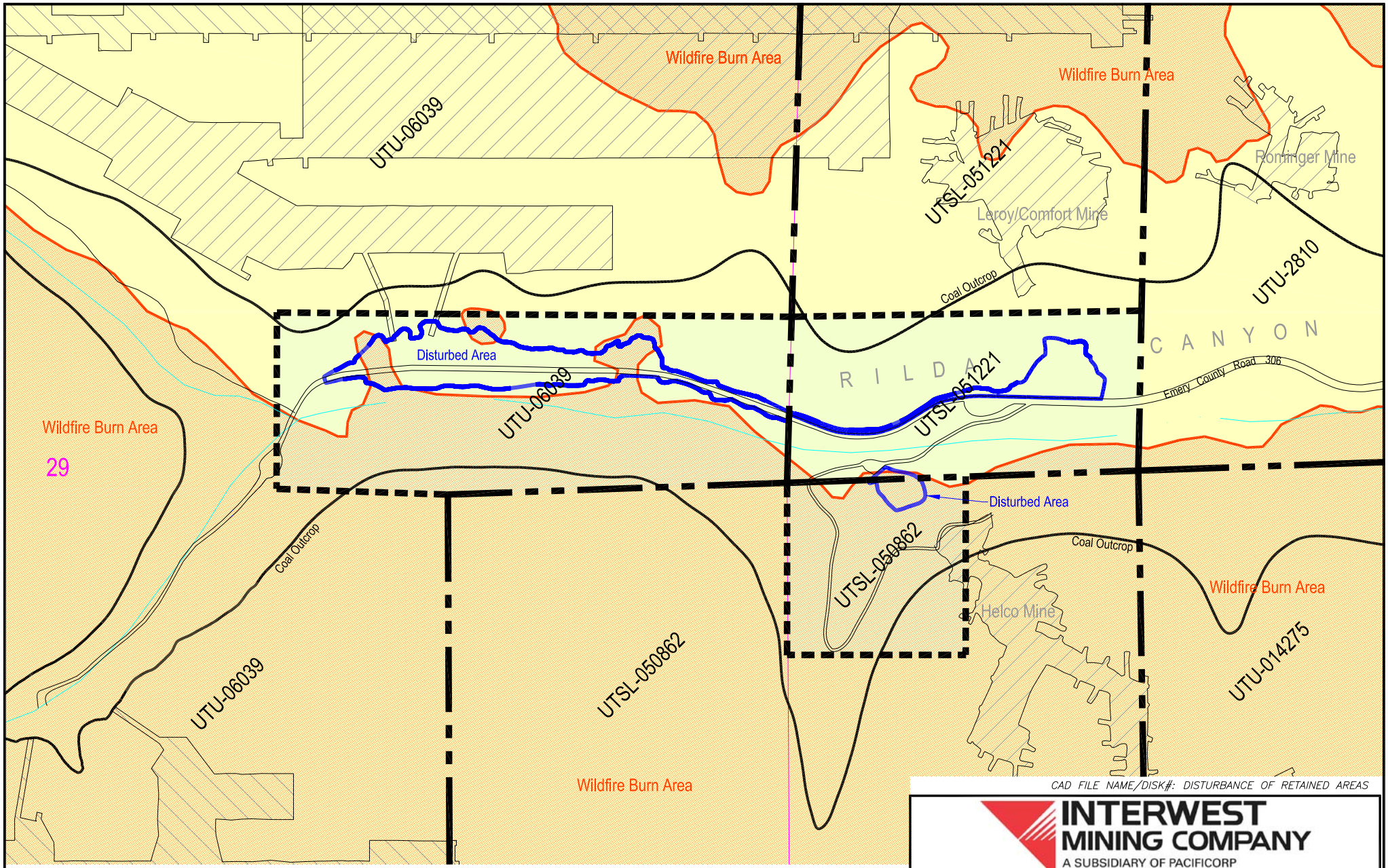
N

CAD FILE NAME/DISK#: UTU-06039

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-06039

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 23, 2018	SHEET 1 OF 1	REV.



LEGEND

	DISTURBED AREA TO BE RECLAIMED
	COAL OUTCROP
	HIAWATHA SEAM MINE WORKINGS
	BLIND CANYON SEAM MINE WORKINGS
UTU-2810	FEDERAL LEASE NUMBER
	FEDERAL LEASE LINE
	FEDERAL COAL LEASE ACREAGE RETAINED
	FEDERAL COAL LEASE ACREAGE RELINQUISHED
	WILDFIRE BURN AREA - JUNE 2018

CAD FILE NAME/DISK#: DISTURBANCE OF RETAINED AREAS

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

DEER CREEK MINE/RILDA CANYON
FEDERAL COAL LEASE ACREAGE RETAINED
WITH DISTURBED AREA

DRAWN BY:	K. LARSEN	FIGURE 2	
SCALE:	1" =500'	DRAWING #:	
DATE:	OCTOBER 1, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTU-06039
Checklist and Data Documentation for
Federal Coal Partial Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-06039 Partial Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Hiawatha and Blind Canyon seams. Coal reserves were recovered by longwall methods. Mining in the Hiawatha seam took place between 11/2000 and 5/2004. Mining in the Blind Canyon seam took place between 7/1994 and 12/2001. The Blind Canyon mine workings and longwall panels directly overlaid the Hiawatha mine workings.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the East Mountain Area were collected in 1980. These elevations are then compared to elevations measured from the photographs taken annually in the fall. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

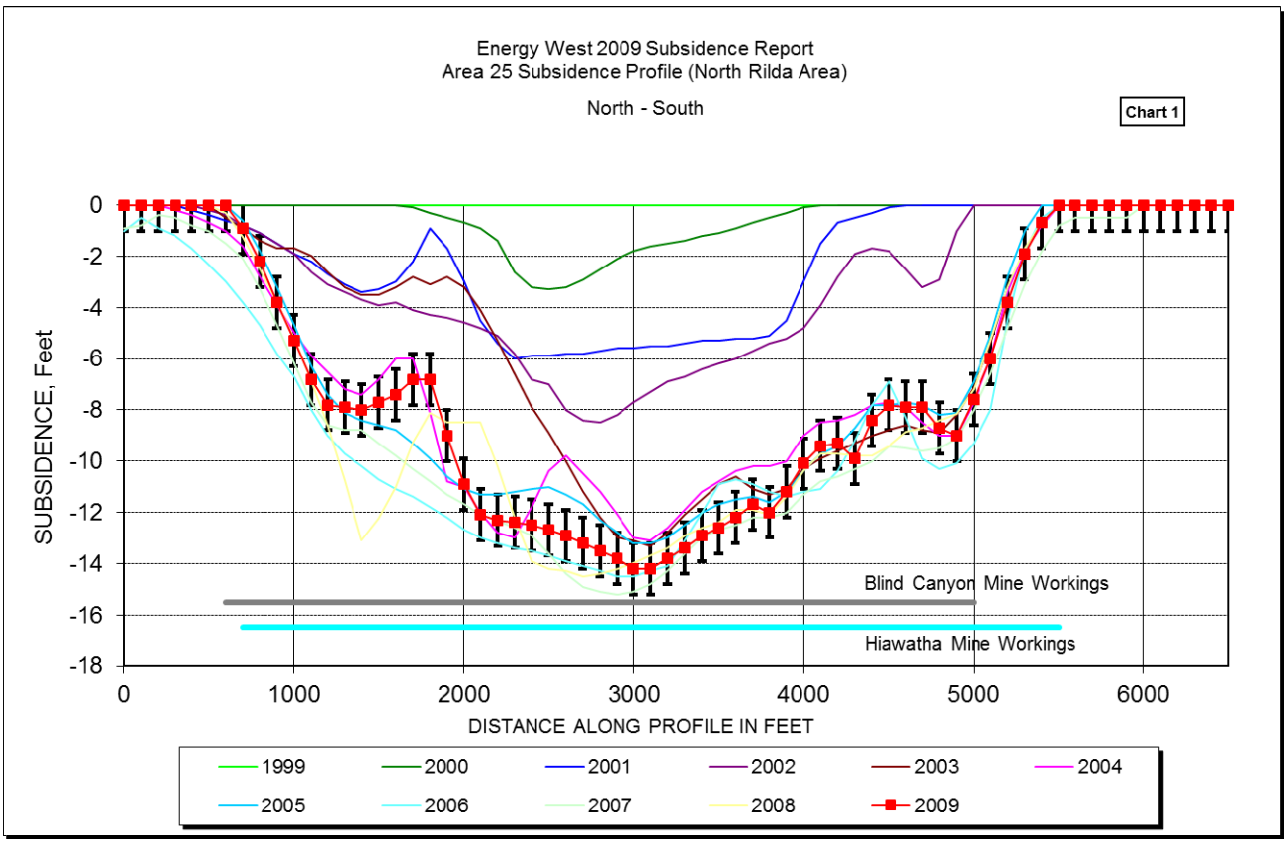
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

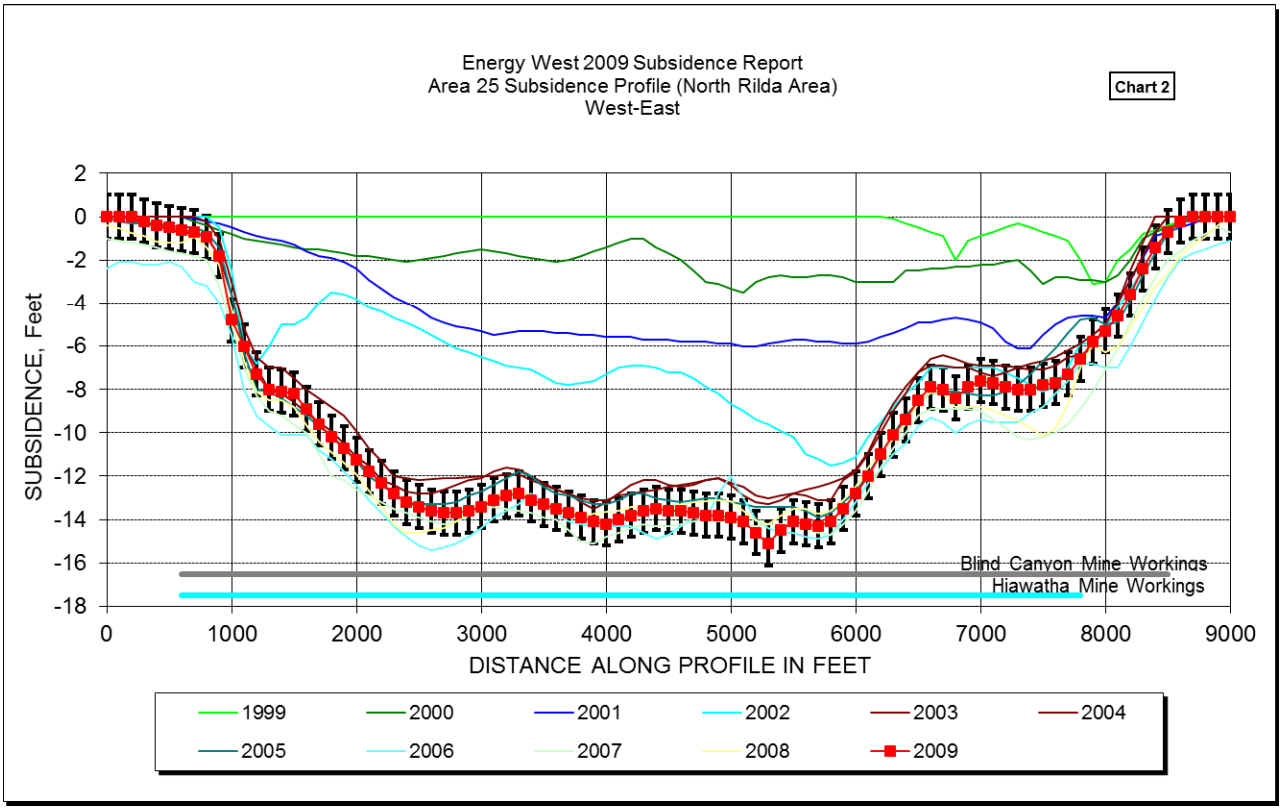
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-06039 Subsidence Data

Subsidence in the lease UTU-06039 area was monitored from 1999 to 2009. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1999 and 2009. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

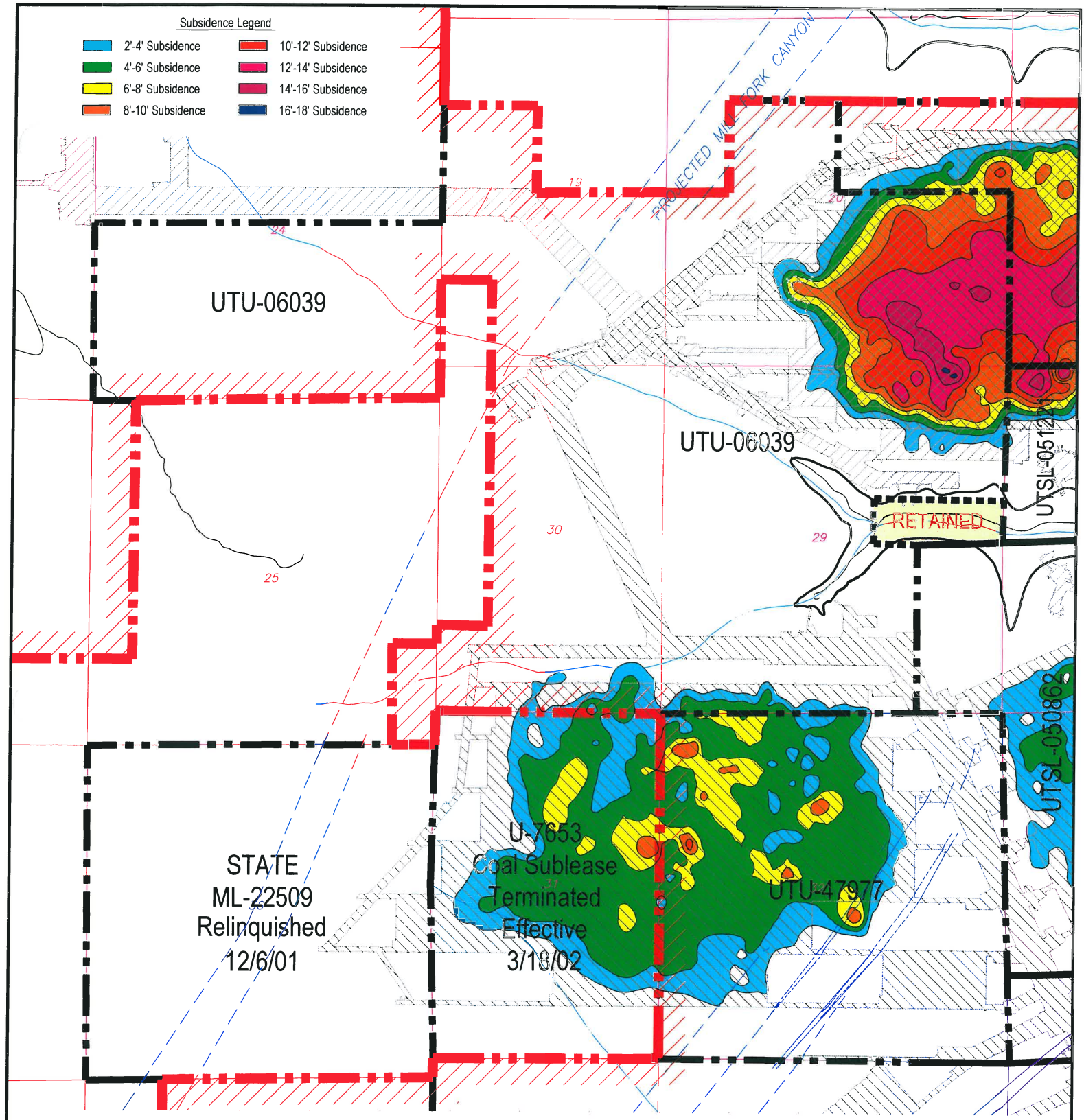
PacifiCorp delineated two profiles covering the main longwall panel districts of Lease UTU-06039, including the dual-seam mining overlay area in the eastern half of the lease, are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 15 feet. Some cliff spalling occurred during undermining. Appropriate measures for protection of property and the public were taken during the subsidence of cliffs that were predicted to spall, including warning signs along the Rilda Canyon road to make the public aware of the potential hazards. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-06039. The last aerial survey was conducted on October 15, 2017. Conventional surveying methods for subsidence were used from 3/99 to 4/07 to measure subsidence in the vicinity cliff escarpments on the south facing slope of North Rilda Ridge. The prism surveys clearly showed the pre-subsidence status of the cliffs, subsidence behavior during double seam undermining, and post- subsidence re-stabilization of the cliffs.

The proposed relinquishment area of Lease UTU-06039 is stable and subsidence is substantially complete.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-06039 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-06039

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

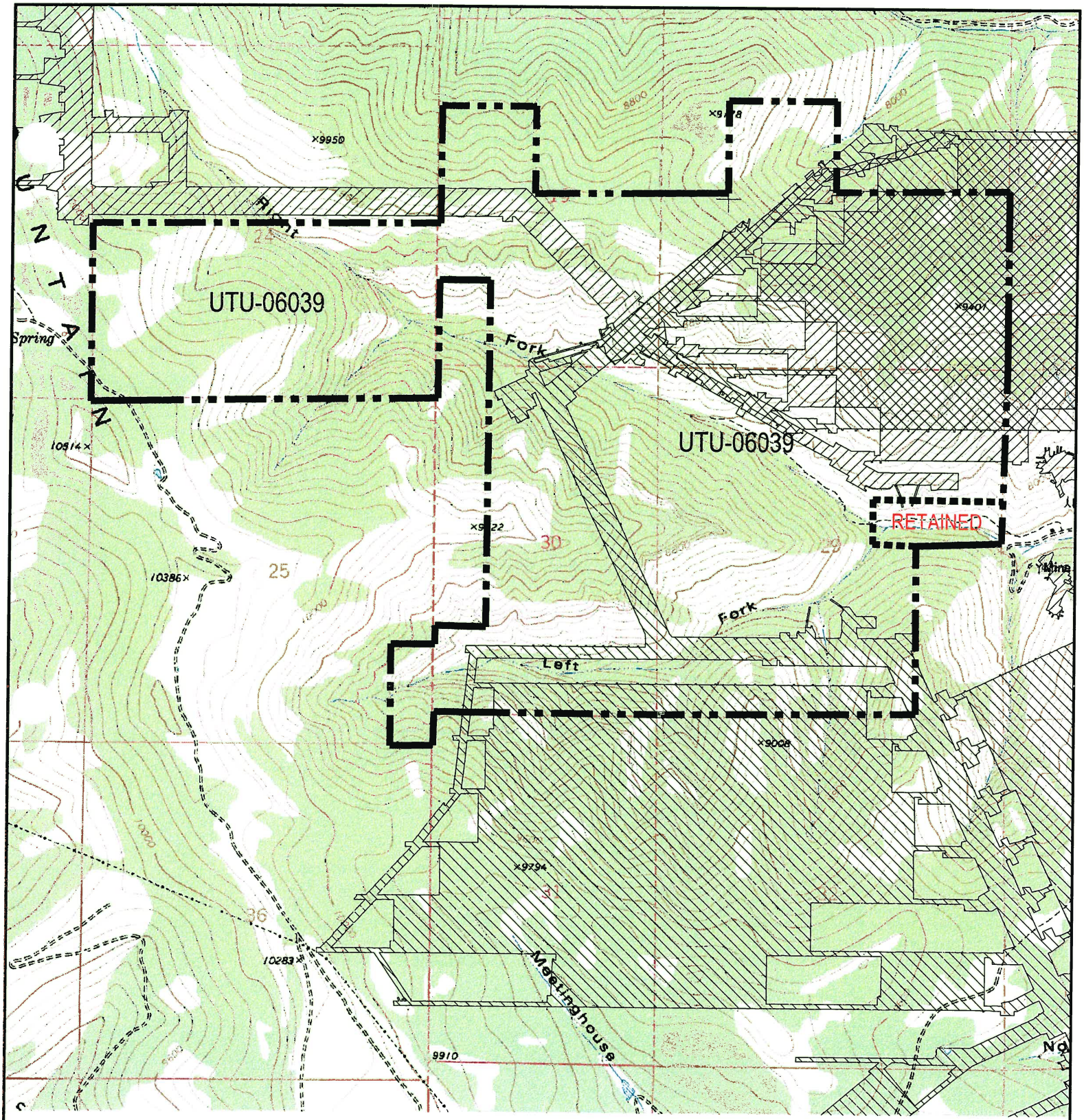
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-06039
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 23, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-06039 Partial Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-06039 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-06039. No restoration and/or mitigation efforts are required for Lease UTU-06039. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-06039 lease boundaries seam outcrop.



HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

FEDERAL LEASE ACREAGE RETAINED

N

CAD FILE NAME/DISK#: UTU-06039

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-06039
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" = 2000'	DRAWING #:	
DATE: APRIL 23, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-06039 Partial Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 80 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). The U.S. Forest Service assumed control of the Left Fork portal site and access road located on this lease for the purpose of constructing sediment catchment basins for fire debris runoff. Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTU-06039 and surrounding area (Mill Fork Area). The western lease modification of UTU-06039 was considered to be part of the Mill Fork area of the mine, so the information presented here for the Mill Fork Area should be considered pertinent to the UTU-06039 lease as a whole.

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP). Lease UTU-06093 is adjacent to the Mill Fork Lease Area and includes within the adjacent ½ mile zone some of the springs that are part of the Mill Fork Lease Area monitoring plan.

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the

operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTU-06039.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The Mill Fork 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the Mill Fork 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. 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 PacifiCorp mining area covers portions of East Mountain and Trail Mountain, which are separated by Cottonwood Canyon, a deep, partially glaciated valley.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, but is not exposed in the Mill Fork Area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the Mill Fork Area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the Mill Fork Area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the Mill Fork Area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area

(Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone are limited to a narrow north-south trending ridge located in the western half of the Mill Fork Area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs

located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the waterbearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to

support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 Area.

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 lease 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 fault within the Mill Fork Area is the Joes Valley Fault, which forms the western limit of the coal reserves in this area. The Joes Valley Fault is the largest and most prominent of several north south trending fault zones within the Wasatch Plateau coal field. Displacement of the fault is approximately 1,500 feet, downthrown on the western side. The fault creates a continuous north-south escarpment on the east side of Joes Valley. Several side canyons are cut into this escarpment on the western side of the lease area, all of which drain into Joes Valley. The fault zone itself is not visible along this escarpment, but the fault has been intercepted underground in the Genwal Mine to the north. Where the fault has been intercepted in the Genwal mine workings, a drag fold is present, indicated by a gentle downward folding of the strata along the fault zone, extending for a few hundred feet to the east of the fault.

The nearest known faulting outside of the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes to the southeast of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in

the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area (including lease UTU-06039) and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow

variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk
Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-

Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The δ2H and δ18O compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.

7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years
    b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
    c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The

radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its $CO_2(g)$ in the soil zone where the partial pressure of CO_2 greatly exceeds atmospheric levels. This CO_2 combines with water to form carbonic acid according to

$$CO_2(g) + H_2O = H_2CO_3 \quad (1)$$

Carbonic acid dissociates into H^+ and HCO_3^- as

$$H_2CO_3 = HCO_3^- + H^+ \quad (2)$$

The H^+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H^+ + \underset{\text{(dolomite)}}{CaMg(CO_3)_2} = Ca^{2+} + Mg^{2+} + 2HCO_3^-, \text{ and} \quad (3)$$

$$H^+ + \underset{\text{(calcite)}}{CaCO_3} = Ca^{2+} + HCO_3^- \quad (4)$$

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$CaSO_4 \bullet 2H_2O = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$

(gypsum)

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-}clay = 2Na^+ + Ca\text{-}clay \quad (9)$$

$$Mg^{2+} + Na\text{-}clay = 2Na^+ + Mg\text{-}clay \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is

supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are

significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} - HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and δ^{18}O

The δ^2H and δ^{18}O composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and δ^{18}O composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Interwest and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork area spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^{3}H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^{3}H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^{3}H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^{3}H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water

does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred

feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep

subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered

in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas

where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute significant groundwater to the discharge from the spring.

  Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – MILL FORK AREA

A. GROUNDWATER

Groundwater within the Mill Fork Area was monitored according to the schedules in established in the Deer Creek MRP. PacifiCorp has conducted baseline and operational monitoring of spring sources in and adjacent to the lease area. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the adjacent Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and

HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.
The ground water monitoring plan in Appendix C includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights
- Measurable flow based on historical surveys
- Reliable measuring point(s)

The following table outlines the rationale for springs selected for long term monitoring. Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency. The spring collection system operated by the North Emery Water Users Special Service District is within ½ mile. Data related to monitoring point RCF3 is included in Appendix C. Surface monitoring points in upper Rilda Canyon and Mill Fork Canyon are also included.

GROUNDWATER MONITORING PLAN - SPRINGS							
Spring	Stratigraphic Position	Projected Subsidence Zone	Regional Location	Water Rights	Historical Measurable Flow	Reliable Measuring Point	Comment
GRANTS SPRING					✓	✓	Added to the spring monitoring program at the request of the USFS
RR-15	✓	✓	✓		✓	✓	
RR-23A	✓		✓		✓	✓	Large spring within a series of springs located downdip from projected mining
EM POND					✓	✓	Added to the spring monitoring program at the request of the USFS
80-50	✓		✓		✓	✓	

Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Surface Hydrology

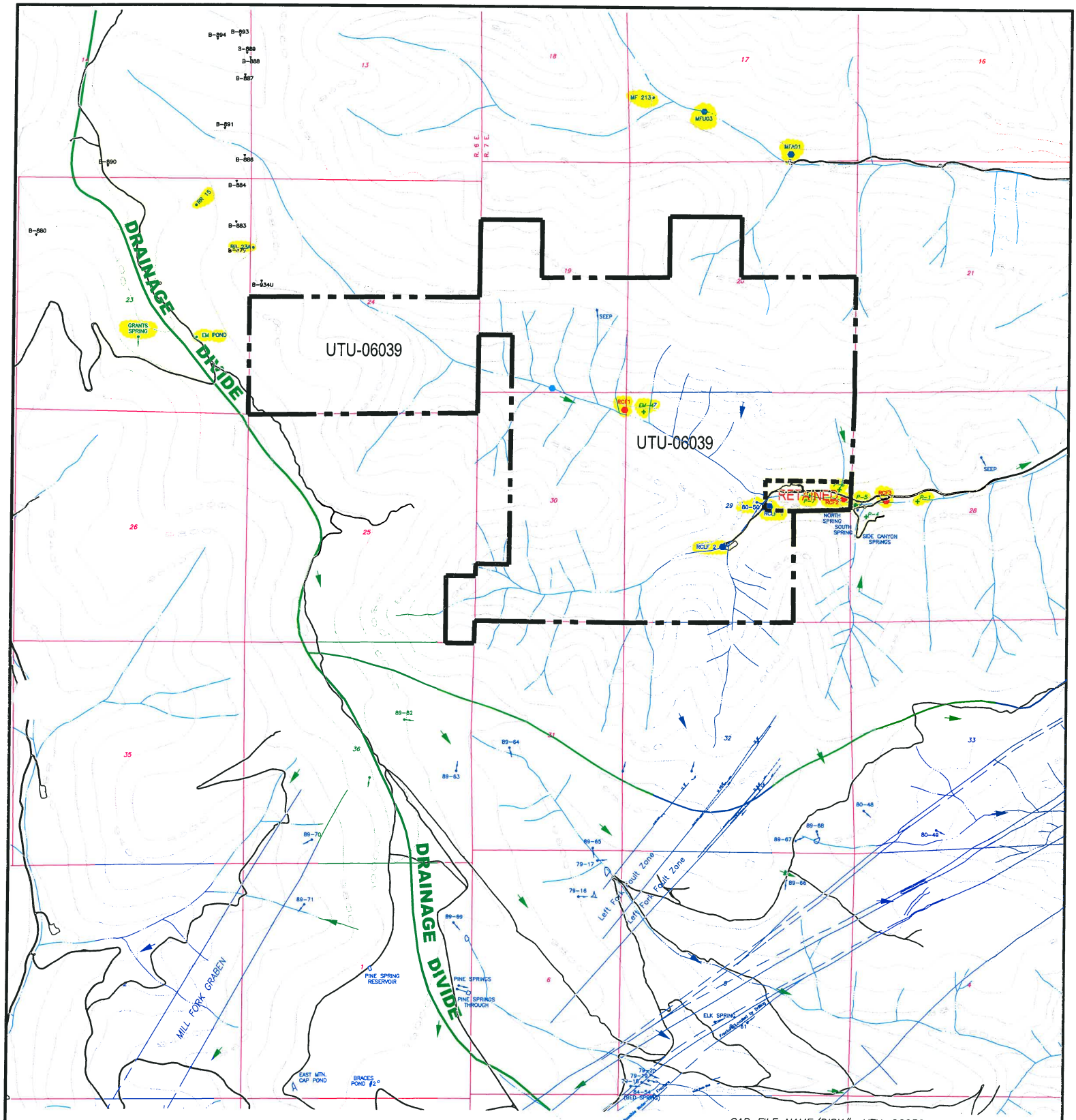
The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTU-06039 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTU-06039 are ephemeral. The majority of the surface flow from the lease block drains to the east in Crandall, Mill Fork and Rilda Canyons and un-named drainages which report to Huntington Creek. On the west side of the East Mountain drainage divide minor drainages report to the Cottonwood Creek drainage system. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.

EAST MOUNTAIN SPRING DATA
Rilda Canyon Area

Federal Lease UTU-06039 Partial Relinquishment

SPRING	MINING HISTORY		STATUS	LOCATION			Approximate Subsidence (feet)
	Type of Mining	Date of Mining (Pre/Post water quality analysis based on dates listed for each spring)		Sec.	T.	R.	
GRANTS SPRING	Not Undermined	NA Nearest second mining: 1560' Nov. 2005	Within ½ mile Offset	23	16S	6E	NA
RR-15	Not Undermined	NA Nearest second mining: 55' Mar. 2006	Within ½ mile Offset	23	16S	6E	NA
RR-23A	Not Undermined	NA Nearest second mining: 1400' May 2006	Within ½ mile Offset	24	16S	6E	NA
EMPOND	Not Undermined	NA Nearest second mining: 1620' Dec. 2005	Within ½ mile Offset	23	16S	6E	NA
80-50	Not Undermined	NA Nearest second mining: 1224' Oct. 2003	Within ½ mile Offset	29	16S	7E	NA



CAD FILE NAME/DISK#: UTU-06039

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-06039
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =3000'	DRAWING #:	
DATE: JUNE 4, 2018	SHEET 1 OF 1	REV. ___

Location: Section 23, Township 16 South, Range 6 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-88554.

Lease Association: Grants Spring is located within Federal Coal lease UTU-88554. The lease was originally acquired from the State Institutional Trust Lands Administration on April 1, 1999 and designated as ML-48258. State Lease ML-48258 reverted to the Bureau of Land Management on July 11, 2011 and was assigned the lease number of UTU-88554. Both the Hiawatha and Blind Canyon seams have been mined in this lease. Room and pillar mining began in the Hiawatha Seam in December 2003 with the first longwall retreat in August 2003. Blind Canyon seam development began in May 2006 with the first longwall retreat in February 2008. After completion of mining in the Blind Canyon seam, production resumed in the Hiawatha seam with final production occurring on January 7, 2015. Second mining occurred 1,560' north of Grants Spring in the Hiawatha Seam in November 2005.

Subsidence: Maximum subsidence in area 1,560' north of Grants Spring has stabilized at approximately 6 feet. The 2017 Annual Subsidence Report reported that the subsidence has been stable since at least 2008. Grants Spring is outside of the subsided area.

For additional data related to subsidence refer to the 2017 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring Grants Spring Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected since 2002 and has continued through 2017. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, 5, and 6. The East Mountain weather station is located on the southern tip of East Mountain. Grants Spring is a low volume spring/seep located below ridge on west facing slope above main Mill Fork access road vegetated with conifers and aspens. Flow from spring Grants Spring generally ranges from 0.5 gpm to a maximum of <3 gpm.

Geologic Mode of Occurrence for spring Grants Spring:

- Water flows laterally through sandstone channels underlain by impermeable mudstones of the North Horn Formation and intersects the land surface forming a spring.
- Geologic Formation: North Horn (refer to Geologic Occurrence sheet).
- Stratigraphic Position: 160' below top.

Justification for removal from monitoring: Grants Spring has been monitored by PacifiCorp since 2002. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in Lease UTU-88554 and adjacent Federal Lease UTU-84285 ceased as of January 7, 2015. Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site Grants Spring be removed from the monitoring program.

EAST MOUNTAIN

MILL FORK SPRING & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **GRANTS SPRING**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
1692' N.	2542' W.	SE	23	16S	6E	10280

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
North Horn	Developed With Steel Pipe Diverted to Trough (not functioning)	None	160' below top

Location Comments: Spring located below ridge on west facing slope above main access road. Area surrounding the spring source vegetated with conifers and aspens.

Probable Recharge Area: Highlands area to the northeast (recharge limited).

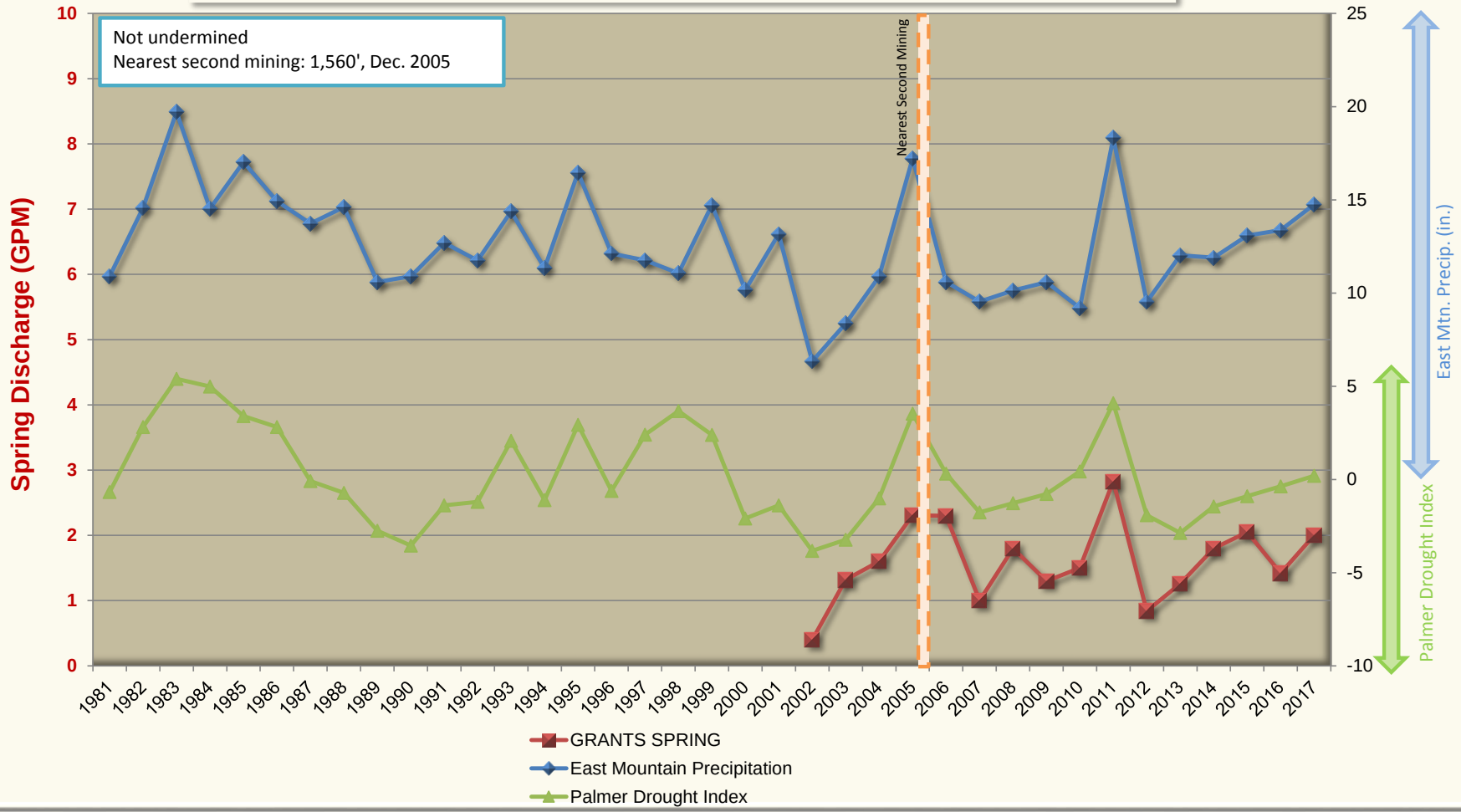
Relationship to Adjacent Springs: This spring occurs in the same manner as EMPOND.

Geologic Occurrence of Spring:

Water flows laterally through sandstone channels underlain by impermeable mudstones of the North Horn Formation and intersects the land surface forming a spring.

EAST MOUNTAIN SPRINGS - MILL FORK SPRING: GRANTS SPRING vs. PRECIPITATION

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION AND PALMER DROUGHT INDEX



East Mountain Spring: GRANTS SPRING
Water Quality Data: Operational
Mine Association: Deer Creek Mine - Mill Fork
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 1560'
Date of Nearest Mining: Nov-05

	Pre-Mining Data: 20000101 THROUGH 20051101				Post-Mining Data: 20051201 THROUGH 201712313				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	290	221	253.428	7	235	205	221.916	24	BICARBONATE
CALCIUM	56.7	54.1	55.7571	7	58.97	48.46	52.7758	24	CALCIUM
CARBONATE	0				8	0	0.4	20	CARBONATE
CHLORIDE	4	3	3.57142	7	7	2	3.20833	24	CHLORIDE
CONDUCTIVITY	491	457	473.285	7	508	422	454.791	24	CONDUCTIVITY
DISSOLVED OXYGEN	0				0				DISSOLVED OXYGEN
FLOW	2.31	0.3	1.11285	7	2.83	0.58	1.25541	24	FLOW
HARDNESS	256	241	248.857	7	255	211	235.708	24	HARDNESS
TOTAL IRON	0				0	0	0	20	TOTAL IRON
DISSOLVED IRON	0				0	0	0	20	DISSOLVED IRON
MAGNESIUM	27.7	25.4	26.6	7	28.1	15.59	25.2425	24	MAGNESIUM
DISSOLVED MANGANESE	0				0.002	0	0.0001	20	DISSOLVED MANGANESE
MANGANESE	0				0	0	0	20	MANGANESE
OIL AND GREASE	0				0				OIL AND GREASE
PH	8.01	7.51	7.74428	7	7.94	7.47	7.77041	24	PH
POTASSIUM	1.34	1.11	1.24857	7	5.36	0.65	1.5	24	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	3.62	3.41	3.48857	7	3.85	1.45	3.49416	24	SODIUM
SULFATE	15	11	13	7	12	6	10.2083	24	SULFATE
SUSPENDED SOLIDS	258	258	258	1	0				SUSPENDED SOLIDS
TEMPERATURE	5.4	4.3	4.81428	7	8.3	4.7	6.3625	24	TEMPERATURE
TOTAL DISSOLVED SOLIDS	272	226	248.714	7	377	217	251.583	24	TOTAL DISSOLVED SOLIDS

Location: Section 23, Township 16 South, Range 6 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-88554.

Lease Association: Spring RR-15 is located within Federal Coal lease UTU-88554. The lease was originally acquired from the State Institutional Trust Lands Administration on April 1, 1999 and designated as ML-48258. State Lease ML-48258 reverted to the Bureau of Land Management on July 11, 2011 and was assigned the lease number of UTU-88554. Both the Hiawatha and Blind Canyon seams have been mined in this lease. Room and pillar mining began in the Hiawatha Seam in December 2003 with the first longwall retreat in August 2003. Blind Canyon seam development began in May 2006 with the first longwall retreat in February 2008. After completion of mining in the Blind Canyon seam, production resumed in the Hiawatha seam with final production occurring on January 7, 2015. First mining occurred in vicinity of RR-15 in the Hiawatha seam, (14th West, June 2005). Extraction face of the 14th West longwall panel is 55' west of RR-15.

Subsidence: No subsidence has been detected near RR-15. The 2017 Annual Subsidence Report reported that the subsidence west of the spring has been stable since at least 2008. RR-15 is outside of the subsided area.

For additional data related to subsidence refer to the 2017 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring RR-15. Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected from 1994 through 1995 by Genwal Resources and 2000 through 2017 by PacifiCorp. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, and 5. The East Mountain weather station is located on the southern tip of East Mountain.
  - RR-15 located on northeast facing slope surrounded with conifers. Flow from springs RR-16 and RR-15 diverted to weir with recorder (Emery Water Conservancy District). Per request from Emery Conservancy District, PacifiCorp removed the weir and recorder in August 2002. Flow from spring RR-15 generally ranges from 10 gpm to a maximum of 55 gpm.

Geologic Mode of Occurrence for spring RR-15:

- Water flowing down through fractures in the upper North Horn Formation intersects channel sandstones and flows laterally through the formation. A spring is formed when the sandstone channel intersects the surface.
- Geologic Formation: North Horn (refer to Geologic Occurrence sheet).
- Stratigraphic Position: 170' below top.

Justification for removal from monitoring: RR-15 has been monitored by PacifiCorp since 2000. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in Lease UTU-88554 and adjacent Federal Lease UTU-84285 ceased as of January 7, 2015. Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site RR-15 be removed from the monitoring program.

EAST MOUNTAIN

MILL FORK SPRING & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **RR-15**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
610' S.	1257'W.	NE	23	16S	6E	10350

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
North Horn	Diverted To Weir (not functioning)	None	170' below top

Location Comments: Spring located on northeast facing slope surrounded with conifers. Flow from springs RR-16 and RR-15 diverted to weir with recorder (Emery Water Conservancy District).

Probable Recharge Area: Areas of higher elevation located to the west.

Relationship to Adjacent Springs: This spring occurs in the same manner as several springs in the immediate area.

Geologic Occurrence of Spring:

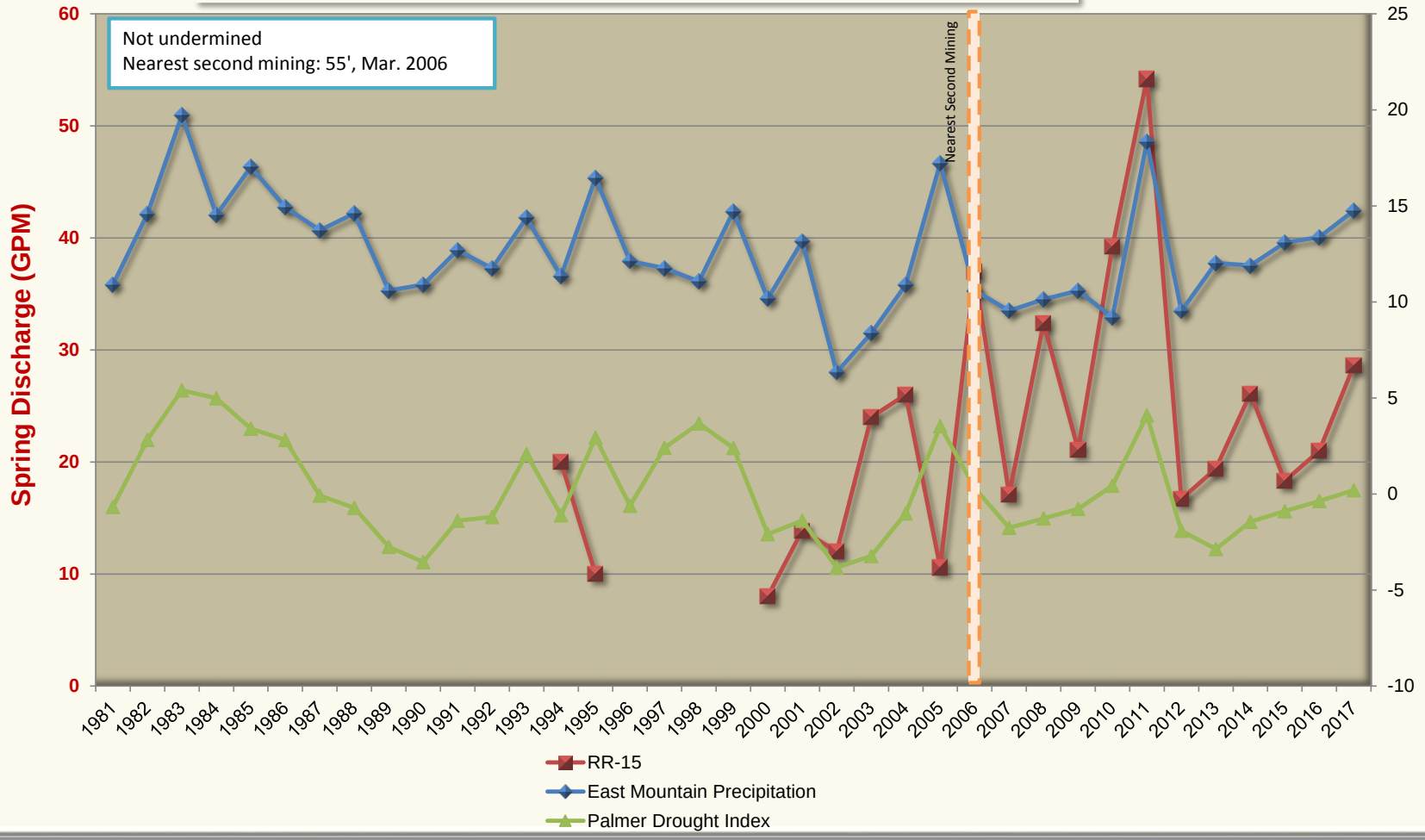
Water flows laterally through sandstone channels underlain by impermeable mudstones of the North Horn Formation and intersects the land surface forming a spring.

RR-15 spring source

RR-15 Weir and recorder (removed August 22, 2002)

EAST MOUNTAIN SPRINGS - MILL FORK SPRING: RR-15 vs. PRECIPITATION

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION AND PALMER DROUGHT INDEX



East Mountain Spring: RR-15
Water Quality Data: Operational
Mine Association: Deer Creek Mine - Mill Fork
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 55'
Date of Nearest Mining: May-06

	Pre-Mining Data: 20000101 THROUGH 20060430				Post-Mining Data: 20060501 THROUGH 20171231				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	285	207	253.727	11	233	204	216.608	23	BICARBONATE
CALCIUM	65.8	55	59.3181	11	60.9	54	57.4321	23	CALCIUM
CARBONATE	0				0	0	0	20	CARBONATE
CHLORIDE	2	1	1.12	10	2	0	0.91304	23	CHLORIDE
CONDUCTIVITY	498	419	440	11	479	356	430.956	23	CONDUCTIVITY
DISSOLVED OXYGEN	0				0				DISSOLVED OXYGEN
FLOW	26	6	12.2363	11	54.2	0.52	19.3426	23	FLOW
HARDNESS	241	218	229.636	11	243	210	226.739	23	HARDNESS
TOTAL IRON	0.832	0.121	0.3106	5	0	0	0	20	TOTAL IRON
DISSOLVED IRON	0.084	0.084	0.084	1	0	0	0	20	DISSOLVED IRON
MAGNESIUM	21.4	16.6	19.809	11	23.2	17.12	20.23	23	MAGNESIUM
DISSOLVED MANGANESE	0.159	0.003	0.058	3	0	0	0	20	DISSOLVED MANGANESE
MANGANESE	0.012	0.003	0.0075	2	0	0	0	20	MANGANESE
OIL AND GREASE	0				0				OIL AND GREASE
PH	8.43	7.53	8.04181	11	8.03	7.37	7.80695	23	PH
POTASSIUM	0.73	0.34	0.5978	5	1.32	0.59	0.8	23	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	4	1.96	2.77181	11	6.5	2.23	3.21565	23	SODIUM
SULFATE	11	4	6.04545	11	10	5	6.95652	23	SULFATE
SUSPENDED SOLIDS	214	214	214	1	0				SUSPENDED SOLIDS
TEMPERATURE	5.8	3	4.01818	11	8.5	3.4	4.36086	23	TEMPERATURE
TOTAL DISSOLVED SOLIDS	259	213	237.727	11	272	215	243.086	23	TOTAL DISSOLVED SOLIDS

Location: Section 24, Township 16 South, Range 6 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-88554.

Lease Association: Spring RR-23A is located within Federal Coal lease UTU-88554. The lease was originally acquired from the State Institutional Trust Lands Administration on April 1, 1999 and designated as ML-48258. State Lease ML-48258 reverted to the Bureau of Land Management on July 11, 2011 and was assigned the lease number of UTU-88554. Both the Hiawatha and Blind Canyon seams have been mined in this lease. Room and pillar mining began in the Hiawatha Seam in December 2003 with the first longwall retreat in August 2003. Blind Canyon seam development began in May 2006 with the first longwall retreat in February 2008. After completion of mining in the Blind Canyon seam, production resumed in the Hiawatha seam with final production occurring on January 7, 2015. First mining occurred in vicinity of RR-23A in the Hiawatha seam, (7th North Mains, August 2004).

Subsidence: No subsidence has been detected near RR-23A. The 2017 Annual Subsidence Report reported that the subsidence west of the spring has been stable since at least 2009. RR-23A is outside of the subsided area.

For additional data related to subsidence refer to the 2017 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring RR-23A. Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected from 2000 and has continued through 2017. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, and 5. The East Mountain weather station is located on the southern tip of East Mountain.
  - RR-23A is located in a clearing on an east facing slope surrounded by aspens. Abundant tufa deposits. Spring forms a small drainage. Flow from spring RR-23A generally ranges from 10 gpm to a maximum of 50 gpm.

Geologic Mode of Occurrence for spring RR-23A:

- Water flowing down through fractures in the upper North Horn Formation intersects channel sandstones and flows laterally through the formation. A spring is formed when the sandstone channel intersects the surface.
- Geologic Formation: North Horn (refer to Geologic Occurrence sheet).
- Stratigraphic Position: 360' above base.

Justification for removal from monitoring: RR-23A has been monitored by PacifiCorp since 2000. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in Lease UTU-88554 and adjacent Federal Lease UTU-84285 ceased as of January 7, 2015. Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site RR-23A be removed from the monitoring program.

EAST MOUNTAIN

MILL FORK SPRING & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **RR-23A**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
1571' S.	64' E.	NW	24	16S	6E	10023

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
North Horn	None	None	360' above base

Location Comments: Spring located in clearing on east facing slope surrounded by aspens. Abundant tufa deposits. Spring forms small drainage.

Probable Recharge Area: Areas of higher elevation located to the west.

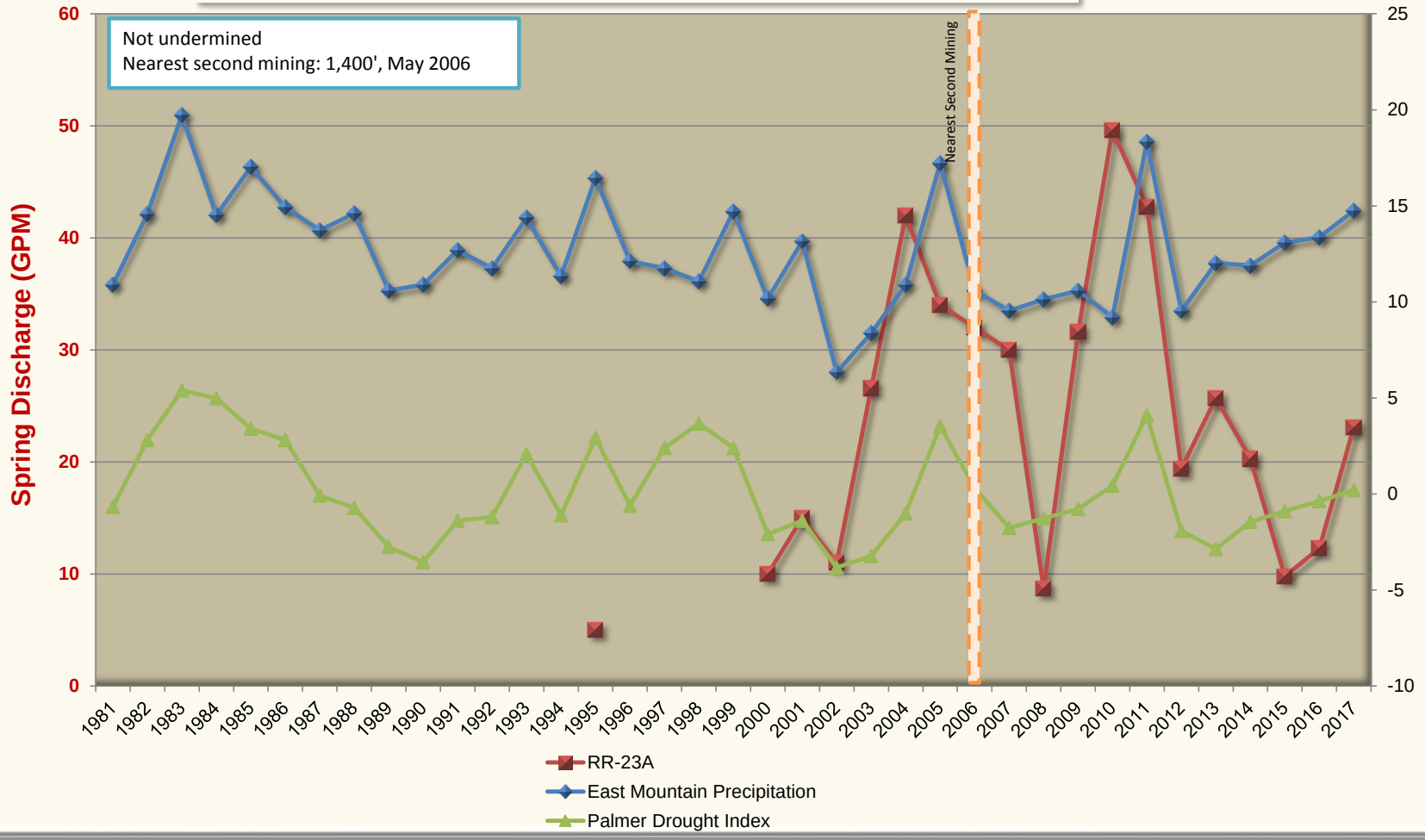
Relationship to Adjacent Springs: This spring occurs in the same manner as several springs in the immediate vicinity.

Geologic Occurrence of Spring:

Water flows laterally through sandstone channels underlain by impermeable mudstones of the North Horn Formation and intersects the land surface forming a spring.

EAST MOUNTAIN SPRINGS - MILL FORK SPRING: RR-23A vs. PRECIPITATION

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION AND PALMER DROUGHT INDEX



East Mountain Spring: RR-23A
Water Quality Data: Operational
Mine Association: Deer Creek Mine - Mill Fork
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 1400'
Date of Nearest Mining: May-06

	Pre-Mining Data: 20000101 THROUGH 20060430				Post-Mining Data: 20060501 THROUGH 20171231				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	309	237	276.181	11	258	217	240.304	23	BICARBONATE
CALCIUM	73.1	65	68.8454	11	75.2	63.42	69.6313	23	CALCIUM
CARBONATE	0				0	0	0	19	CARBONATE
CHLORIDE	2	1	1.59	10	3	0	1.47826	23	CHLORIDE
CONDUCTIVITY	566	461	493.272	11	560	411	489.173	23	CONDUCTIVITY
DISSOLVED OXYGEN	0				0				DISSOLVED OXYGEN
FLOW	42	8.32	17.5381	11	49.6	5.7	18.6495	23	FLOW
HARDNESS	272	245	255.636	11	282	232	258.086	23	HARDNESS
TOTAL IRON	1.12	0.3	0.54725	4	1.19	0	0.12238	21	TOTAL IRON
DISSOLVED IRON	0.008	0.008	0.008	1	0	0	0	19	DISSOLVED IRON
MAGNESIUM	21.7	19.5	20.3181	11	22.8	17.95	20.4526	23	MAGNESIUM
DISSOLVED MANGANESE	0.265	0.012	0.1385	2	0.066	0	4.38095	21	DISSOLVED MANGANESE
MANGANESE	0.011	0.011	0.011	1	0	0	0	19	MANGANESE
OIL AND GREASE	0				0				OIL AND GREASE
PH	8.28	7.21	7.69818	11	8.3	7.15	7.53913	23	PH
POTASSIUM	0.714	0.51	0.60866	6	1.1	0.56	0.72043	23	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	4	2.22	2.89545	11	3.78	1.97	2.78608	23	SODIUM
SULFATE	14	10	11.9181	11	15	8	12.2173	23	SULFATE
SUSPENDED SOLIDS	280	280	280	1	0				SUSPENDED SOLIDS
TEMPERATURE	8.2	4	5.21818	11	8.6	3.9	5.1	23	TEMPERATURE
TOTAL DISSOLVED SOLIDS	304	226	271.545	11	312	249	277.043	23	TOTAL DISSOLVED SOLIDS

Location: Section 23, Township 16 South, Range 6 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-88554.

Lease Association: EMPOND Spring is located within Federal Coal lease UTU-88554. The lease was originally acquired from the State Institutional Trust Lands Administration on April 1, 1999 and designated as ML-48258. State Lease ML-48258 reverted to the Bureau of Land Management on July 11, 2011 and was assigned the lease number of UTU-88554. Both the Hiawatha and Blind Canyon seams have been mined in this lease. Room and pillar mining began in the Hiawatha Seam in December 2003 with the first longwall retreat on August 2003. Blind Canyon seam development began in May 2006 with the first longwall retreat in February 2008. After completion of mining in the Blind Canyon seam, production resumed in the Hiawatha seam with final production occurring on January 7, 2015. Second mining occurred 1,620' north of EMPOND in the Hiawatha Seam in December 2005.

Subsidence: Maximum subsidence in area 1,560' north of Grants Spring has stabilized at approximately 6 feet. The 2017 Annual Subsidence Report reported that the subsidence has been stable since at least 2008. EMPOND is outside of the subsided area.

For additional data related to subsidence refer to the 2017 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring Grants Spring Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected since 1993 through 1995 by Genwal Resources and 2000 and through 2017 by PacifiCorp. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, 5, and 6. The East Mountain weather station is located on the southern tip of East Mountain. EMPOND is a located below ridge on east facing slope above small pond adjacent to road. Vegetation of the area surrounding the spring is dominated by conifers. Flow from spring EMPOND generally ranges from 1 gpm to a maximum of <10 gpm.

Geologic Mode of Occurrence for spring EMPOND:

- Water flows laterally through sandstone channels underlain by impermeable mudstones of the North Horn Formation and intersects the land surface forming a spring.
- Geologic Formation: North Horn (refer to Geologic Occurrence sheet).
- Stratigraphic Position: 160' below top.

Justification for removal from monitoring: EMPOND has been monitored by PacifiCorp since 2000. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in Lease UTU-88554 and adjacent Federal Lease UTU-84285 ceased as of January 7, 2015. Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site EMPOND be removed from the monitoring program.

EAST MOUNTAIN

MILL FORK SPRING & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **EMPOND**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
1744' N.	1223' W.	SE	23	16S	6E	10280

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
North Horn	None	None	160' below top

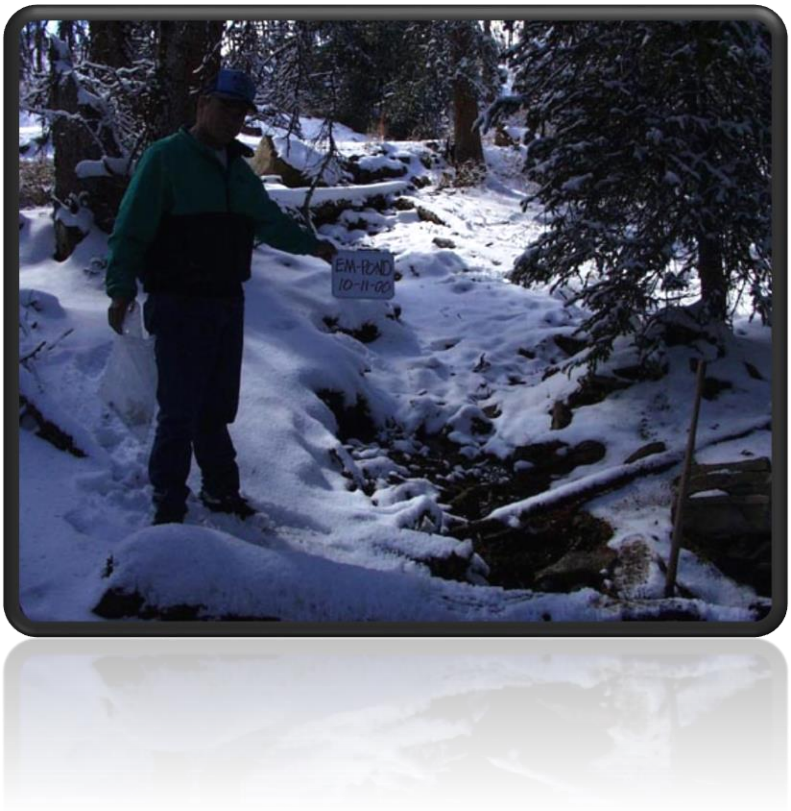
Location Comments: Spring located below ridge on east facing slope above small pond adjacent to road. Vegetation of the area surrounding the spring dominated by conifers.

Probable Recharge Area: Highlands area to the northwest (recharge limited).

Relationship to Adjacent Springs: This spring occurs in the same manner as EM-222 and EM-223.

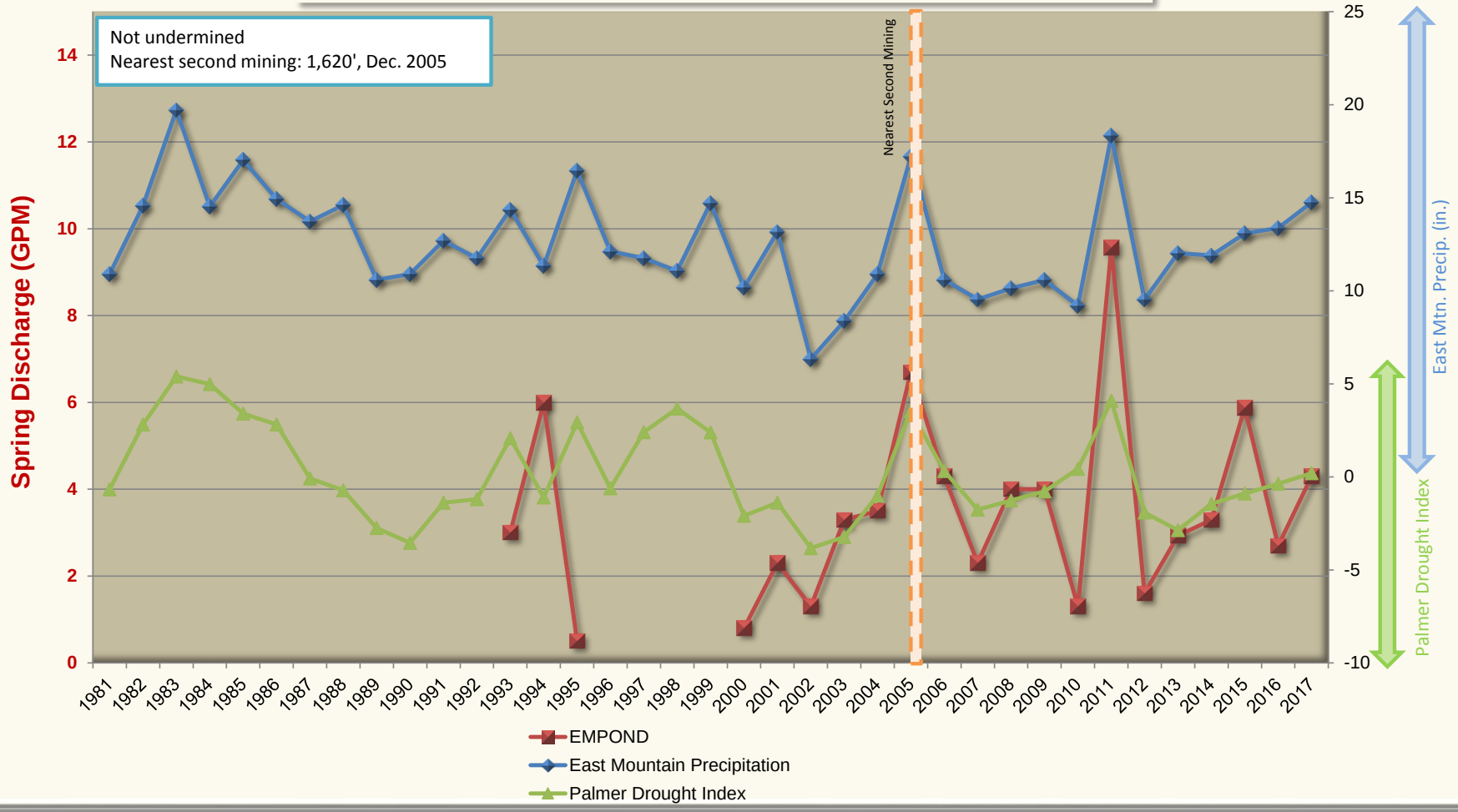
Geologic Occurrence of Spring:

Water flows laterally through sandstone channels underlain by impermeable mudstones of the North Horn Formation and intersects the land surface forming a spring.



EAST MOUNTAIN SPRINGS - MILL FORK SPRING: EMPOND vs. PRECIPITATION

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION AND PALMER DROUGHT INDEX



East Mountain Spring: EMPOND
Water Quality Data: Operational
Mine Association: Deer Creek Mine - Mill Fork
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 1620'
Date of Nearest Mining: Dec-05

	Pre-Mining Data: 20000101 THROUGH 20051130				Post-Mining Data: 20051201 THROUGH 20171231				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	296	228	269.1	10	239	213	225.875	24	BICARBONATE
CALCIUM	62	57.4	60	10	62.74	54.49	58.16125	24	CALCIUM
CARBONATE	0				12	0	0.6	20	CARBONATE
CHLORIDE	2	1	1.13	10	3	0	1.33333	24	CHLORIDE
CONDUCTIVITY	525	446	468.7	10	491	371	445.125	24	CONDUCTIVITY
DISSOLVED OXYGEN	0				0				DISSOLVED OXYGEN
FLOW	6.7	0.5	2.175	10	9.57	0.37	2.78333	24	FLOW
HARDNESS	249	231	242.7	10	254	221	236.375	24	HARDNESS
TOTAL IRON	1.5	0.088	0.4452	5	1.4	0	0.20695	23	TOTAL IRON
DISSOLVED IRON	0.056	0.056	0.056	1	0	0	0	20	DISSOLVED IRON
MAGNESIUM	23.7	21.3	22.57	10	24.1	20.45	22.137	24	MAGNESIUM
DISSOLVED MANGANESE	0.07	0.002	0.02	5	0.063	0	8.29166	24	DISSOLVED MANGANESE
MANGANESE	0.008	0.007	0.0075	2	0	0	0	20	MANGANESE
OIL AND GREASE	0				0				OIL AND GREASE
PH	8.21	7.84	7.983	10	8.15	7.67	7.91791	24	PH
POTASSIUM	0.697	0.539	0.60433	6	0.92	0.53	0.65375	24	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	4	2	2.385	10	2.56	1.35	2.06583	24	SODIUM
SULFATE	7	4.8	5.38	10	6	3	3.79166	24	SULFATE
SUSPENDED SOLIDS	239	239	239	1	0				SUSPENDED SOLIDS
TEMPERATURE	6	3.8	5.24	10	10.6	4.9	6.9	24	TEMPERATURE
TOTAL DISSOLVED SOLIDS	280	231	251.6	10	287	204	245.333	24	TOTAL DISSOLVED SOLIDS

Location: Section 29, Township 16 South, Range 7 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-06039.

Lease Association: Spring 80-50 is located within Federal Coal lease UTU-06039. The lease was originally issued effective May 1, 1953. Both the Hiawatha and Blind Canyon seams have been mined in this lease. Room and pillar mining began in the Blind Canyon Seam in November 1993 with the first longwall retreat in August 1999. Hiawatha seam development began in October 2000 with the first longwall retreat in April 2002. . No mining occurred in vicinity of 80-50.

Subsidence: No subsidence has been detected near 80-50. The 2008 Annual Subsidence Report reported that the subsidence west of the spring has been stable since at least 2005. 80-50 is outside of the subsided area.

For additional data related to subsidence refer to the 2008 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring 80-50. Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected from 2001 and has continued through 2017. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, and 5. The East Mountain weather station is located on the southern tip of East Mountain.
  - 80-50 is located on east facing hillside which is densely populated with spruce trees above the Rilda Canyon road (Emery County Road #306) turn around. Flow from spring 80-50 generally ranges from 0gpm/seep to a maximum of 3.5 gpm.

Geologic Mode of Occurrence for spring 80-50:

- Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.
- Geologic Formation: Blackhawk Formation (refer to Geologic Occurrence sheet).
- Stratigraphic Position: 100' above base.

Justification for removal from monitoring: 80-50 has been monitored by PacifiCorp from 1980 through 1986 and from 1996 through 2018. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in Lease UTU-88554 and adjacent Federal Lease UTU-84285 (west and north of UTU-06039) ceased as of January 7, 2015. Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site 80-50 be removed from the monitoring program.

EAST MOUNTAIN

EAST MOUNTAIN & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **80-50**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
2850’ S.	2230' W.	NW	29	16S	7E	7810

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
Blackhawk	None	None	100' above bottom

Location Comments: Spring located on east facing hillside which is densely populated with spruce trees.

Probable Recharge Area: Areas of higher elevations which are located to the west.

Relationship to Adjacent Springs: Spring not associated with any other springs.

Geologic Occurrence of Spring:

Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.

Spring 80-50, May 22, 2018

Location: Section 29, Township 16 South, Range 7 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-06039.

Lease Association: Spring 80-50 is located within Federal Coal lease UTU-06039. The lease was originally issued effective May 1, 1953. Both the Hiawatha and Blind Canyon seams have been mined in this lease. Room and pillar mining began in the Blind Canyon Seam in November 1993 with the first longwall retreat in August 1999. Hiawatha seam development began in October 2000 with the first longwall retreat in April 2002. . No mining occurred in vicinity of 80-50.

Subsidence: No subsidence has been detected near 80-50. The 2008 Annual Subsidence Report reported that the subsidence west of the spring has been stable since at least 2005. 80-50 is outside of the subsided area.

For additional data related to subsidence refer to the 2008 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring 80-50. Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected from 2001 and has continued through 2017. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, and 5. The East Mountain weather station is located on the southern tip of East Mountain.
  - 80-50 is located on east facing hillside which is densely populated with spruce trees above the Rilda Canyon road (Emery County Road #306) turn around. Flow from spring 80-50 generally ranges from 0gpm/seep to a maximum of 3.5 gpm.

Geologic Mode of Occurrence for spring 80-50:

- Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.
- Geologic Formation: Blackhawk Formation (refer to Geologic Occurrence sheet).
- Stratigraphic Position: 100' above base.

Justification for removal from monitoring: 80-50 has been monitored by PacifiCorp from 1980 through 1986 and from 1996 through 2018. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in Lease UTU-88554 and adjacent Federal Lease UTU-84285 (west and north of UTU-06039) ceased as of January 7, 2015. Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site 80-50 be removed from the monitoring program.

EAST MOUNTAIN

EAST MOUNTAIN & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **80-50**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
2850’ S.	2230' W.	NW	29	16S	7E	7810

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
Blackhawk	None	None	100' above bottom

Location Comments: Spring located on east facing hillside which is densely populated with spruce trees.

Probable Recharge Area: Areas of higher elevations which are located to the west.

Relationship to Adjacent Springs: Spring not associated with any other springs.

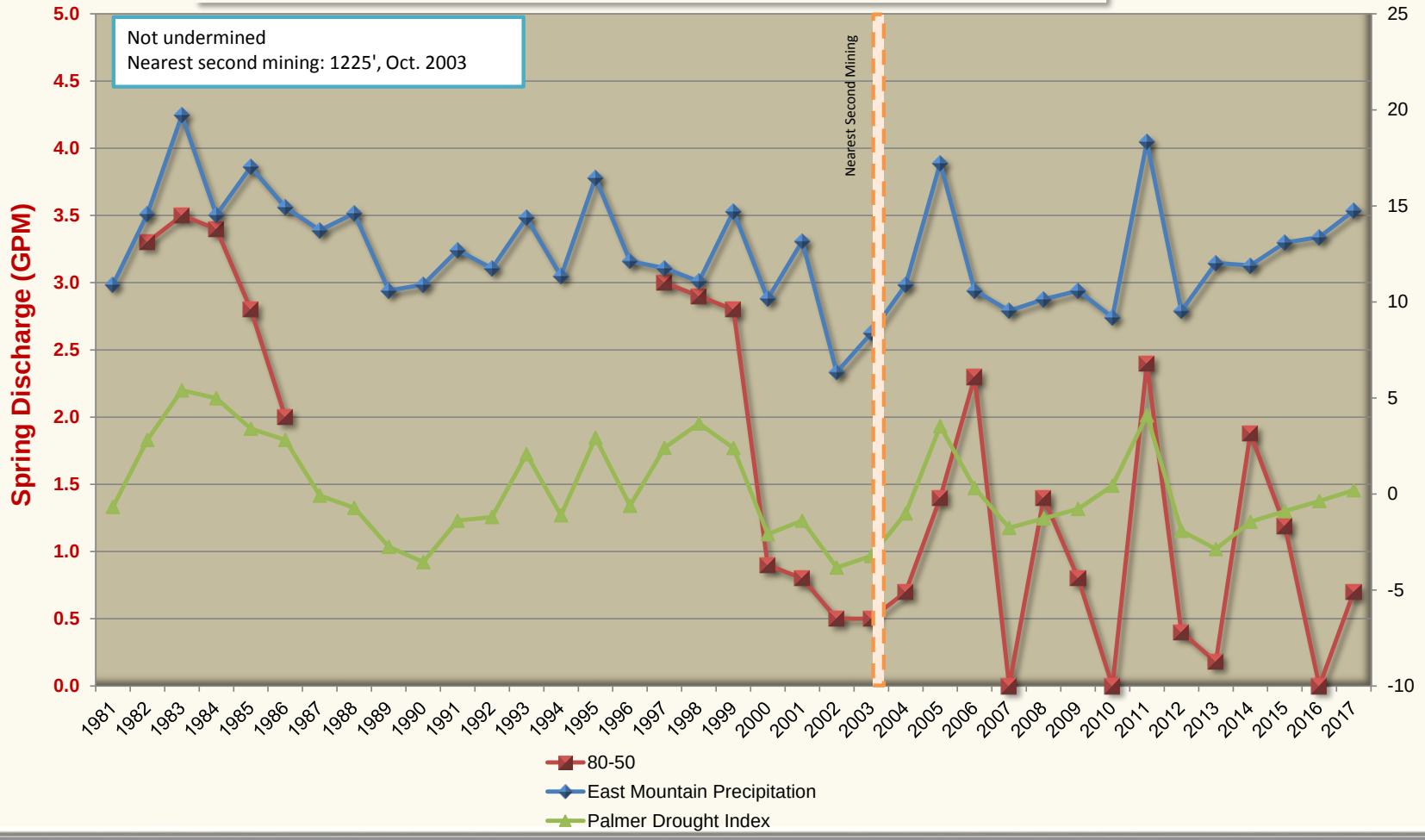
Geologic Occurrence of Spring:

Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.

Spring 80-50, May 22, 2018

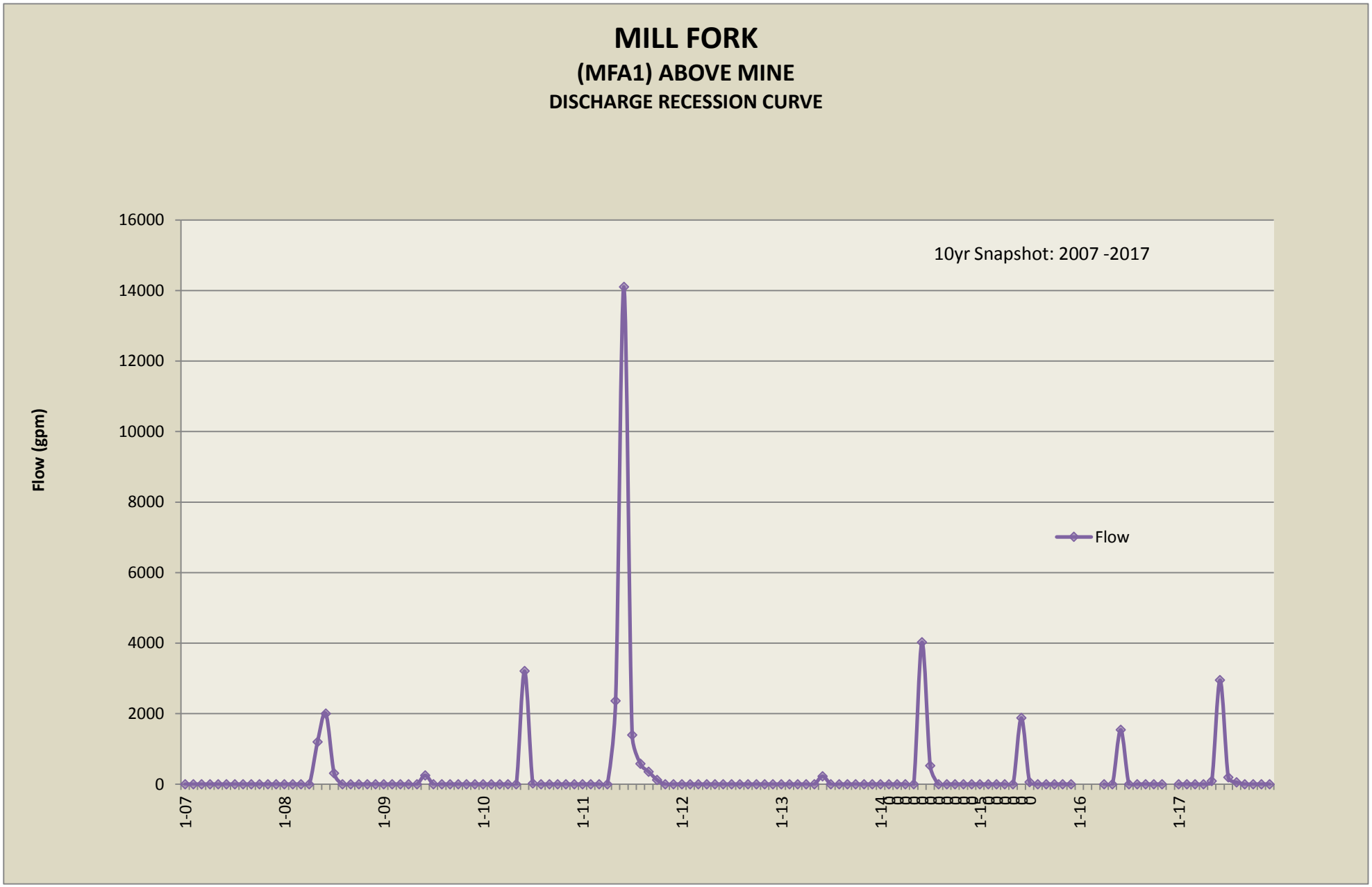
EAST MOUNTAIN SPRINGS - EAST MTN. SPRING: 80-50 Spring vs. PRECIPITATION

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION AND PALMER DROUGHT INDEX



East Mountain Spring: 80-50
Water Quality Data: Operational
Mine Association: Deer Creek Mine - East Mountain
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 1890'
Date of Nearest Mining: May-05

	Pre-Mining Data: 19770101 THROUGH 20031001				Post-Mining Data: 20031030 THROUGH 20171231				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	574	456	504.375	16	421	343	387.23	13	BICARBONATE
CALCIUM	150	44	59.8625	16	70.84	48.5	57.9692	13	CALCIUM
CARBONATE	0				0	0	0	9	CARBONATE
CHLORIDE	28	9	18.025	16	24	8	14.4615	13	CHLORIDE
CONDUCTIVITY	1298	872	1073.06	16	1249	800	991.538	13	CONDUCTIVITY
DISSOLVED OXYGEN	10.2	6.3	8.25	2	0				DISSOLVED OXYGEN
FLOW	3	0.38	1.436875	16	2.36	0.18	1.11538	13	FLOW
HARDNESS	670	452	566.214	14	679	420	525.384	13	HARDNESS
TOTAL IRON	0.8	0.063	0.4315	2	3.06	0	0.37363	11	TOTAL IRON
DISSOLVED IRON	0.4	0.33	0.365	2	0	0	0	9	DISSOLVED IRON
MAGNESIUM	133	27	98.63125	16	132	65.31	92.4038	13	MAGNESIUM
DISSOLVED MANGANESE	0				0.141	0	1.82222	9	DISSOLVED MANGANESE
MANGANESE	0				0.009	0	0.0009	10	MANGANESE
OIL AND GREASE	0				0				OIL AND GREASE
PH	8.14	7.04	7.748125	16	8.23	7.12	7.97692	13	PH
POTASSIUM	12	3	4.3125	16	3.58	2.53	3.03461	13	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	46	18	26.3125	16	25.5	19.18	21.943	13	SODIUM
SULFATE	252	114	184.525	16	256	89	154	13	SULFATE
SUSPENDED SOLIDS	79	1.5	40.25	2	0				SUSPENDED SOLIDS
TEMPERATURE	8.3	6.3	7.51875	16	11.4	7.6	9.15384	13	TEMPERATURE
TOTAL DISSOLVED SOLIDS	810	494	651.625	16	721	470	588.153	13	TOTAL DISSOLVED SOLIDS


MILL FORK
(MFA1) ABOVE MINE
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow
Flow (gpm)
16000
14000
12000
10000
8000
6000
4000
2000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17

MILL FORK CANYON WATER QUALITY *

MFA1 - ABOVE MINE

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170607.0	-214	225.0	56.3	0.0	2	449	220.00	0.38	0.00	19.3	0.0	0	8.53	1.29	16.58	23	72.0	258.0
No. of Analysis	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
2016**	0	228	50	0	2	438	198	1	0	18	0	0	9	1	27	30	55	313
2015**	0	214	50	11	2	471	200	2	0	19	0	0	9	1	25	29	244	356
2014**	0	252	57	0	2	483	220	0	0	19	0	0	9	1	20	29	85	285
2013**	0	230	59	0	2	550	230	5	0	20	0	0	9	1	33	44	546	290
2012**	No Flow During 2012																	
2011**																		
MIN	0	206	54.73	0	2	427	231	0	0	18.49	0	0	8.42	0.73	6.17	16	0	253
MAX	0	210	61.86	0	2	468	247	13.41	0	26.71	0	0	8.5	0.99	7.4	32	1426	256
MEAN	0	208	58.295	0	2	447.5	239	6.705	0	22.6	0	0	8.46	0.86	6.785	24	713	254.5
2010**	0	191	54.76	0	2	387	206	3.29	0	16.82	0	0	8.56	0.85	5.89	15	379	226
2009**	0.0	206	61.23	10	2	443	246.00	0	0.00	23	0	0.00	8.61	0.96	6	23	8	264
2008**		162	60.59	36	2	433	233	0.40		19.78			8.52	0.78	4.20	15	26	227
2007**	No Flow During 2007																	
2006**		220	63		3	463	251	0.08		23			8.47	1	4.84	20	12	265
HISTORICAL 1986-2016																		
MIN	0.0	153.0	32.0	0.0	2.0	180.0	198.0	0.0	0.0	13.0	0.0	0.0	8.0	0.7	1.0	12.0	0.0	176
MAX	0.0	400.0	82.0	36.0	24.0	813.0	462.0	13.4	0.5	73.0	0.0	0.0	8.6	3.0	33.3	223.0	1426.0	710
MEAN	0.0	260.8	57.2	7.2	7.8	502.9	281.3	1.3	0.1	33.7	0.0	0.0	8.3	1.5	11.4	54.4	122.7	323.8485
COUNT	9	32	33	13	32	33	33	27	11	33	9	9	34	30	33	33	31	33

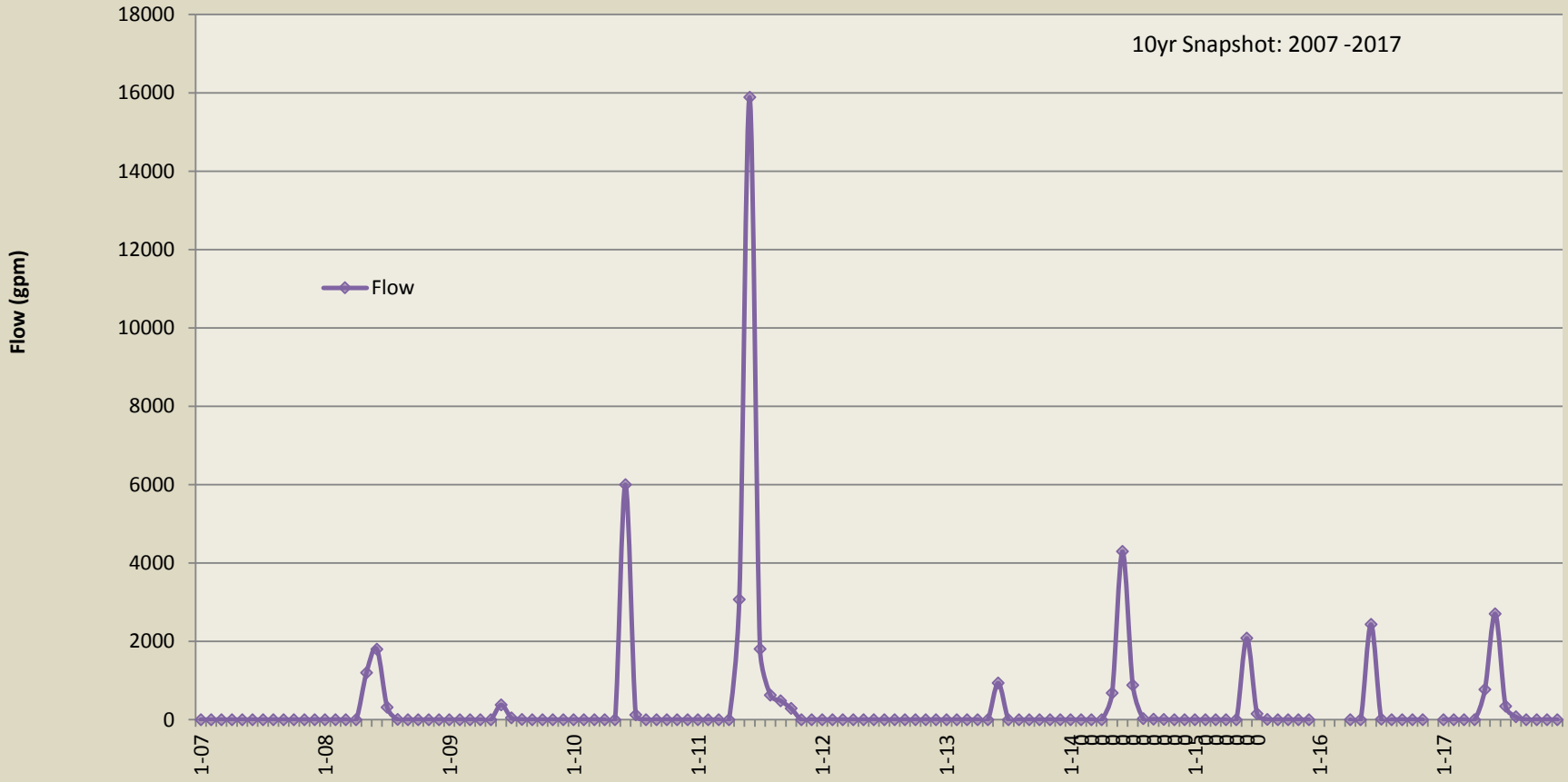
*** Quality parameters are reported as mg/l unless otherwise noted.**

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

MILL FORK

(MFU03) ABOVE MILL FORK GRABEN

DISCHARGE RECESSION CURVE



MILL FORK CANYON WATER QUALITY *

MFU3 - ABOVE MILL FORK FAULT

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170607	-274.0	221	57.1	0.0	2.0	453	222.00	0.4	0.00	19.19	0.00	0.0	8.6	1.32	16.8	23	74	260
No. of Analysis	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
2016**	0	225	51	0	2	415	188	1	0	15	0	0	8	1	26	30	55	315
2015**	0	215	50	12	2	470	201	2	0	18	0	0	9	1	25	29	211	312
2014**																		
MIN	0	223	49	0	2	484	221	0	0	19	0	0	8	1	20	29	8	261
MAX	0	250	57	8	4	503	237	0	0	28	0	0	9	1	20	41	67	294
MEAN	0	237	53	4	3	494	229	0	0	24	0	0	9	1	20	35	38	278
2013**	0	245	60	0	2	535	232	10	0	20	0	0	9	1	34	44	1096	310
2012**	No Flow During 2012																	
2011**																		
MIN	0	207	63	0	5	427	235	4	0	19	0	0	8	1	6	16	1804	258
MAX	0	219	63	0	5	482	259	4	0	27	0	0	8	1	8	32	1804	259
MEAN	0	213	61	0	4	455	247	2	0	23	0	0	8	1	7	24	902	259
2010**	0	191	54.75	0	2	393	206.00	4	0.00	16.90	0	0.00	8.53	0.86	6	15	409	221
2009**	0	209	62.60	9	2	453	251.00	0	0.00	23.11	0	0.00	8.49	0.98	6	23	0	261
2008**	0.0	162	60.72	37	2	428	233	0.37	0	19.69	0.01	0	8.50	0.78	4.11	15	53	234
2007**	No Flow During 2007																	
2006**		221	61.80		3	468	246	0.08		22.30			8.33	1	4.72	20	9	275
HISTORICAL 1986-2016																		
MIN	0.0	162.0	49.0	0.0	2.0	393.0	188.0	0.0	0.0	14.5	0.0	0.0	8.2	0.7	4.1	15.0	0.0	221
MAX	0.0	251.0	64.2	37.0	5.0	535.0	259.0	9.8	0.0	27.9	0.0	0.0	8.6	1.4	34.3	44.0	1804.0	315
MEAN	0.0	216.2	57.7	7.8	2.5	455.7	229.6	1.5	0.0	20.8	0.0	0.0	8.4	0.9	12.4	25.4	313.5	267.5714
COUNT	10	14	14	12	14	14	14	14	10	14	11	10	14.00	14	14	14	12	14

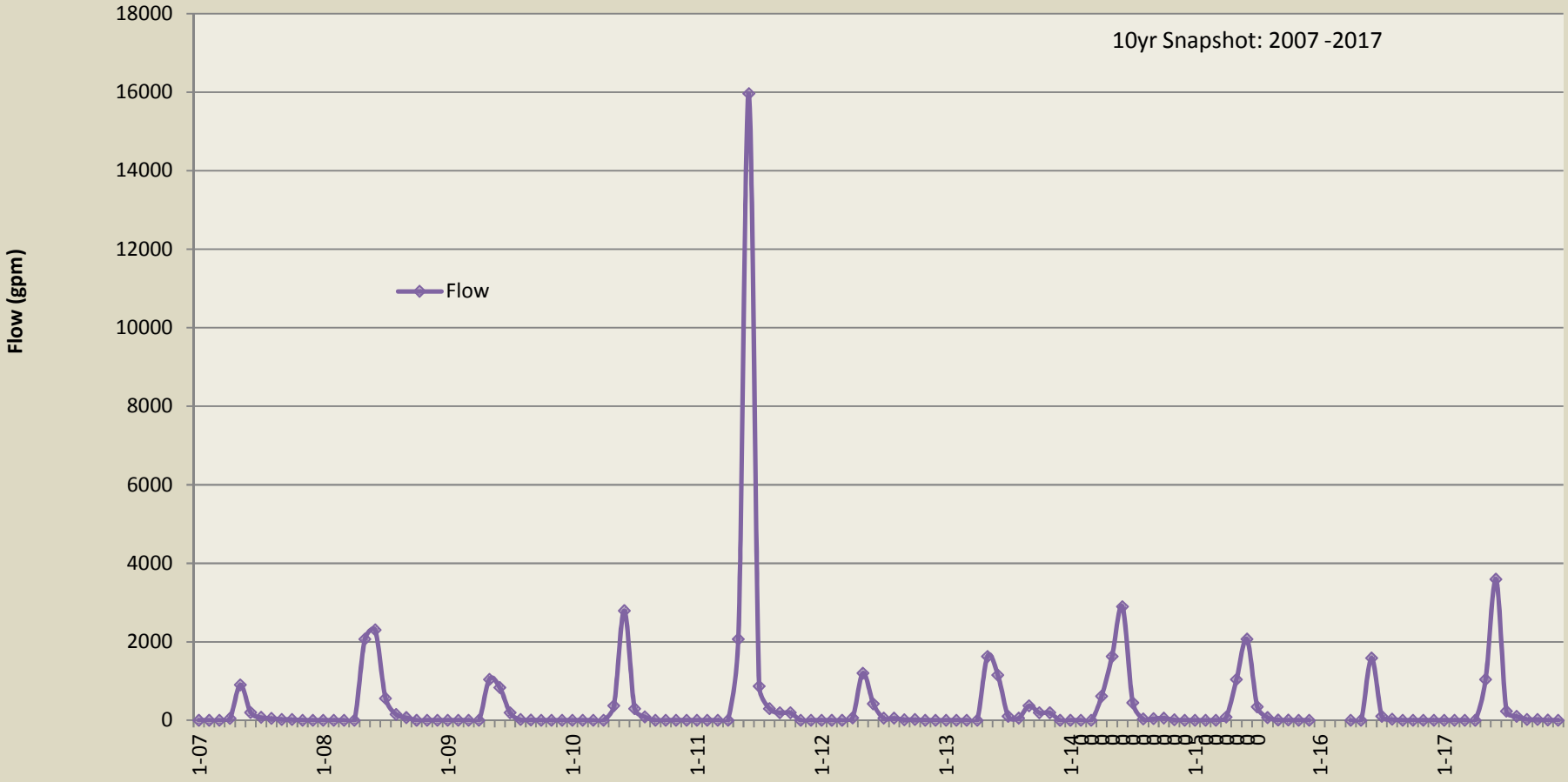
*** Quality parameters are reported as mg/l unless otherwise noted.**

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

RILDA CANYON

(RCF1) RIGHT FORK

DISCHARGE RECESSION CURVE



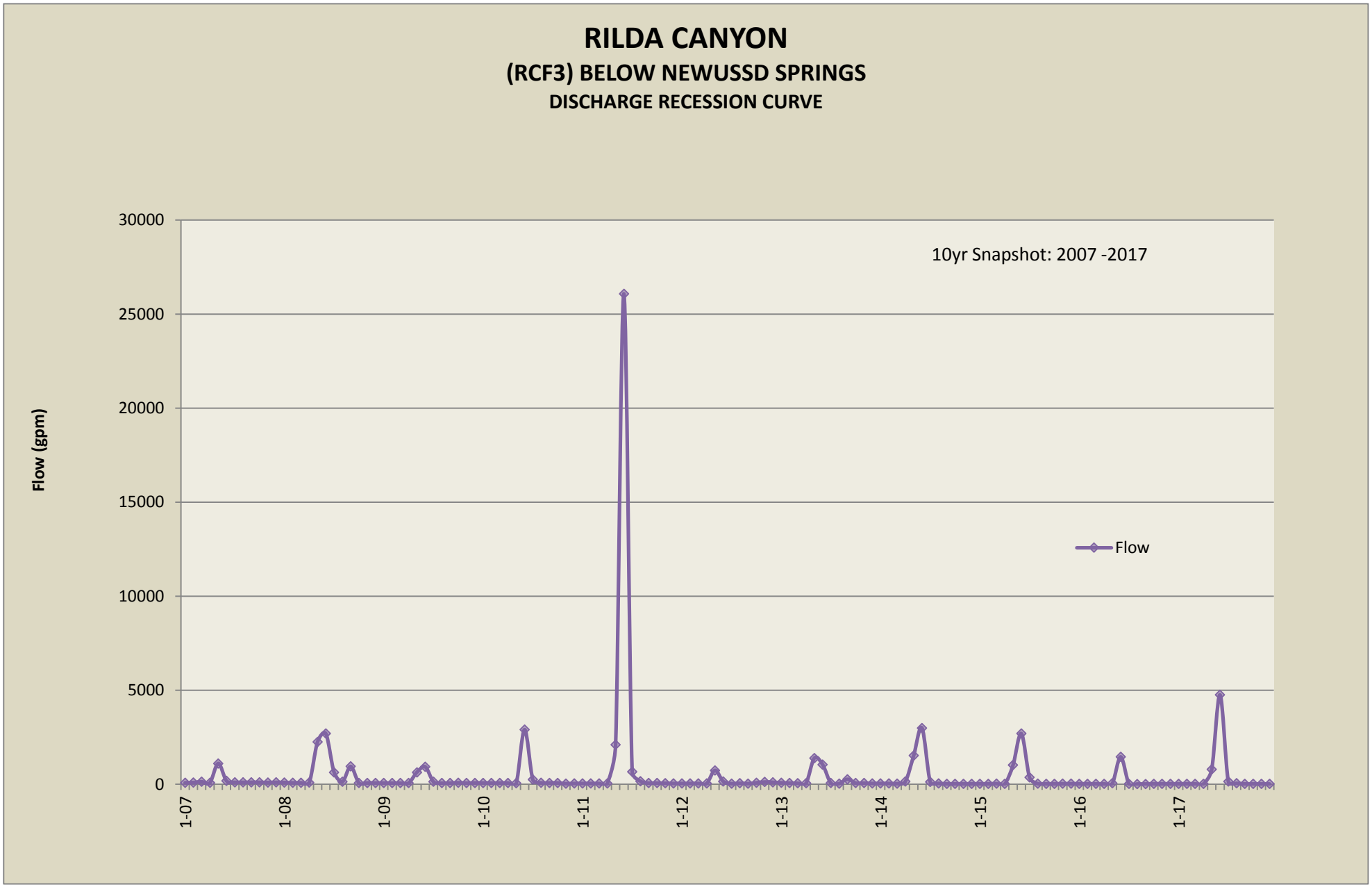
RILDA CANYON SURFACE WATER QUALITY *

RCF1 - RILDA CANYON FLUME - RIGHT FORK

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170607	0.0	212.0	58.3	0.0	1.0	403.0	224.0	0.2	0.0	19.0	0.0	0.0	8.6	1.0	5.9	10.0	36.0	217.0
20170911	0.0	200.0	48.9	10.0	2.0	429.0	220.0	0.0	0.0	23.7	0.0	0.0	8.5	1.3	8.7	24.0	0.0	266.0
No. of Analysis	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	2
2017																		
MIN	0	200	49	0	1	403	220	0	0	19	0	0	9	1	6	10	0	217
MAX	0	212	58	10	2	429	224	0	0	24	0	0	9	1	9	24	36	266
MEAN	0.00	206.00	53.58	5.00	1.50	416.00	222.00	0.10	0.00	21.33	0.00	0.00	8.58	1.14	7.28	17.00	18.00	241.50
2016*	0	200	53	0	3	371	213	0	0	19	0	0	8	0	4	19	36	265
2015**																		
MIN	0	196	46	0	1	418	211	0	0	21	0	0	8	1	5	11	0	251
MAX	0	215	52	0	2	425	216	1	0	24	0	0	9	2	9	22	117	264
MEAN	0	206	49	0	2	422	214	1	0	22	0	0	8	1	7	17	59	258
2014**																		
MIN	0	209	49	0	2	432	208	0	0	18	0	0	8	1	5	11	0	232
MAX	0	226	53	0	2	433	216	0	0	23	0	0	9	1	9	22	52	255
MEAN	0	218	51	0	2	433	212	0	0	21	0	0	9	1	7	17	26	244
2013**																		
MIN	0	198	50	0	1	406	201	0	0	19	0	0	8	1	6	12	48	186
MAX	0	198	53	0	2	421	212	8	0	19	0	0	9	1	9	17	744	233
MEAN	0	198	51	0	2	414	207	4	0	19	0	0	9	1	8	15	396	209.5
2012**																		
MIN	0	209	56	0	1	438	226	0	0	21	0	0	8	1	7	18	12	229
MAX	0	213	56	0	2	447	242	0	0	25	0	0	9	1	9	25	26	256
MEAN	0	211	56	0	2	443	234	0	0	23	0	0	8	1	8	22	19	243
2011**																		
MIN	0	196	53	0	1	408	222	0	0	18	0	0	9	1	4	10	17	226
MAX	0	209	60	0	1	431	224	4	0	22	0	0	9	1	8	22	347	231
MEAN	0	203	56	0	1	420	223	2	0	20	0	0	9	1	6	16	182	228.5
2010**		201	58	0	1	399	218	1	0	18	0	0	9	1	5	10	133	226
2009**		202	53	9	3	446	237	0	0	25	0	0	9	1	9	25	0	264
2008**																		
MIN		198	52	0	2	446	228	0		0	0		0	1	1	9		0
MAX		202	53	9	3	453	228	237		24	25		9	9	9	24		252
MEAN		200	53	5	3	450	228	119		12	13		4	5	5	16		126
2007**																		
MIN		186	51		2	484	217	0.05		21.6	0.000		8.05	0.74	7.36	19		242
MAX		199	53		3	513	240	0.05		26.0	0.000		8.32	1.24	8.93	27		263
MEAN		193	52.4		2.5	498.5	228.5	0.05		23.8	0.000		8.19	0.99	8.15	23.0		252.5
2006**																		
MIN		207	56		3	434	228	0.25		19.7	0		8.46	0.86	5.00	15	16	240
MAX		213	59		3	488	231	0.25		22.1	0		8.49	1.01	8.06	23	16	259
MEAN		210	58		3	461	230	0.25		20.9	0		8.48	0.94	6.53	19	16	250
HISTORICAL 1989-2016																		
MIN	0.0	177.0	45.8	0.0	1.0	300.0	193.0	0.0	0.0	17.5	0.0	0.0	7.8	0.0	3.8	1.0	0.0	145
MAX	10.0	329.0	108.6	27.0	15.0	513.0	384.0	8.0	1.2	30.0	0.1	5.0	8.9	10.0	24.0	80.0	744.0	292
MEAN	1.6	228.5	57.1	6.3	3.7	426.7	232.1	0.7	0.1	21.8	0.0	1.1	8.5	1.3	7.5	20.4	74.3	246.85
COUNT	24	47	47	39	47	47	47	36	25	47	25	23	47	40	47	46	34	47

*** Quality parameters are reported as mg/l unless otherwise noted.**

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

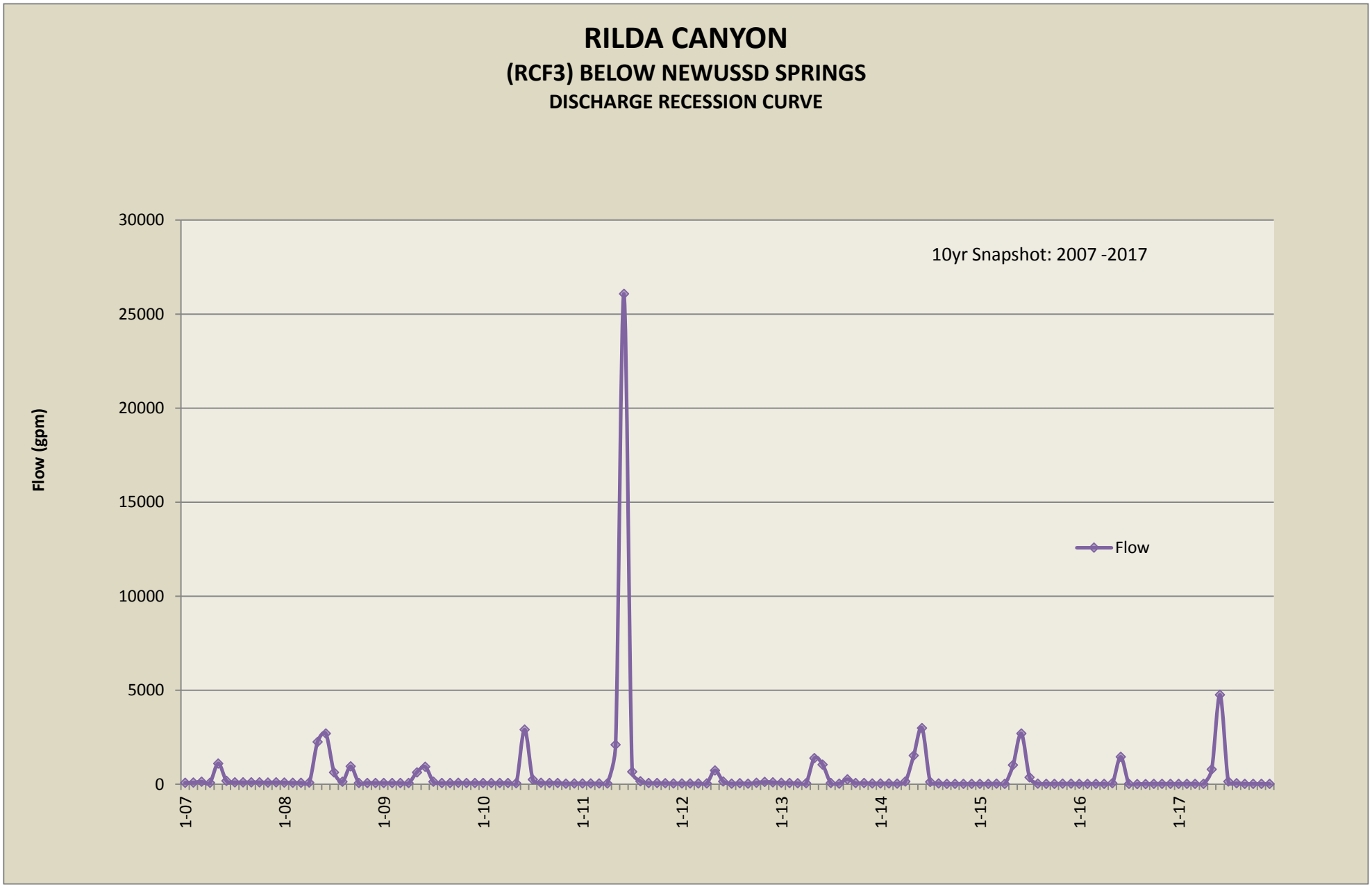

RILDA CANYON
(RCF3) BELOW NEWUSSD SPRINGS
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
30000
25000
20000
15000
10000
5000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - BELOW NEWUA SPRINGS

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170313	0.0	354.0	99.2	0.0	32.0	1013.0	8.1	493.0	0.2	0.1	59.6	0.0	0.0	8.1	4.2	28.5	177.0	0.0	611.0
20170608	0.0	222.0	60.7	0.0	2.0	449.0	10.2	239.0	0.5	0.0	21.2	0.0	0.0	8.6	1.0	5.4	15.0	165.0	252.0
20170907	6.0	320.0	82.0	0.0	15.0	885.0	10.4	407.0	0.1	0.0	49.1	0.0	0.0	8.6	3.1	20.9	137.0	0.0	514.0
20171205	0.0	331.0	90.7	0.0	12.0	901.0	13.1	443.0	0.1	0.0	52.6	0.0	0.0	8.0	3.4	21.6	143.0	8.0	575.0
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2017																			
MIN	0	222	61	0	2	449	8	239	0	0	21	0	0	8	1	5	15	0	
MAX	6	354	99	0	32	1013	13	493	1	0	60	0	0	9	4	29	177	165	
MEAN	0.00	306.75	83.14	0.00	15.25	812.00	10.45	395.50	0.23	0.01	45.62	0.01	0.00	8.32	2.91	19.11	118.00	43.25	
2016**																			
MIN	0.0	205.0	55.2	0.0	1.0	381.0	8.7	210.0	0.0	0.0	17.5	0.0	0.0	8.0	0.0	4.4	12.0	0.0	272.0
MAX	6.0	350.0	95.0	0.0	10.0	880.0	9.9	483.0	0.5	0.0	59.6	0.0	0.0	8.1	2.9	23.6	159.0	56.0	589.0
MEAN	1.5	302.8	82.3	0.0	7.8	746.5	9.4	398.5	0.3	0.0	46.8	0.0	0.0	8.1	2.1	18.5	115.0	19.3	493.0
2015**																			
MIN	0	218	52	0	2	419	10	218	0	0	22	0	0	8	1	5	14	0	277
MAX	0	343	87	0	10	895	10	454	3	0	58	0	0	9	3	24	157	221	583
MEAN	0	303	78	0	8	769	10	388	1	0	47	0	0	8	2	19	117	83	506
2014**																			
MIN	0	339	85	0	9	871	0	425	0	0	52	0	0	8	3	25	139	0	550
MAX	6	343	89	0	10	920	0	447	0	0	54	0	0	8	4	55	170	0	586
MEAN	3	341	87	0	10	896	0	436	0	0	53	0	0	8	3	40	155	0	568
2013**																			
MIN	0	205	53	0	1	155	0	221	0	0	20	0	0	8	1	7	17	0	214
MAX	5	339	97	11	10	901	0	486	12	0	59	0	0	9	3	25	154	1092	562
MEAN	3	274	76	3	6	599	0	351	3	0	39	0	0	8	2	16	88	284	386
2012**																			
MIN	0	250	67	0	4	576	8	297	0	0	32	0	0	8	1	12	56	0	334
MAX	30	350	101	0	10	921	8	495	0	0	59	0	0	8	3	26	159	8	556
MEAN	8	312	85	0	8	782	8	413	0	0	48	0	0	8	2	20	113	4	468
2011**																			
MIN	0	212	59.9	0	2.0	423	8.70	228	0.16	0.00	19.14	0.00	0.00	7.95	0.80	4.79	13.0	0.0	258
MAX	5	351	97.0	0	11.0	899	8.70	481	14.79	0.00	58.07	0.03	0.00	8.54	2.82	24.63	152.0	1786.0	573
MEAN	1	287	79.9	0	7.0	702	8.70	373	3.86	0.00	42.22	0.02	0.00	8.19	1.97	16.74	95.0	448.0	436
2010**																			
MIN					2.0	411	6.10	221	0.29		18.45	0.00		7.87	0.81	5.10	13.0	0.0	233
MAX					11.0	922	10.20	510	1.37		62.65	0.04		8.56	3.10	26.36	157.0	100.0	592
MEAN					7.3	765	8.80	419.75	0.65		48.58	0.02		8.14	2.42	19.78	111.3	34.0	488
2009**																			
MIN	0	217	62		2	462	8	251	0		23	0		8	1	7	26	6	288
MAX	15	374	108		10	1005	9	545	1		67	0		8	3	30	183	90	678
MEAN	9	330	91		8	840	8	448	1		53	0		8	3	22	130	31	550
2008**																			
MIN	0	179	61		2	470	9	242	1		22	0		8	1	5	18	8	247
MAX	20	378	115		10	1072	16	577	1		70	0		9	4	29	213	12	742
MEAN	10	322	97		8	911	12	471	1		55	0		8	3	23	147	10	571
2007**																			
MIN		285	77.6		6.0	834	10.09	378	0.20		44.70	0.02		7.54	1.86	15.60	90.0	5.0	438
MAX		400	132.0		12.0	1304	12.48	614	1.17		69.10	0.09		8.04	3.51	30.06	255.0	6.0	746
MEAN		370	111.2		10.2	1128.2	11.26	536.2	0.50		62.75	0.05		7.79	3.14	26.11	196.0	5.5	652.6
2006**																			
MIN		220	62		3.0	487	10.3	252	0.16		23.8	0		7.78	0.98	6.4	25	6	278
MAX		376	112		12.0	1073	12.5	563	0.30		69.0	0		8.18	3.32	26.8	185	18	626
MEAN		328	94		8.8	906	11.7	454	0.25		53.3	0		7.97	2.57	20.9	135	10	517
HISTORICAL 1989-2016																			
MIN	0.0	179.0	50.4	0.0	1.0	155.0	4.4	204.0	0.0	0.0	17.5	0.0	0.0	7.5	0.0	4.4	7.0	0.0	199.0
MAX	38.0	500.0	132.0	30.0	50.0	1304.0	15.5	748.0	14.8	0.4	70.2	0.2	5.0	8.8	5.0	55.0	255.0	1786.0	746.0
MEAN	6.6	344.7	84.5	3.1	8.7	748.0	8.7	403.5	0.7	0.0	45.5	0.0	1.1	8.1	2.3	17.9	107.3	67.5	464.1
COUNT	67	103	103	62	103	104	79	103	101	56	103	75	59	104	100	103	103	79	103

*** Quality parameters are reported as mg/l unless otherwise noted.**
**** Data: Database input restricted to values greater then laboratory minimum detection limit.**


RILDA CANYON
(RCF3) BELOW NEWUSSD SPRINGS
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
30000
25000
20000
15000
10000
5000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - BELOW NEWUA SPRINGS

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170313	0.0	354.0	99.2	0.0	32.0	1013.0	8.1	493.0	0.2	0.1	59.6	0.0	0.0	8.1	4.2	28.5	177.0	0.0	611.0
20170608	0.0	222.0	60.7	0.0	2.0	449.0	10.2	239.0	0.5	0.0	21.2	0.0	0.0	8.6	1.0	5.4	15.0	165.0	252.0
20170907	6.0	320.0	82.0	0.0	15.0	885.0	10.4	407.0	0.1	0.0	49.1	0.0	0.0	8.6	3.1	20.9	137.0	0.0	514.0
20171205	0.0	331.0	90.7	0.0	12.0	901.0	13.1	443.0	0.1	0.0	52.6	0.0	0.0	8.0	3.4	21.6	143.0	8.0	575.0
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2017																			
MIN	0	222	61	0	2	449	8	239	0	0	21	0	0	8	1	5	15	0	
MAX	6	354	99	0	32	1013	13	493	1	0	60	0	0	9	4	29	177	165	
MEAN	0.00	306.75	83.14	0.00	15.25	812.00	10.45	395.50	0.23	0.01	45.62	0.01	0.00	8.32	2.91	19.11	118.00	43.25	
2016**																			
MIN	0.0	205.0	55.2	0.0	1.0	381.0	8.7	210.0	0.0	0.0	17.5	0.0	0.0	8.0	0.0	4.4	12.0	0.0	272.0
MAX	6.0	350.0	95.0	0.0	10.0	880.0	9.9	483.0	0.5	0.0	59.6	0.0	0.0	8.1	2.9	23.6	159.0	56.0	589.0
MEAN	1.5	302.8	82.3	0.0	7.8	746.5	9.4	398.5	0.3	0.0	46.8	0.0	0.0	8.1	2.1	18.5	115.0	19.3	493.0
2015**																			
MIN	0	218	52	0	2	419	10	218	0	0	22	0	0	8	1	5	14	0	277
MAX	0	343	87	0	10	895	10	454	3	0	58	0	0	9	3	24	157	221	583
MEAN	0	303	78	0	8	769	10	388	1	0	47	0	0	8	2	19	117	83	506
2014**																			
MIN	0	339	85	0	9	871	0	425	0	0	52	0	0	8	3	25	139	0	550
MAX	6	343	89	0	10	920	0	447	0	0	54	0	0	8	4	55	170	0	586
MEAN	3	341	87	0	10	896	0	436	0	0	53	0	0	8	3	40	155	0	568
2013**																			
MIN	0	205	53	0	1	155	0	221	0	0	20	0	0	8	1	7	17	0	214
MAX	5	339	97	11	10	901	0	486	12	0	59	0	0	9	3	25	154	1092	562
MEAN	3	274	76	3	6	599	0	351	3	0	39	0	0	8	2	16	88	284	386
2012**																			
MIN	0	250	67	0	4	576	8	297	0	0	32	0	0	8	1	12	56	0	334
MAX	30	350	101	0	10	921	8	495	0	0	59	0	0	8	3	26	159	8	556
MEAN	8	312	85	0	8	782	8	413	0	0	48	0	0	8	2	20	113	4	468
2011**																			
MIN	0	212	59.9	0	2.0	423	8.70	228	0.16	0.00	19.14	0.00	0.00	7.95	0.80	4.79	13.0	0.0	258
MAX	5	351	97.0	0	11.0	899	8.70	481	14.79	0.00	58.07	0.03	0.00	8.54	2.82	24.63	152.0	1786.0	573
MEAN	1	287	79.9	0	7.0	702	8.70	373	3.86	0.00	42.22	0.02	0.00	8.19	1.97	16.74	95.0	448.0	436
2010**																			
MIN					2.0	411	6.10	221	0.29		18.45	0.00		7.87	0.81	5.10	13.0	0.0	233
MAX					11.0	922	10.20	510	1.37		62.65	0.04		8.56	3.10	26.36	157.0	100.0	592
MEAN					7.3	765	8.80	419.75	0.65		48.58	0.02		8.14	2.42	19.78	111.3	34.0	488
2009**																			
MIN	0	217	62		2	462	8	251	0		23	0		8	1	7	26	6	288
MAX	15	374	108		10	1005	9	545	1		67	0		8	3	30	183	90	678
MEAN	9	330	91		8	840	8	448	1		53	0		8	3	22	130	31	550
2008**																			
MIN	0	179	61		2	470	9	242	1		22	0		8	1	5	18	8	247
MAX	20	378	115		10	1072	16	577	1		70	0		9	4	29	213	12	742
MEAN	10	322	97		8	911	12	471	1		55	0		8	3	23	147	10	571
2007**																			
MIN		285	77.6		6.0	834	10.09	378	0.20		44.70	0.02		7.54	1.86	15.60	90.0	5.0	438
MAX		400	132.0		12.0	1304	12.48	614	1.17		69.10	0.09		8.04	3.51	30.06	255.0	6.0	746
MEAN		370	111.2		10.2	1128.2	11.26	536.2	0.50		62.75	0.05		7.79	3.14	26.11	196.0	5.5	652.6
2006**																			
MIN		220	62		3.0	487	10.3	252	0.16		23.8	0		7.78	0.98	6.4	25	6	278
MAX		376	112		12.0	1073	12.5	563	0.30		69.0	0		8.18	3.32	26.8	185	18	626
MEAN		328	94		8.8	906	11.7	454	0.25		53.3	0		7.97	2.57	20.9	135	10	517
HISTORICAL 1989-2016																			
MIN	0.0	179.0	50.4	0.0	1.0	155.0	4.4	204.0	0.0	0.0	17.5	0.0	0.0	7.5	0.0	4.4	7.0	0.0	199.0
MAX	38.0	500.0	132.0	30.0	50.0	1304.0	15.5	748.0	14.8	0.4	70.2	0.2	5.0	8.8	5.0	55.0	255.0	1786.0	746.0
MEAN	6.6	344.7	84.5	3.1	8.7	748.0	8.7	403.5	0.7	0.0	45.5	0.0	1.1	8.1	2.3	17.9	107.3	67.5	464.1
COUNT	67	103	103	62	103	104	79	103	101	56	103	75	59	104	100	103	103	79	103

*** Quality parameters are reported as mg/l unless otherwise noted.**
**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTU-06039 Partial Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production (in 2015) and after sealing and abandonment in 2017. Approximately 80 percent of the vegetation on the lease was burned in the fire (see Map #1). The U.S. Forest Service assumed control of the Left Fork portal site and access road located on this lease after the fire for the purpose of constructing sediment catchment basins for fire debris runoff. Burning occurred over nearly all of the areas that were undermined. PacifiCorp is currently applying to remove the Left Fork portals disturbed area from its DOGM permit. While PacifiCorp maintains that there were no reported effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the vegetation characteristics of the area.

Vegetation of Lease UTU-06039 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown by vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-06039:

Aspen	AS
Barren/Sparse Vegetation	BR/SV
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Mountain Mahogany	MM
Mountain Shrubland	MS
Pinyon-Juniper	PJ
Riparian Woody	RW
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires (such as the wildfire of June, 2018

that destroyed more than 80% of the vegetation on this lease), variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. None of the land owners, stakeholders, or regulatory agencies in the area have reported vegetation effects that might have been caused by mining. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

Stat. of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR
OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

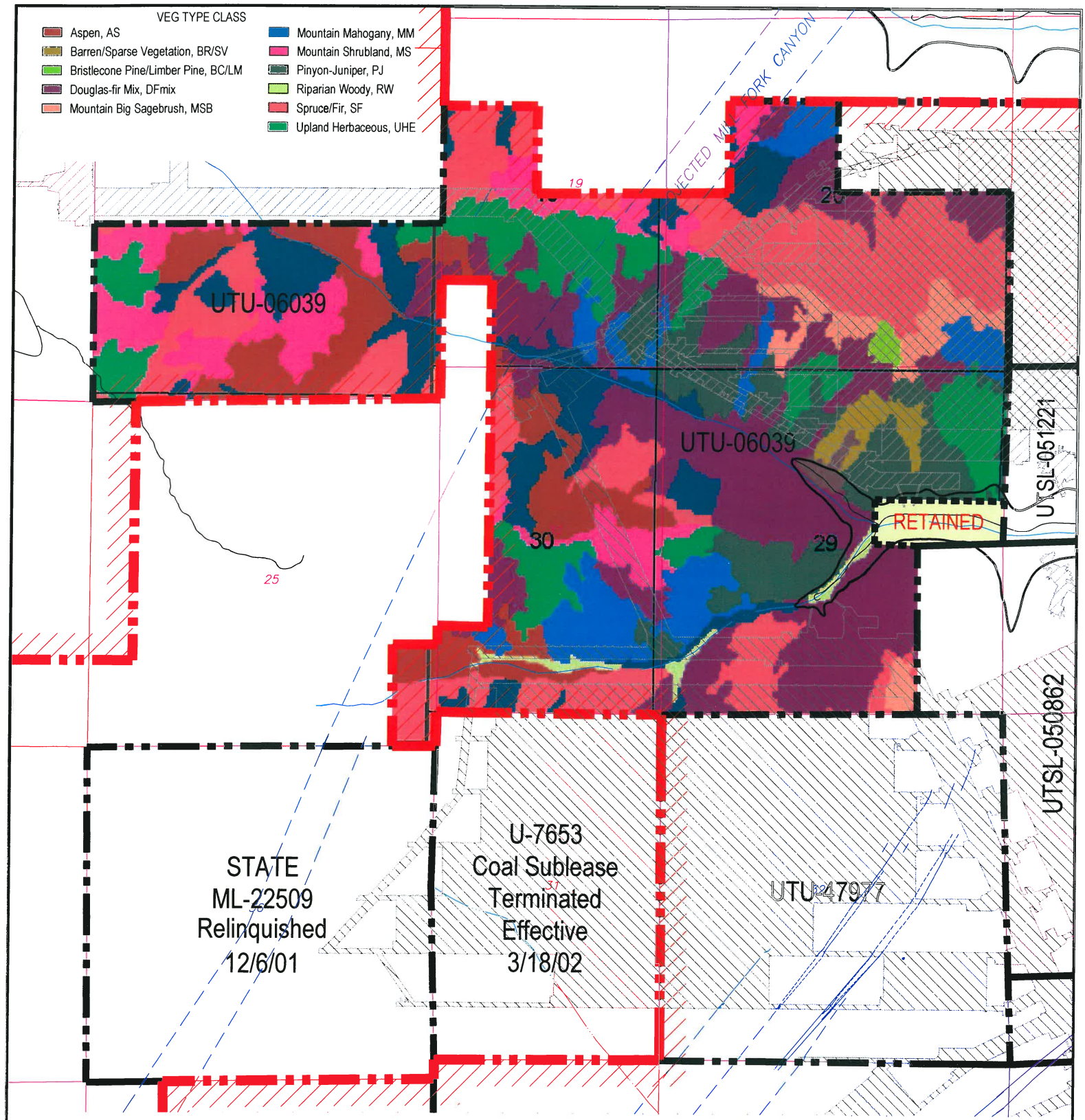
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-06039 area. The wildfire of June, 2018 destroyed at least 80% of the vegetation on this lease. There were no surface facilities or installations on the relinquished portions of this lease that might have affected vegetation.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-06039 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-06039

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-06039
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 23, 2018	SHEET 1 OF 1	REV.

FEDERAL COAL LEASE UTU-06039
Deer Creek Mine
Federal Coal Lease UTU-06039 Partial Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in the areas of Lease UTU-06039 that are to be relinquished.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-06039 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTU-06039 have taken place in January 2002, December 2002 (Blind Canyon Seam) and November 2004 (Hiawatha Seam). CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-06039 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 10th West, 4th North, 5th North Mains, 6th North Mains, Mill Fork Access #1 & 2, 9th East Submains, 8th – 12th E. Sections, 2nd – 7th Right Sections, 1st Right Mains and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) #UTU-06039 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 10th West, 4th North, 5th North Mains, 6th North Mains, Mill Fork Access #1 & 2, 9th East Submains, 8th – 12th E. Sections, 2nd – 7th Right Sections, 1st Right Mains and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-06039 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 10th West, 4th North, 5th North Mains, 6th North Mains, Mill Fork Access #1 & 2, 9th East Submains, 8th – 12th E. Sections, 2nd – 7th Right Sections, 1st Right Mains and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTU-06039 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 10th West, 4th North, 5th North Mains, 6th North Mains, Mill Fork Access #1 & 2, 9th East Submains, 8th – 12th E. Sections, 2nd – 7th Right Sections, 1st Right Mains and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: Nov. 7, 2018

Lease(s) #UTU-06039 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 10th West, 4th North, 5th North Mains, 6th North Mains, Mill Fork Access #1 & 2, 9th East Submains, 8th – 12th E. Sections, 2nd – 7th Right Sections, 1st Right Mains and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attachments			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-06039 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 10th West, 4th North, 5th North Mains, 6th North Mains, Mill Fork Access #1 & 2, 9th East Submains, 8th – 12th E. Sections, 2nd – 7th Right Sections, 1st Right Mains and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 07/84 – 05/18 (No Mine Discharge Since 1/15)

Submittal Date: NOV, 7 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-06039
Deer Creek Mine - MSHA # 42-00121

Sealed Mine Sections: 10th West, 4th North, 5th North Mains, 6th North Mains, Mill Fork Access #1 & #2, 7th North Mains, 1st Right Mains, Remainder of Mine Workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (7/94 - 12/17) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	7/94 - 12/17	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	7/94 - 12/17	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	7/94 - 12/17	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	7/94 - 12/17	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	7/94 - 12/17	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	7/94 - 12/17	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	7/94 - 12/17	Naptha	40 - 50%	64742-94-5	All Sections
	7/94 - 12/17	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	7/94 - 12/17	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	7/94 - 12/17	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	7/94 - 12/17	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	7/94 - 12/17	Propane	14%	74-98-6	All Sections
	7/94 - 12/17	Butane	13%	106-97-8	All Sections
	7/94 - 12/17	Toluene	17%	108-88-3	All Sections
	7/94 - 12/17	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	7/94 - 12/17	Napthalene	0.40%	91-20-3	All Sections
	7/94 - 12/17	Acetone	41%	67-64-1	All Sections
	7/94 - 12/17	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	7/94 - 12/17	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	7/94 - 12/17	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	7/94 - 12/17	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	7/94 - 12/17	Mineral Oil	20 - 25%	8042-47-5	All Sections
	7/94 - 12/17	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	7/94 - 12/17	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	7/94 - 12/17	Methanol	<20%	67-56-1	All Sections
	7/94 - 12/17	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	7/94 - 12/17	Heptane	69 - 79%	142-82-5	All Sections
	7/94 - 12/17	Ethyl Ether	11 - 21%	60-29-7	All Sections
	7/94 - 12/17	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	7/94 - 12/17	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	7/94 - 12/17	Heptane	60 - 70%	142-82-5	All Sections
	7/94 - 12/17	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	7/94 - 12/17	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	7/94 - 12/17	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	7/94 - 12/17	None			All Sections
Cat Transmission and Drive Train Oil	7/94 - 12/17	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	7/94 - 12/17	Monoethanolamine	<10%	141-41-3	All Sections
	7/94 - 12/17	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	7/94 - 12/17	Mineral Oil	70 - 95%	Mixture	All Sections
	7/94 - 12/17	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	7/94 - 12/17	Lubricant base oil	87 - 91%	Various	All Sections
	7/94 - 12/17	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	7/94 - 12/17	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	7/94 - 12/17	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	7/94 - 12/17	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	7/94 - 12/17	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	7/94 - 12/17	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	7/94 - 12/17	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	7/94 - 12/17	Trichloroethylene	95 - 99%	79-01-6	All Sections
	7/94 - 12/17	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	7/94 - 12/17	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	7/94 - 12/17	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	7/94 - 12/17	Deionized Water	1 - 3%	7732-18-5	All Sections
	7/94 - 12/17	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA
Lease(s) UTU-06039
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 10th West, 4th North, 5th North Mains, 6th North Mains, Mill Fork Access #1 & #2, 7th North Mains, 1st Right Mains, Remainder of Mine Workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (11/05 - 01/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	7/94 - 12/17	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	7/94 - 12/17	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	7/94 - 12/17	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	7/94 - 12/17	Calcium sulfate	2 - 10%		All Sections
	7/94 - 12/17	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	7/94 - 12/17	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	7/94 - 12/17	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	7/94 - 12/17	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	7/94 - 12/17	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	7/94 - 12/17	Lead	34%	7439-92-1	All Sections
	7/94 - 12/17	Lead Dioxide	31%	1309-60-0	All Sections
	7/94 - 12/17	Lead Sulfate	<1%	7446-14-2	All Sections
	7/94 - 12/17	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	7/94 - 12/17	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	7/94 - 12/17	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	7/94 - 12/17	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	7/94 - 12/17	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	7/94 - 12/17	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	7/94 - 12/17	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	7/94 - 12/17	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	7/94 - 12/17	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	7/94 - 12/17	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	7/94 - 12/17	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	7/94 - 12/17	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	7/94 - 12/17	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	7/94 - 12/17	Portland Cement		65997-15-1	All Sections
	7/94 - 12/17	Crystalline Silicon Dioxide		13397-24-5	All Sections
	7/94 - 12/17	Calcium Hydroxide		001-305-620	All Sections
	7/94 - 12/17	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	7/94 - 12/17	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	7/94 - 12/17	Polyglycols	60 - 100%	Mixture (2)	15 W
	7/94 - 12/17	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	7/94 - 12/17	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	7/94 - 12/17	Polyester Resin	5 - 15%	Not Reported	All Sections
	7/94 - 12/17	Styrene Monomer	3 - 7%	100-42-5	All Sections
	7/94 - 12/17	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	7/94 - 12/17	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	7/94 - 12/17	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	7/94 - 12/17	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	7/94 - 12/17	Isobutane	2 - 10%	75-28-5	All Sections
	7/94 - 12/17	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	7/94 - 12/17	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	7/94 - 12/17	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	7/94 - 12/17			64742-48-9	All Sections
	7/94 - 12/17			64742-88-7	All Sections
	7/94 - 12/17	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	7/94 - 12/17	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	7/94 - 12/17	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	7/94 - 12/17	Lubricant base oil	>99	Various	All Sections
	7/94 - 12/17	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	7/94 - 12/17	Lubricant base oil	87 - 91%	Various	All Sections
	7/94 - 12/17	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	7/94 - 12/17	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	7/94 - 12/17	Mineral Oil	>95%	Proprietary	All Sections

ENERGY WEST Mining Co.
PO Box 310
Huntington, Utah 84528

July 16, 2001

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

Attention: Daron Haddock
Permit Supervisor

Re: Abandonment of Mining Machinery: 9th East Longwall Conveyor Pan Sections, PacifiCorp, Deer Creek Mine, C/015/018, Emery County, Utah

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, herewith submits a request to the Division concerning abandonment of mine machinery in the Deer Creek Mine. PacifiCorp, on July 16, 2001 submitted a request to the Bureau of Land Management for a "Lease Term and Condition Modification Request; Removal of Machinery, Federal Lease U-06039."

Federal Coal Lease U-06039 (modified on February 11, 1999) includes stipulations; Sec. 10 - Delivery of Premises, Removal of Machinery, Equipment, ETC and Sec. 15 - Special Stipulations 24: WASTE CERTIFICATION, which documents abandonment of mine machinery within the federal coal lease. PacifiCorp worked closely with the BLM during development of "Special Stipulations 24." It was PacifiCorp understanding that this material did not qualify under the stipulations listed in the federal coal lease, however, courtesy notification was given to the BLM.

As documented in the July 16, 2001 request to the BLM, the 9th East Longwall panel is scheduled for final extraction in late August / early September of this year. This longwall systems are made up of hydraulic roof supports, face conveyor drives, face conveyor line pans, stageloader, crusher, belt tailpiece and face electrics. All equipment, with exception of the longwall conveyor line pans, is planned for fully recovery during the extraction of the 9th East panel. The equipment planned for abandonment consist of 140 American Longwall (1 m X 1500mm) conveyor line pans with face and gob side accessories consisting of toe plates, clevises, cable trays, bretby tray, spill plates and dynatrac castings, conveyor chain and flight bars (see attached map). No hoses, cables, lubricants, and/or oils of any kind were requested to be included in the abandonment.

Huntington Office:
(435) 687-9821
Fax (435) 687-2695
Purchasing Fax (435) 687-9092

Deer Creek Mine:
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Trail Mountain Mine:
(435) 748-2140
Fax (435) 748-5125

Energy West made every reasonable effort to economically recover and salvage the referenced face conveyor line pans prior to panel extraction. However, due to the equipment's condition and low market scrap prices for steel, it was not reasonable or economical to recover the referenced machinery parts.

To comply with the Division's request, PacifiCorp has provided the following:

- A map identifying the location of the line pan (see attached map)
- Description of the longwall component:

  The longwall component abandoned consist of 140 American Longwall (1m X 1500mm) conveyor line pans with face and gob side accessories consisting of toe plates, clevises, cable trays, bretby tray, spill plates and dynatrac castings, conveyor chain and flight bars (see attached map). No hoses, cables, lubricants, and/or oils of any kind were requested to be included in the abandonment.
- Revision to the Probable Hydrologic Consequences section of the permit (Volume 9: Hydrologic Section) is not necessary. Structurally, the material abandoned is similar to the primary/secondary roof support systems utilized during the mining process. As discussed in Volume 11, Deer Creek MRP: North Rilda Area, the dip of the strata is to the east and intercepted groundwater will not contribute to the surface discharge system upon completion of mining.
- This request is almost identical to the approval received by your office and dated January 29, 2001 for abandonment of a previous face conveyor panline.
- A copy of the BLM request is included for your reference.

If there are any questions or concerns please call Chuck Semborski at 687-4720 or Dennis Oakley 687-4825.

Sincerely,

Charles A. Semborski
Geology and Environmental Supervisor
enclosures:
cc: Scott Child
Carl Pollastro
File

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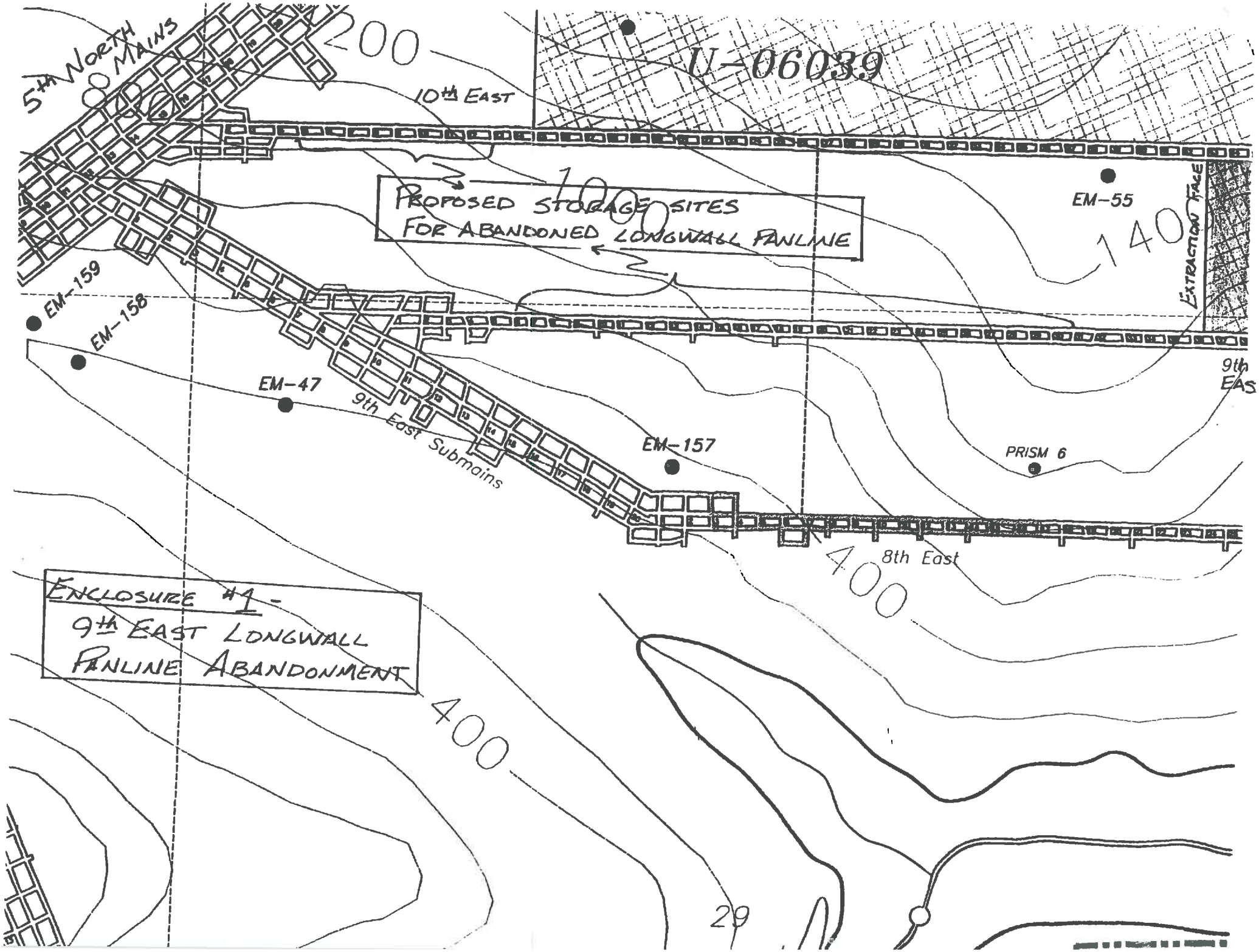

U-06039
5th North Mains
10th East
200
100
140
PROPOSED STORAGE SITES
FOR ABANDONED LONGWALL PANLINE
EM-55
EXTRACTION FACE
EM-159
EM-158
EM-47
9th East Submains
EM-157
PRISM 6
9th EAS
8th East
400
400
29
ENCLOSURE #1 -
9th EAST LONGWALL
PANLINE ABANDONMENT

R645-301-500: TABLE 7 DEER CREEK MINE SUMMARY OF NON-RECOVERED EXTENSION MATERIAL			
ITEM	**Lease #**	**LOCATION**	**QUANTITY**
Belt Head Roller	Federal Lease # SL-070645/U-02292	1st South Conveyor Head Roller	1
8kv Mine Power Feeder Cable	Federal Lease # SL-070645/U-02292	1st South (Main West to Bin)	≈ 8,000'
Communication Cable	Federal Lease # SL-070645/U-02292	1st South (Main West to Bin)	≈ 8,000'
4" Aluminum Pipe	Federal Lease # SL-070645/U-02292	1st South (Main West to Bin)	3,000'
6" Aluminum Pipe	Federal Lease # SL-070645/U-02292	1st South (Main West to Bin)	3,000'
4" Steel Pipe	Federal Lease # SL-070645/U-02292	1st South (Main West to Bin)	4,000'
Steel Track & Pipe	Fee	McKinnon Workings	Exact Quantity Unknown

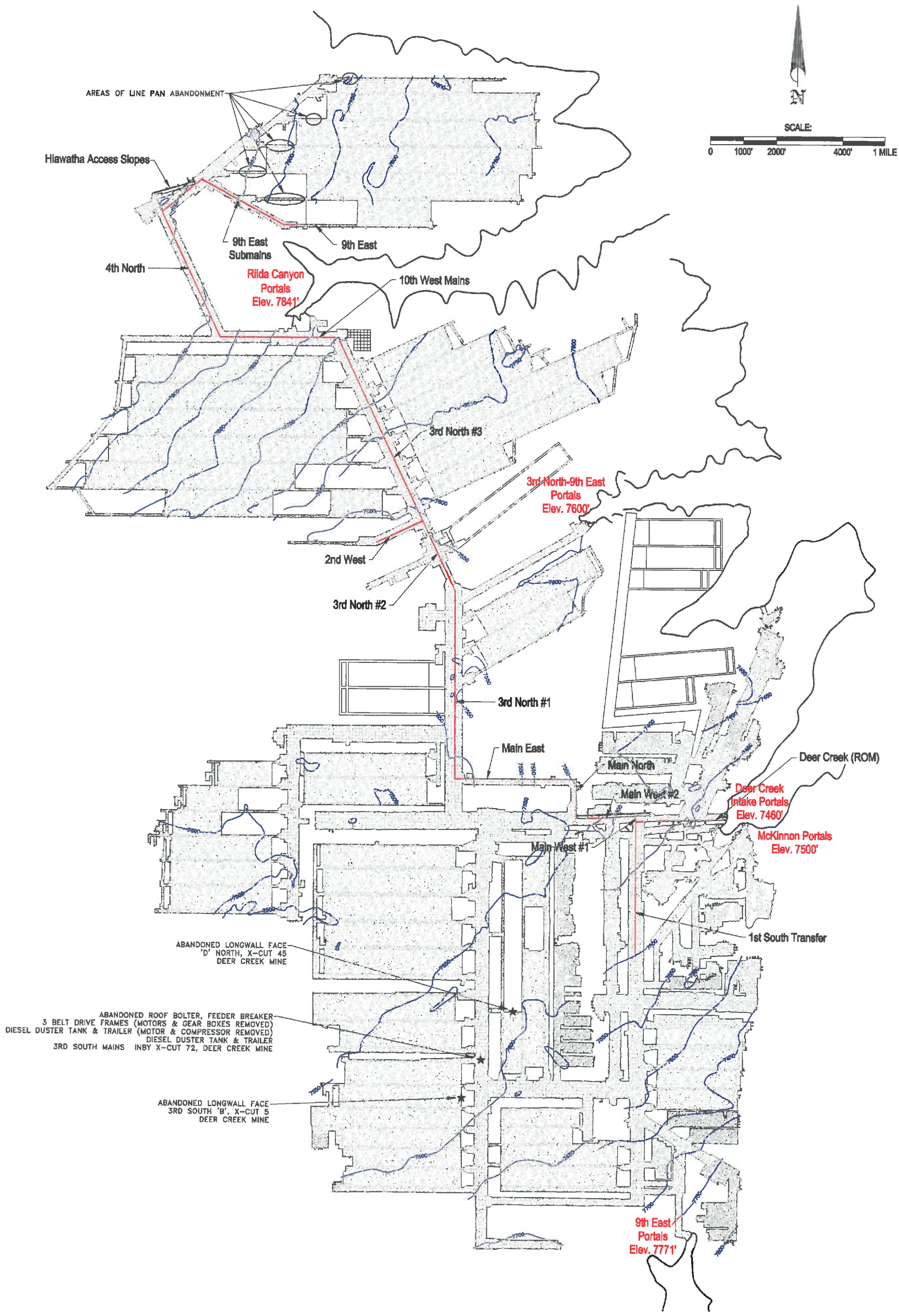
Abandonment of Machinery: To comply with Section 10 of the Federal Coal Lease Stipulations, PacifiCorp will request approval prior to abandonment of machinery within the mine. R645-301-500: Table 8 list machinery abandoned in the Deer Creek Mines (refer to Figure R645-301-500G).

R645-301-500: TABLE 8 DEER CREEK MINE			
LEASE #	**LOCATION**	**TYPE OF EQUIPMENT**	**BUREAU OF LAND MANAGEMENT APPROVAL DATE**
Federal Lease U-040151	D North (1988)	111 Longwall Shields and Face Conveyor	Stipulation not included in lease at the time of abandonment
Federal Lease U-040151	5th Right (1985)	108 Longwall Shields and Face Conveyor	Stipulation not included in lease at the time of abandonment
Federal Lease U-040151	3rd South Mains (inby xc-72)	Lee Norse Roof Bolter	Stipulation not included in lease at the time of abandonment (area caved, 6/91)
Federal Lease U-040151	3rd South Mains (inby xc-72)	Long Airdox Feeder Breaker	Stipulation not included in lease at the time of abandonment (area caved, 6/91)
Federal Lease U-040151	3rd South Mains (inby xc-72)	Belt Frames (3), motor & gearboxes removed	Stipulation not included in lease at the time of abandonment (area caved, 6/91)
Federal Lease U-040151	3rd South Mains (inby xc-72)	Diesel Duster Tank & Trailor (motor & Compressor Removed)	Stipulation not included in lease at the time of abandonment (area caved, 6/91)
Federal Lease U-040151	3rd South Mains (inby xc-72)	Isuzu Pickup	Stipulation not included in lease at the time of abandonment (area caved, 6/91)
Federal Lease U-040151	3rd South Mains (inby xc-72)	Rail Runner (Track Jeep)	Stipulation not included in lease at the time of abandonment (area caved, 6/91)
Federal Lease U-06039	10th & 11th East	140 Longwall conveyor line pans	PacifiCorp on November 29, 1999 submitted to the BLM a "Lease Term and Condition Modification Request, Removal of Machinery and notified DOGM April 5, 2000.
Federal Lease U-06039	12th & 15th East	140 Longwall conveyor line pans	PacifiCorp on November 08, 2000 submitted to the BLM a "Lease Term and Condition Modification Request, Removal of Machinery and notified DOGM January 10, 2001.
Federal Lease U-06039	9th East	140 Longwall conveyor line pans	PacifiCorp on July 16, 2001 submitted to the BLM a "Lease Term and Condition Modification Request, Removal of Machinery and notified DOGM on July 16, 2001.

Abandonment of this machinery is insignificant compared to the other steel materials that must be left underground. Ferrous materials include steel roofbolts, steel wire ceiling mesh and steel covered longwall support cans. These materials are not removed due to safety concerns in all underground coal mines.

Although the shields contained emulsified oil which could eventually enter the hydrologic system, it will not have a significant impact on the hydrologic balance in the area based on the following criteria:

- It will be a period of many years prior to the sediments being saturated to reach potential areas of discharge. Hydrologic studies have verified that the water intercepted in the mine is not hydraulically connected to the surface water systems (refer to Hydrologic Section, Volume 9 for complete details).
- The combination of water chemistry (pH neutral to slightly alkaline), temperature, and lack of oxygen will impede the rate of oxidation of the metal.
- The combination of specific gravity and dip of the geology will potentially carry any migration away from the surface waters (lowest portal - long term discharge point is Deer Creek Canyon intake portals, refer to Figure R645-301-500G).
- The total volume of the potential contaminants is so minute it will be diluted within a short distance. Initial mixture is 95% water and 5% emulsified oil.
- No municipal or domestic water uses exist within 5 miles of the sites.



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ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

DEER CREEK MINE
LOCATION OF CURRENT MINE EXTENSION EQUIPMENT
AND ABANDONED EQUIPMENT

DRAWN BY: K. LARSEN	R645-301-500G	
SCALE: 1" =3000'	DRAWING #:	
DATE: NOVEMBER 30, 2001	SHEET 1 OF 1	REV.

ENERGY WEST Mining Co.
PO Box 310
Huntington, Utah 84528

February 11, 2002

Mr. Tom Rasmussen
Assistant Field Manager
Bureau of Land Management
Price Field Office
125 South 600 West
Price, Utah 84501

Subject: **5TH NORTH [BLIND CANYON] PANEL BLOCK: CONFIRMATION OF EQUIPMENT AND MATERIAL RECOVERY/ABANDONMENT, HAZARDOUS MATERIAL INSPECTION AND FINAL MINE ENTRY SEALING; ENERGY WEST MINING COMPANY, DEER CREEK MINE, HUNTINGTON, UTAH**

Mr. Rasmussen:

PacifiCorp, by and through its wholly-owned subsidiaries, Interwest Mining Company ("Interwest") as managing agent and Energy West Mining Company ("Energy West") as mine operator, hereby provides written confirmation to the BLM authorized officer [in accordance with 43 CFR 3484.1(c)(7)] regarding equipment and material recovery/abandonment, hazardous material inspection and final sealing approval for the portion of the Deer Creek Mine in the area comprising the 5th North [Blind Canyon] panel block; included within federal coal leases U-06039 Tract #1 and Tract #2, U-024317, SL-051221 and U-2810.

Please find attached general arrangement area drawings regarding the area of reference along with final seal locations for the project [SEE ATTACHMENTS #1 and #2].

With the completion of the 8th East longwall panel in early December / 2001, Energy West Mining Company began mine recovery and preparation for final sealing of the 5th North [Blind Canyon]

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Cottonwood Mine:
(801) 748-2319
Fax (801) 748-2380

panel block at Energy West's Deer Creek Mine. On December 8, 2001, as part of the BLM's quarterly mine inspection, this project was reviewed and fully discussed with the BLM mine inspector.

On January 22, 2002, prior to final sealing operations of the 5th North panel block, a joint (BLM/EW) On-Site Hazardous Material Inspection was conducted within the affected area the the 5th North Mains and gate road neck-off areas as well as in the 9th East Sub-Mains and gate road neck-off areas [Falk, BLM; LaFrentz / Christensen, EW]. The inspection (part of a routine procedure used by the overseeing governmental agency) is to identify materials that may need to be removed/recovered from or abandoned within the underground workings prior to final sealing operations.

During the referenced inspection, no hazardous waste or unacceptable proposed abandoned material was encountered within the identified sealed area. At the time of the inspection, recovery efforts and seal construction was in progress. Please find attached a complete listing and status of equipment and materials that were within the affected sealed area [***SEE ATTACHMENTS #3***]. Please also find attached site specific area maps of each affected gate road neck-off area, specifying materials abandoned and their specific location [***SEE ATTACHMENTS #4 THROUGH #9***].

Site recovery included, but was not limited to, removal of the majority of in-place conveyor drive equipment, conveyor belt / structure, portions of the mine power feeder cables, monitoring cables, sensors, and discharge pipe. Recovery exceptions are to include installed primary and secondary roof and rib support materials, general miscellaneous mine supplies and/or hardware items, in-place water supply and discharge pipeline, communication and control cables and sections of bleeder electrical distribution cable***[SEE ATTACHMENTS]***.

The material and equipment items identified for in-place abandonment have minimal commercial value due to present service condition and are evaluated to not be reasonable or economical to recover. The decision to abandon materials in-place is made with full consideration to the **absence** of any short term or long term effect to present and/or future underground or surface resources and/or operations. As discussed above, prior to final site sealing, a joint environmental audit was conducted of the applicable underground workings by the governmental agency [BLM] and Energy West to evaluate, verify and document in-place materials proposed for recovery and/or abandonment.

PacifiCorp submits that the proposed sealing and abandonment is in compliance with the terms, conditions and stipulations of the referenced leases. In support of this project Energy West submits that the following conditions have been fully satisfied:

(1) All practical and economical coal reserves have been mined from this area in accordance with the approved R2P2 and it's subsequent minor modifications.

(2) All associated mining equipment/machinery and materials have been recovered from this area with the exceptions of some mine materials as referenced in this document.

(3) A complete underground environmental audit of this area has been conducted on January 22, 2002. Representatives of the BLM and Energy West conducted and documented a full site audit of the referenced area where no hazardous waste or unacceptable proposed abandoned material were observed.

Final recovery and sealing of the 5th North [Blind Canyon] panel block was completed on January 28, 2002. Energy West would like to thank the Price BLM Field Office and the BLM inspector for calaborating with Energy West in conducting such a timely review and site inspection of the 5th North area. This type of agency / industry coordination and cooperation allowed Energy West to finalize the project on schedule.

If you have any questions or require additional information and/or detail, please contact Larry LaFrentz [Energy West] at (435) 687-2317.

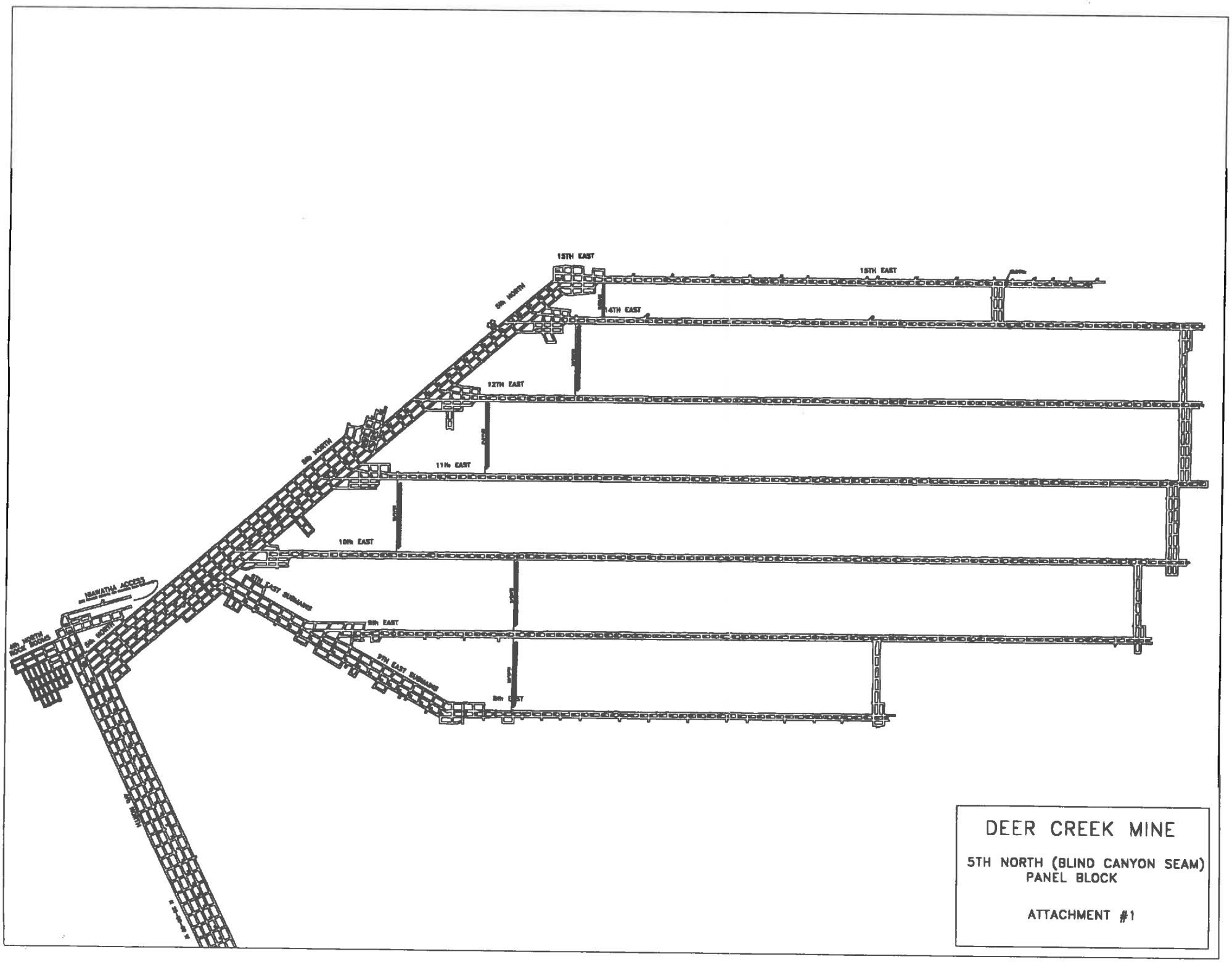
Sincerely,

Steven E. Kochevar, P.E.
Manager, Technical Services
Interwest Mining Company

Ten (10) Enclosures:

Enclosure #1:	General Area Map, Deer Creek Mine 5th North (Blind Canyon Seam) Panel Block.
Enclosure #2:	General Area Map, Deer Creek Mine 5th North (Blind Canyon Seam) Mine Entry Seal Locations.
Enclosure #3:	Deer Creek Mine; Final 5th North Material / Equipment Recovery and Abandonment Listing.
Enclosure #4:	Deer Creek 15th East Neck-off
Enclosure #5	Deer Creek 14th East Neck-off
Enclosure #6:	Deer Creek 12th East Neck-off
Enclosure #7:	Deer Creek 11th East Neck-off
Enclosure #8:	Deer Creek 9th East Neck-off
Enclosure #9:	Deer Creek 8th East Neck-off
Enclosure #10:	Deer Creek 10th East Neck-off

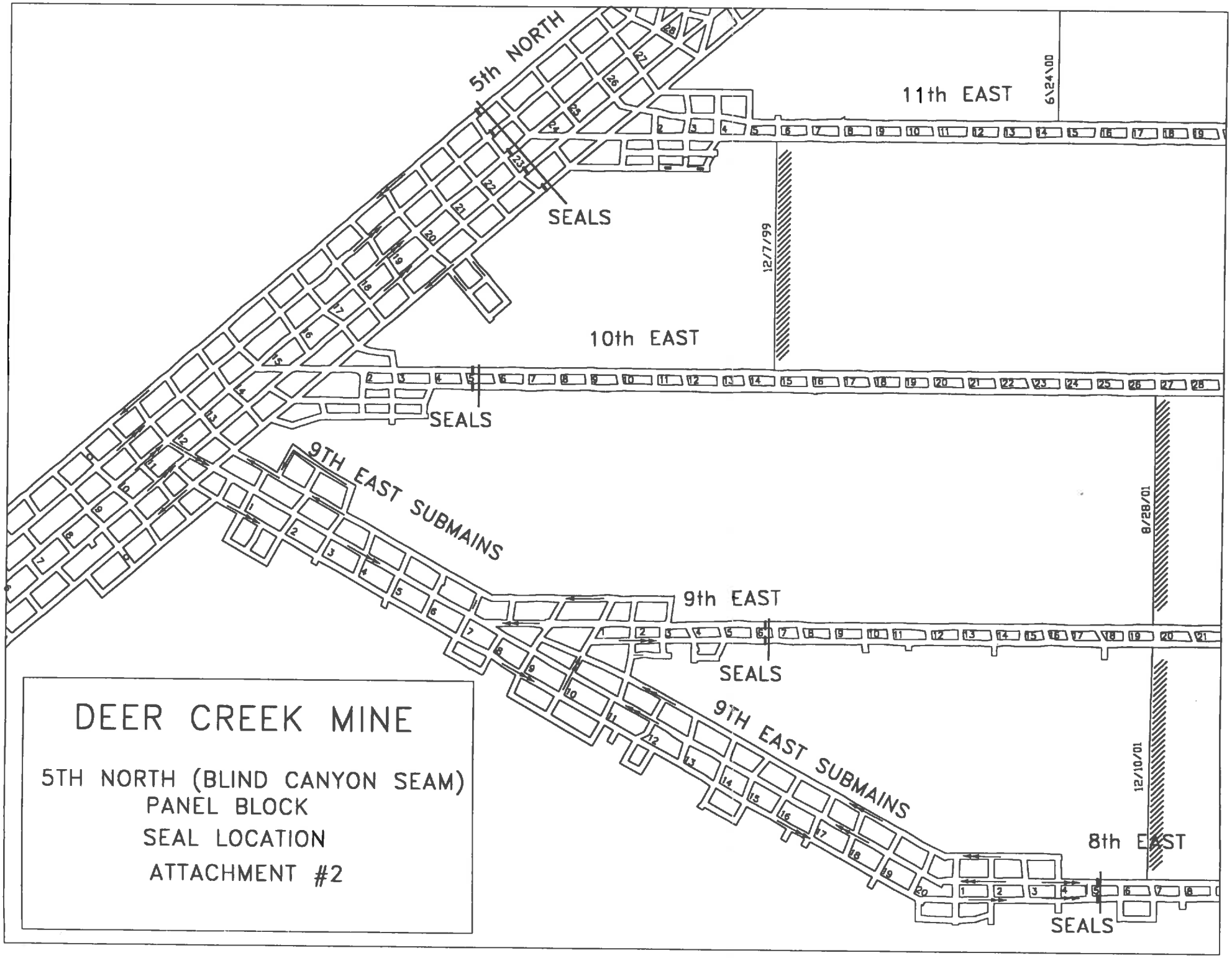
cc:	Dee Jense,	IMC
	Bob King,	IMC
	Steve Kochevar,	IMC
	Scott Child,	IMC
	Carl Pollastro,	EWMC
	Earl Snow,	EWMC
	Scott Timothy	EWMC
	Chuck Semborski,	EWMC
	Lou Tonc	EWMC
	Kevin Tuttle	EWMC
	Ken Fleck	EWMC
	L.J. LaFrentz,	EWMC



DEER CREEK MINE

5TH NORTH (BLIND CANYON SEAM)
PANEL BLOCK

ATTACHMENT #1



DEER CREEK MINE

5TH NORTH (BLIND CANYON SEAM)
PANEL BLOCK
SEAL LOCATION
ATTACHMENT #2

DEER CREEK MINE

FINAL 5TH NORTH MATERIAL/EQUIPMENT RECOVERY AND ABANDONMENT LISTING

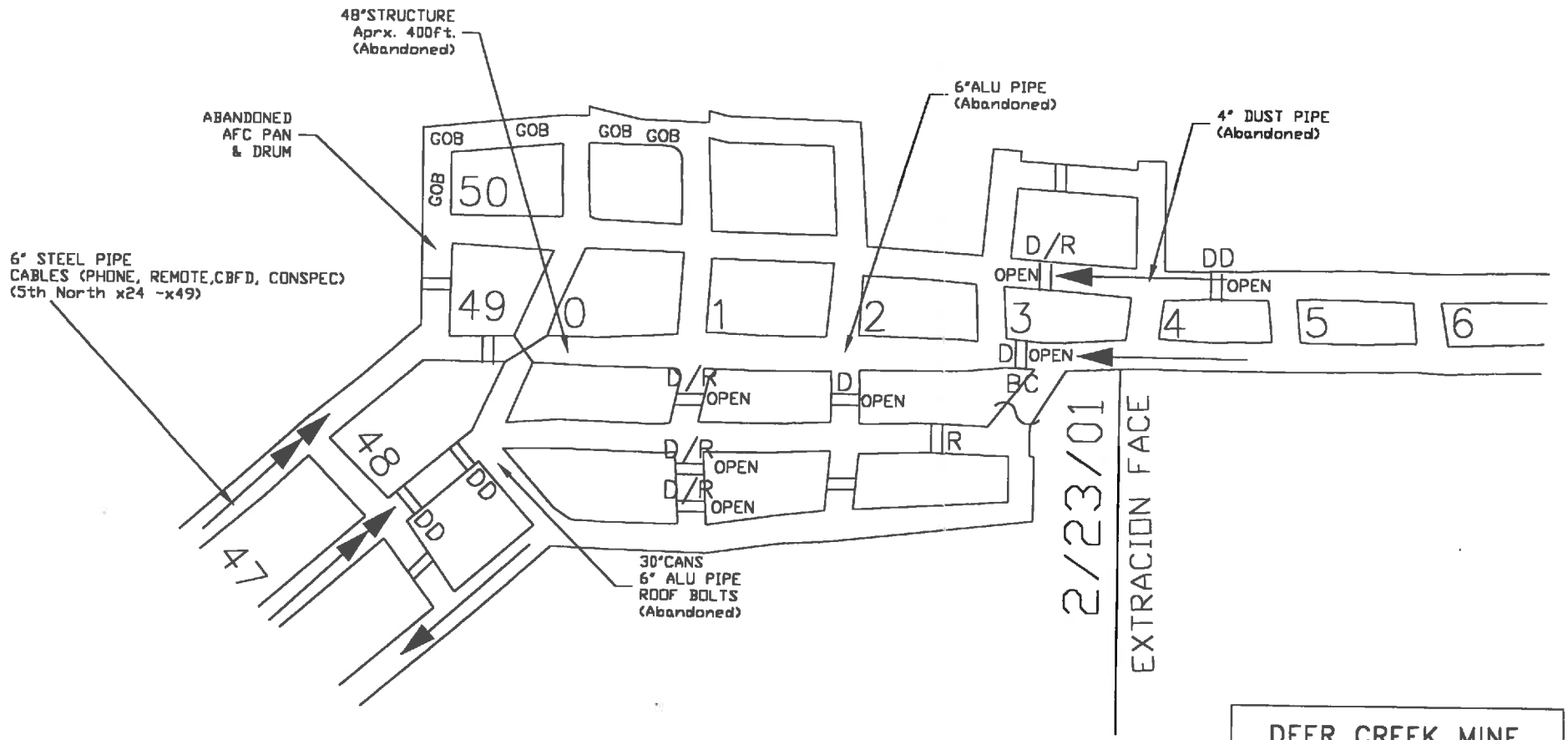
[*ATTACHMENT #3*]

5TH NORTH MAINS + SECTION HEADINGS:

- BELT DRIVES ---------- FULL RECOVERY
- BELT STORAGE UNIT ---------- FULL RECOVERY
- HEAD / DISCHARGE PULLEY ASSEMBLIES ------- FULL RECOVERY
- TRANSFORMERS ---------- FULL RECOVERY
- TRIPLE SWITCHES ---------- FULL RECOVERY
- SUBMERSIBLE PUMPS AND CONTROLS ---------- PARTIAL
- 48 IN. CONVEYOR STRUCTURE ---------- PARTIAL
- 48 IN. CONVEYOR BELTING (ROLLS) ---------- PARTIAL
- 60 IN. CONVEYOR STRUCTURE [5TH NORTH] ----- FULL RECOVERY
- 60 IN. CONVEYOR BELTING [5TH NORTH] ------- FULL RECOVERY
- CONVEYOR STANDS AND GUARDING ---------- PARTIAL
- 6 IN. HP STEEL PIPE, VIC CONNECTORS ------ PARTIAL
- FIRE HYDRANTS ---------- PARTIAL
- 4 IN. ALUMINUM DUST LINE ---------- PARTIAL
- BELT FIRE SUPPRESSION SYSTEMS: WATER DELUGE / SPRINKLER PIPING AND HARDWARE --- PARTIAL
- CONTROL CABLES [PHONE, CBFD, REMOTE, CONSPEC, ETC.] ---------- PARTIAL
- HIGH VOLTAGE (15KV) ELECTRICAL CABLES [DIESEL ROADWAY] ---------- PARTIAL
- 6 IN. ALUMINUM DEWATER PIPE ---------- PARTIAL
- 6 IN. POLY PIPE DEWATER LINE ---------- PARTIAL
- MISC. ROOF CONTROL SUPPLIES [BOLTS, PLATES, MATS, MESH, HOLY BOARDS, CRIB, CANS, ETC.] ---------- PARTIAL
- VENTILATION STRUCTURES [DOORS, STOPPINGS, REGULATORS, O/C'S, BLOCK, SEALANT, ETC.] ---------- PARTIAL
- BAGGED ROCK DUST ---------- PARTIAL
- WATER HOSE ---------- PARTIAL
- AFC PANLINE [THREE (3) SYSTEMS; 11E /12E, 14E /15E, 10E / 9E; AS PER DOCUMENTATION TO BLM / DOGM] ---------- ABANDONED
- MISC. LW COMPONENTS [DRUMS, COWLS, BRETBY, HOSE, CABLES, MISC. HARDWARE, ETC.] ---------- PARTIAL
- LOOSE HARDWARE AND CABLE ---------- PARTIAL

5TH NORTH BLEEDER / 8TH EAST BLEEDER:

- SUBMERSIBLE PUMPS ---------- PARTIAL
- D-BOXES ---------- PARTIAL
- ELECTRICAL PUMP CABLE ---------- PARTIAL
- POLY PIPE DISCHARGE PIPE ---------- PARTIAL

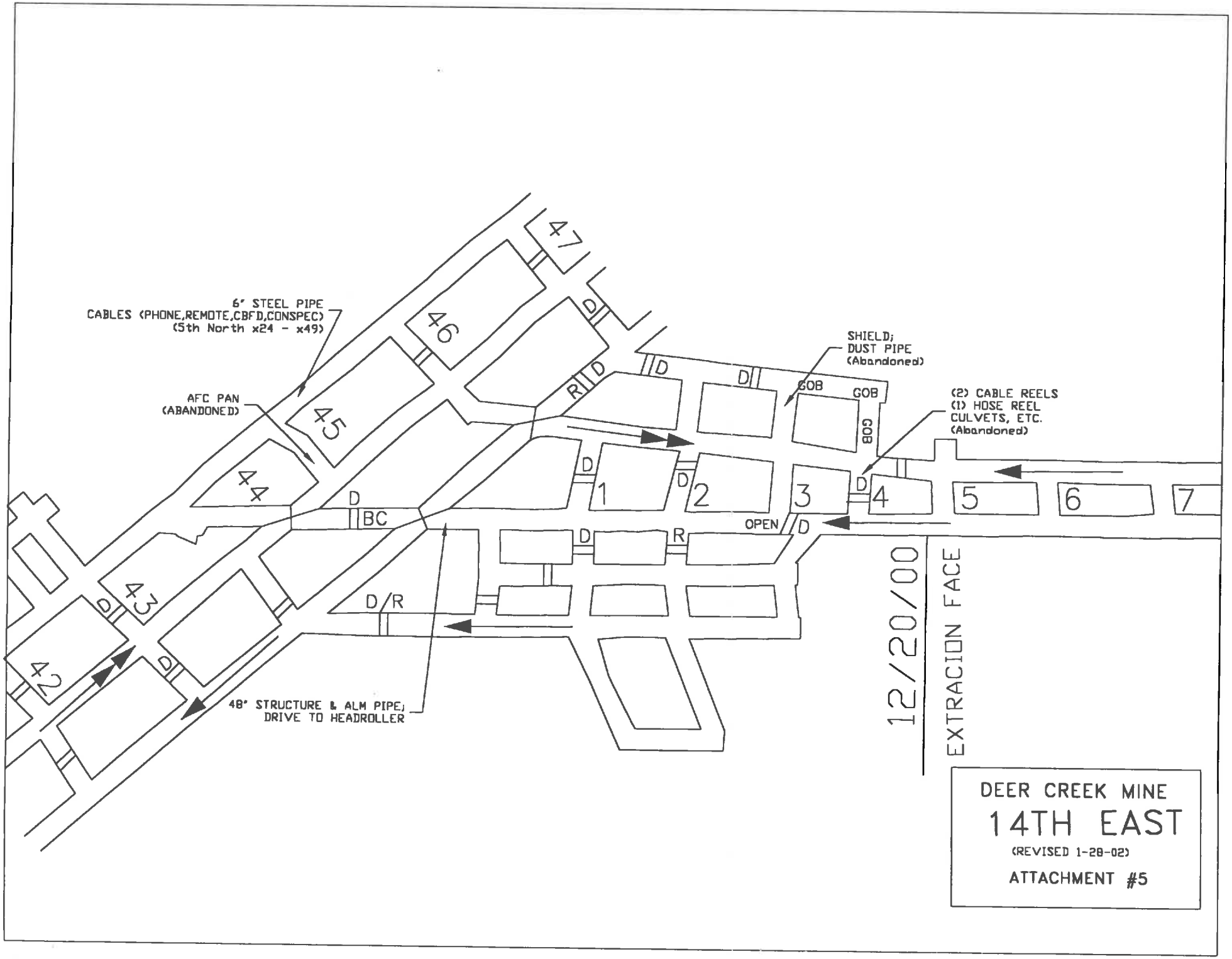


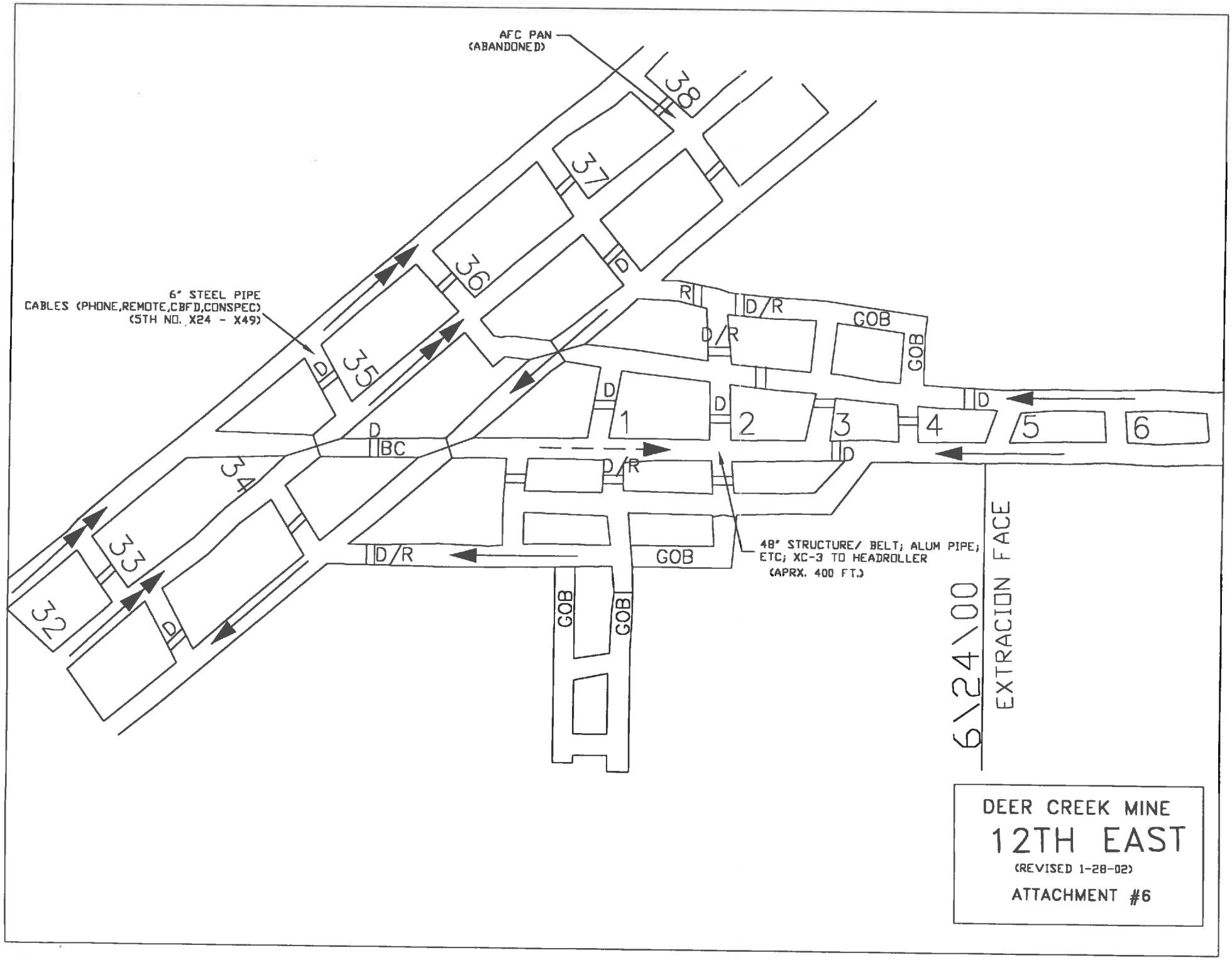
DEER CREEK MINE

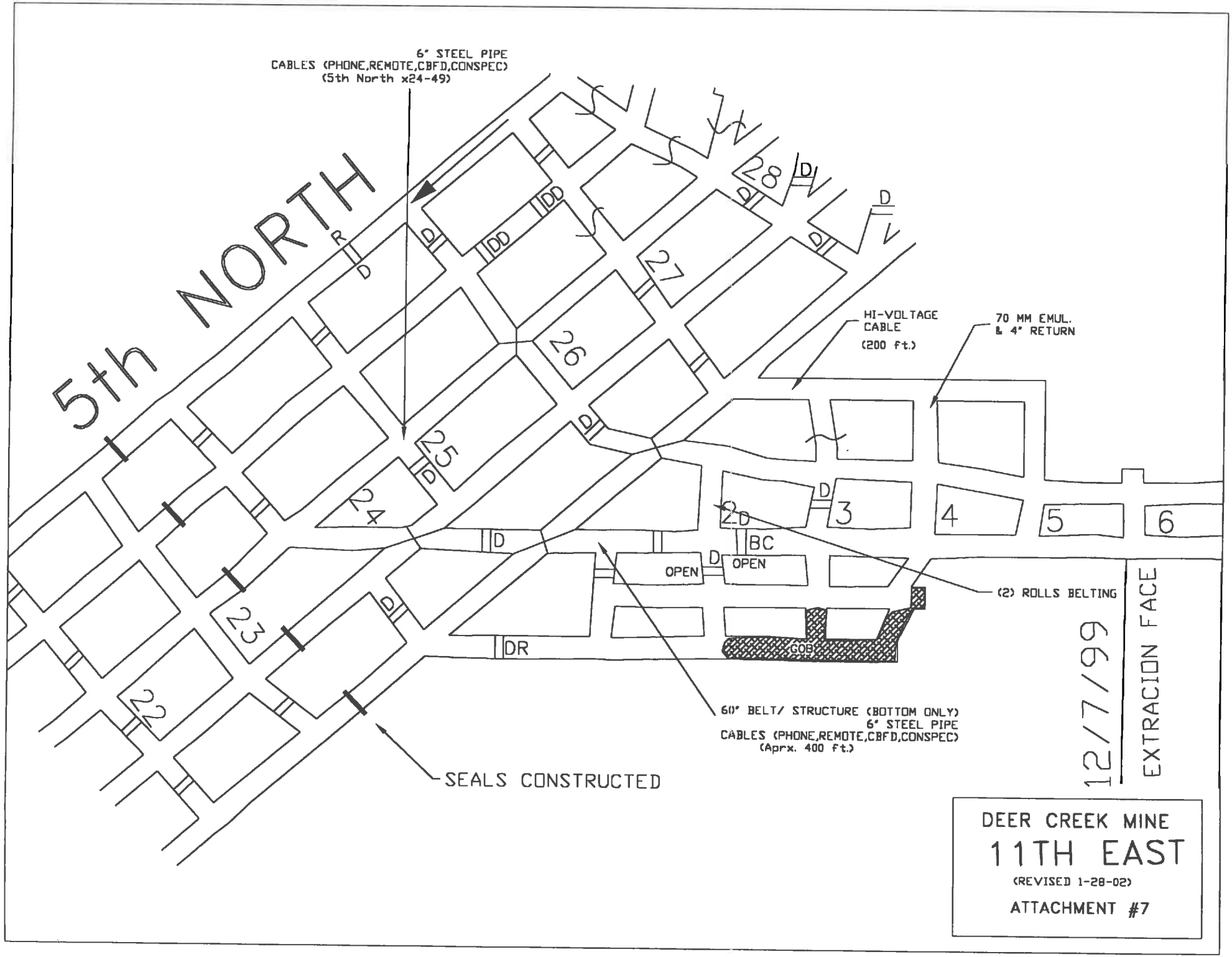
15TH EAST

(REVISED 1-28-02)

ATTACHMENT #4

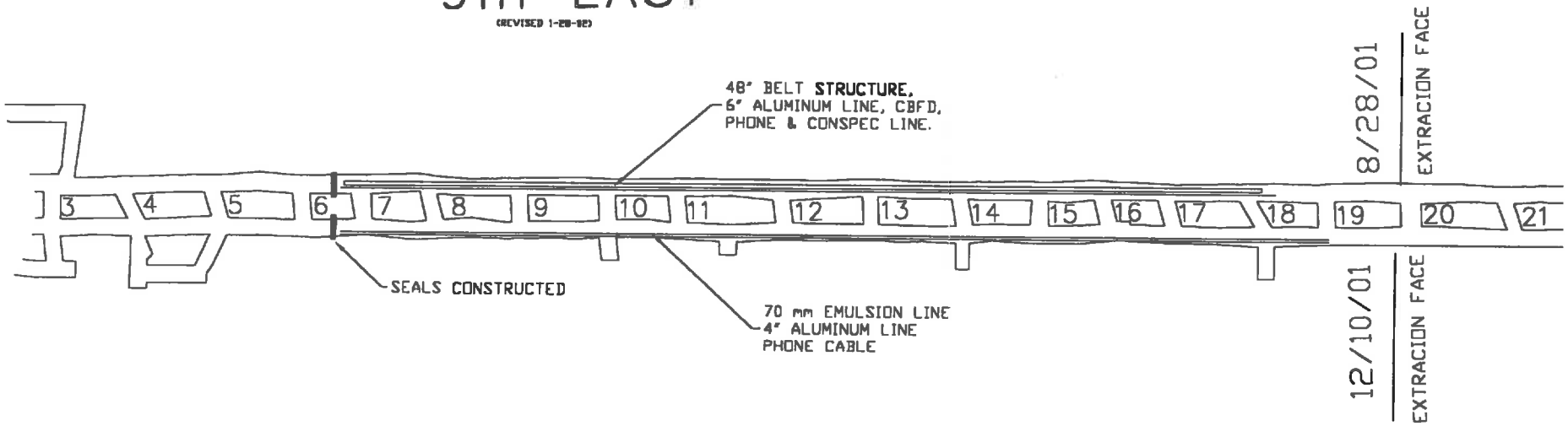

6" STEEL PIPE
CABLES (PHONE,REMOTE,CBFD,CONSPEC)
(5th North x24 - x49)
AFC PAN
(ABANDONED)
SHIELD;
DUST PIPE
(Abandoned)
(2) CABLE REELS
(1) HOSE REEL
CULVETS, ETC.
(Abandoned)
48" STRUCTURE & ALM PIPE;
DRIVE TO HEADROLLER
GOB
GOB
GOB
OPEN
BC
D
R
D/R
1
2
3
4
5
6
7
42
43
44
45
46
47
12/20/00
EXTRACION FACE
DEER CREEK MINE
14TH EAST
(REVISED 1-28-02)
ATTACHMENT #5


AFC PAN
(ABANDONED)
6" STEEL PIPE
CABLES (PHONE,REMOTE,CBFD,CONSPEC)
(5TH NO. X24 - X49)
48" STRUCTURE/ BELT; ALUM PIPE;
ETC; XC-3 TO HEADROLLER
(APRX. 400 FT.)
EXTRACION FACE
6\24\00
GOB
D/R
BC
DEER CREEK MINE
12TH EAST
(REVISED 1-28-02)
ATTACHMENT #6


6" STEEL PIPE
CABLES (PHONE,REMOTE,CBFD,CONSPEC)
(5th North x24-49)
5th NORTH
HI-VOLTAGE CABLE
(200 ft.)
70 MM EMUL. & 4" RETURN
(2) ROLLS BELTING
60" BELT/ STRUCTURE (BOTTOM ONLY)
6" STEEL PIPE
CABLES (PHONE,REMOTE,CBFD,CONSPEC)
(Aprx. 400 ft.)
SEALS CONSTRUCTED
OPEN
OPEN
GOB
BC
DR
DD
D
R
22
23
24
25
26
27
28
2
3
4
5
6
12/7/99
EXTRACION FACE
DEER CREEK MINE
11TH EAST
(REVISED 1-28-02)
ATTACHMENT #7

9th EAST

(REVISED 1-28-02)

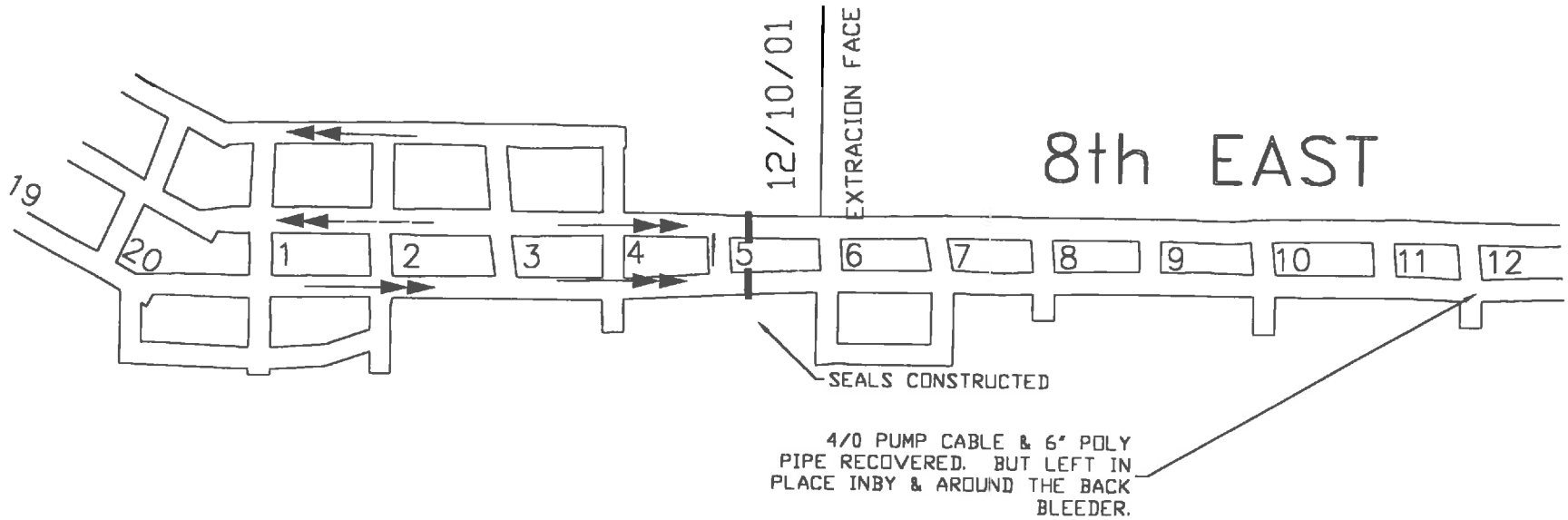


DEER CREEK MINE

9TH EAST

(REVISED 1-28-02)

ATTACHMENT #8

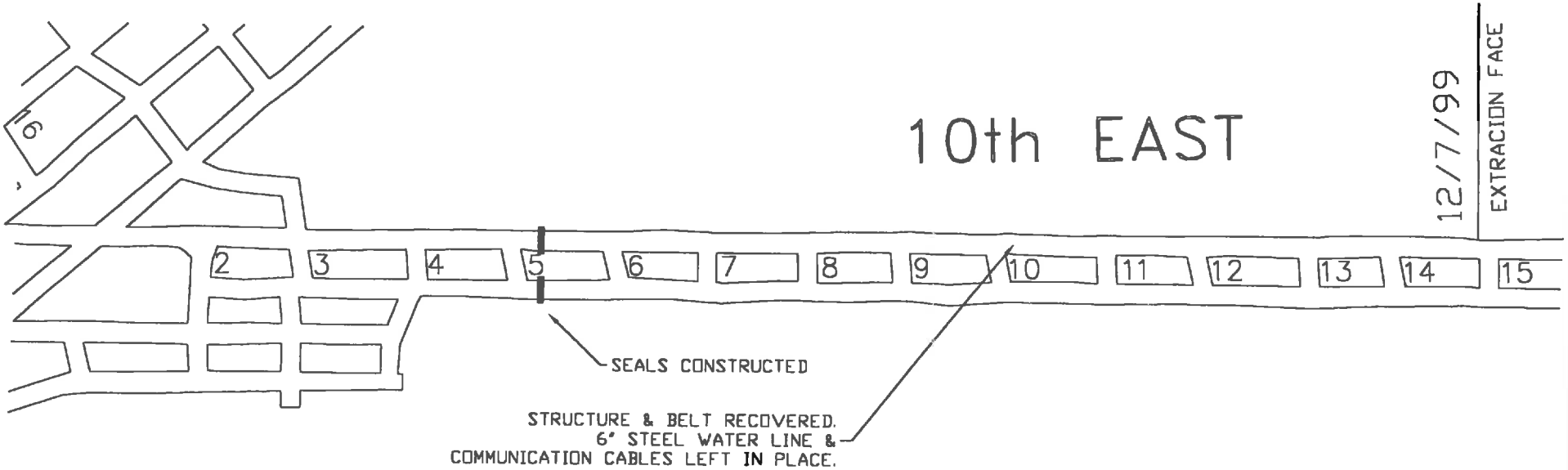


DEER CREEK MINE

8TH EAST

(REVISED 1-28-02)

ATTACHMENT #9



DEER CREEK MINE

10TH EAST

(REVISED 1-28-02)

ATTACHMENT #10

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

May 3, 2002

Chuck Semborski, Environmental Supervisor
Energy West Mining Company
P.O. Box 310
Huntington, Utah 8528

Re: Final Approval of 9th East Conveyor Abandonment, Energy West Mining Company, Deer Creek, C/015/018-AB01F-2, Outgoing File

Dear Mr. Semborski:

The above-referenced amendment was conditionally approved on April 12, 2002, upon receipt of 7 clean copies prepared for incorporation. This condition has been met. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for completing this permitting action. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Permit Supervisor

an
Enclosure
cc: Ranvir Singh, OSM
Tom Rasmussen, BLM
Elaine Zieroth, USFS (2)
Mark Page, Water Rights w/o
Dave Ariotti, DEQ w/o
Derris Jones, DWR w/o
Price Field Office
O:\015018.DER\FINAL\Fin01F-2.doc

One Utah Center, Suite 2000
Salt Lake City, Utah 84140-0020
(801) 220-4616 • FAX (801) 220-4725

INTERWEST
MINING COMPANY

A Subsidiary of PacifiCorp

December 18, 2002

Mr. Jim Kohler
Solids Branch Chief
Bureau of Land Management
324 South State Street
Salt Lake City, Utah 84145-0155

Re: 5TH NORTH MAINS [BLIND CANYON SEAM]: 2ND PHASE OF MINE ENTRY SEALING FOR THE AREA "INBY" XC#11+50; DEER CREEK MINE; HUNTINGTON, UTAH.

Mr. Kohler:

PacifiCorp, by and through its wholly-owned subsidiaries, Interwest Mining Company ("Interwest") as managing agent and Energy West Mining Company ("Energy West") as mine operator, hereby provides written confirmation to the BLM Authorized Officer [in accordance with 43 CFR 3484.1 (c) (7)] regarding equipment and material recovery / abandonment, hazardous material inspection / documentation and final entry sealing for the portion of the Deer Creek Mine in the area of the 5th North Mains [Blind Canyon Seam] "inby" XC#11+50; included within Federal Coal Leases U-06039 Tract #1 and Tract #2, U-024317, SL-051221 and U-2810.

With the completion of the 8th East longwall panel in early December / 2001, Energy West Mining Company began mine recovery and preparations for the 1st Phase of entry sealing of the 5th North panel block [Blind Canyon Seam] at the Deer Creek Mine. On January 22, 2002, prior to sealing operations, a joint (BLM / EW) on-site Hazardous Material Inspection was conducted within the affected area comprising the 5th North Mains "inby" XC#23, the 10th East gate roads "inby" XC#5, the 9th East gate roads "inby" XC#6 and the 8th East gate roads "inby" XC#5. Actual seal construction was completed prior to start-up of the 5th Right longwall panel in early February / 2002.

Please find attached a general arrangement area drawing regarding the area of reference together with existing seal locations and proposed seal locations.

In conjunction with the proposed 2nd Phase of mine entry sealing for the area of the 5th North Mains "inby" XC#11+50 [Blind Canyon Seam] a joint (BLM / EW) on-site Hazardous Material Inspection was conducted on 12/09/02. The area(s) inspected consisted of the 5th North Main entries ("inby" XC#11+50), the 10th East neck-off area, the 9th East Sub-Main

entries (et al), the 9th East neck-off area and the 8th East neck-off area [Falk, BLM; Demczak, DOGM; Fleck, EW]. The on-site inspection is part of a routine procedure used by the overseeing governmental agencies to identify materials that may need to be removed / recovered from or abandoned within the underground workings prior to final sealing operations.

During the referenced inspection, no hazardous waste or unacceptable materials proposed for abandonment were encountered. At the time of the inspection recovery efforts and seal construction was in progress. Please find attached a complete listing and status of equipment and materials that were inventoried within the affected area. Please also find attached a site specific area map of the referenced area specifying the location(s) of equipment and materials to be recovered and/or abandoned.

Site recovery included, but was not limited to, removal of the majority of the in-place conveyor drive equipment, conveyor belt and structure, mine power feeder cable, monitoring cables, sensors, etc. Recovery exceptions are to include installed primary and secondary roof / rib support materials, in place water and discharge pipelines, communication and control cables and general / miscellaneous mine supplies and/or hardware items. Abandoned longwall pan line sections and Bretby cable handling system have already been addressed in previous documentation to the Authorized Officer.

The materials and equipment items identified for in-place abandonment have minimal commercial value due to present service condition and are evaluated to not be reasonable or economical to recover. The decision to abandon materials in-place is made with full consideration to the absence of any short term or long term effect to present and/or future underground or surface resources and/or operations. As discussed above, prior to final site sealing a joint environmental audit was conducted of the applicable underground workings by the governmental agency [BLM / DOGM] and Energy West to evaluate, verify and document in-place material and equipment items proposed for recovery and/or abandonment.

PacifiCorp submits that the proposed sealing and abandonment is in compliance with the terms, conditions and stipulations of the referenced leases. In support of this project, Energy West submits that the following conditions have been fully satisfied:

(1) All practical and economically recoverable coal reserves have been mined from this area in accordance with the approved R2P2 and it's subsequent minor modifications.

(2) All associated mining equipment/machinery and materials have been recovered from this area with the exceptions of some mine materials as referenced in this document.

(3) A complete underground environmental audit of this area has been conducted on December 9, 2002. Representatives of the BLM, DOGM and Energy West conducted and documented a full site audit of the referenced area where no hazardous waste or unacceptable proposed abandoned materials were observed.

(4)
Final recovery and sealing of the 5th North and 9th East Sub-Main area of the Deer Creek Mine [Blind Canyon seam] will be completed by the end of December 2002. Energy West would like to thank the Price BLM Field Office and BLM / DOGM inspectors for collaborating with Energy West in conducting such a timely review and site inspection of the 5th North area. This type of agency / industry coordination and cooperation will allow Energy West to complete the project on schedule.

With the information and detail submitted, it is anticipated that a timely review and approval can be granted. If there are any questions, please contact Carl Pollastro at (435) 687-4701 or Larry LaFrentz at (435) 687 – 6626.

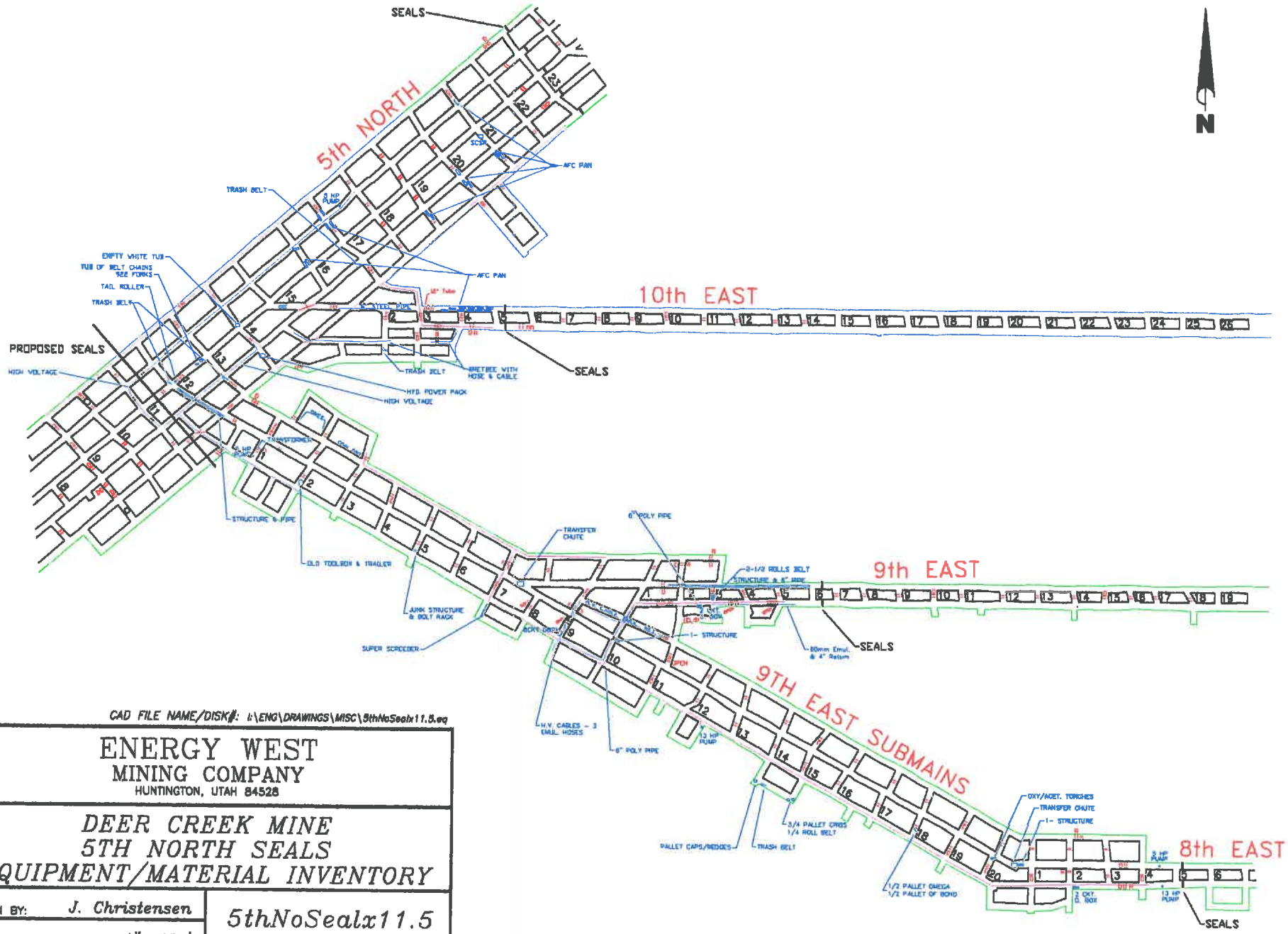
Sincerely,

Steven E. Kochevar, P.E.
Manager, Technical Services
Interwest Mining Company

cc: Steve Falk – BLM (Price River Office)
Steve Demczak - DOGM Inspector
Bob King – IMC
Scott Child – IMC
Steve Kochevar - IMC
Carl Pollastro – EW
Earl Snow – EW
Chuck Semborski – EW
Ken Fleck – EW
Larry LaFrentz – EW

ATTACHMENTS:

Enclosure #1: DEER CREEK MINE 5TH NORTH SEALS; EQUIPMENT / MATERIAL INVENTORY DRAWING; DWG. # 5thNoSealsx11.5; DATED 12/02/02; SHEET 1 OF 1.
Enclosure #2: LIST OF MATERIAL / EQUIPMENT (AS OF 12/04/02)
Enclosure #3: LIST OF MATERIAL / EQUIPMENT (AS OF 12/18/02)



CAD FILE NAME/DISK#: I:\ENG\DRAWINGS\MISC\5thNoSealx11.5.eq

ENERGY WEST MINING COMPANY HUNTINGTON, UTAH 84528		
DEER CREEK MINE 5TH NORTH SEALS EQUIPMENT/MATERIAL INVENTORY		
DRAWN BY: J. Christensen	5thNoSealx11.5	
SCALE: 1" =400'	DRAWING #:	
DATE: 12/2/02	SHEET 1 OF 1	REV.

MATERIAL/EQUIPMENT TO BE RECOVERED

Before sealing 5th North (as of 12/04/02)

ITEM	LOCATION	RECOVER/LEAVE
13 HP Pump	8th E. xc4.5, #2 entry	Recover
5 HP pump	8th E. xc 4.5, #1 entry	Recover
2 circuit D. Box	8th E. xc 2, #2 entry	Recover
Oxy/Acet Bottles/Torches	9th E. Sub-Mains, xc 20, #2 entry	Recover
13 HP pump	9th E. Sub-Mains, xc 12.5, #3 entry	Recover
High Voltage Cables (4ea)	9th E. Sub, xc9, #1 to #3 entries	Recover
Emulsion hoses (large)	9th E. Sub, xc9, #1 to #3 entries	Recover
6" Scalair pipe	9th E. Sub, x7 – 20, #3 entry	Recover
2 ckt. D. Box	9th East, xc 2.5, #2 entry	Recover
2 ½ Rolls of 48" Belt	9th East, xc 3, #2 entry	Recover
8 ckt. D. Box	9th E. Sub xc 9, #3 entry	Recover
Super Screeder	9th E. Sub xc 7, #3 entry	Recover
5 HP pump	9th E. Sub xc 1, #3 entry	Recover
Transformer	9th E. Sub xc 1, #3 entry	Recover
High Voltage Cable	5th No. x18, #2 to xc11, #4	Recover
922 Forks, Tub of belt chains	5th No. xc 13, belt entry	Recover
5 HP Pump	5th No. xc 17.5, #2 entry	Recover
High Voltage	5th No. xc 11-14, #4 entry	Recover
SCSRs in Action Packer	5th No. xc 21, #4 entry	Recover
½ pallet omega & ½ pallet bond	9th E. Sub xc 18, #3 entry	Leave
¾ pallet crib	9th E. Sub xc 15, #4 entry	Recover
Pallet of caps/wedges	9th E. Sub xc 14, #4 entry	Recover
60mm emul. & return	9th E. xc 0-5, #2 entry	Leave
48" structure & pipe	9th E. xc 1.5 – 6, #1 entry	Leave
6" Poly pipe	9th E. xc 1- 5, #2 entry	Recover
Old toolbox(junk) & trailer	9th E. Sub xc2, #3 entry	Leave
Transfer Chutes	8th & 9th East Headroller	Leave
1 length Structure	8th East Headroller	Leave
½ roll 48" belt	9th E. Sub xc 15, #4 entry	Leave
Junk piece of belt	9th E. Sub xc 14, #4 entry	Leave
Junk structure & old bolt racks	9th E. Sub xc 5, #3 entry	Leave
60" structure & pipe (150')	9th E. Sub xc 0-2, belt entry	Leave
Trash pieces of belt (100')	5th No. xc 12 & 13, #3 & #4 entries	Leave
Trash belt	10th East xc 2, #4 entry	Leave
BretBee with hose & cable (500')	10th East xc 0 – 4 , #3 entry	Leave
AFC Pan	10th E. x4, 5 No. x 16, 19, 20, 21	Leave

5th North Seals - Material Recovery

ADDITIONAL ITEMS FOUND ON TOUR WITH BLM/DOGM: (MENTIONED FOR RECOVERY)

Pump/controller/extinguisher	9th E. xc 6 #2 seal.
Fire Extinguishers	All pump & electrical installations
Mine Phone/Battery	9th E. x 1 ½ #3 entry
	All Locations
B.O. 5 hp pump	9th E. xc 0.5 #1 entry
5 hp pump (running)	9th E. Sub xc 7 #1 entry
13 hp pump (running)	9th E. Sub xc 1 #1 entry
Trash can full of rags & aerosol cans.	9th E. Sub. xc 9 between int. & belt entries
Trash can with phone battery in it.	10th E. xc 2.5 #2 entry
2 full tubs of mine sealant & mine phone	5th No. xc 22, #4 entry.

Noted but not needing recovering:

6" culvert	9th E. Sub xc 17 #1 to #3 entry
12" culverts	Notches to the right of 9th E. Sub. intake road
1 new roll brattice & 20-30 bags of Packsetter grout.	10th E. xc 3 ½ #2 entry

5TH NORTH / 9TH EAST SUB-MAIN MATERIAL/EQUIPMENT STATUS
5TH NORTH BLIND CANYON SEALING PROJECT
(AS OF 12/18/02 AM)

ITEM	LOCATION	RECOVER / ABANDONED
13 HP Pump	8th E. xc4.5, #2 entry	Recovered
5 HP pump	8th E. xc 4.5, #1 entry	Recovered
2 circuit D. Box	8th E. xc 2, #2 entry	Recovered
Oxy/Acet Bottles/Torches	9th E. Sub-Mains, xc 20, #2 entry	Recovered
13 HP pump	9th E. Sub-Mains, xc 12.5, #3 entry	Recovered
High Voltage Cables (4ea)	9th E. Sub, xc9, #1 to #3 entries	Recovered
Emulsion hoses (large)	9th E. Sub, xc9, #1 to #3 entries	Recovered
6" Scalair pipe	9th E. Sub, x7 – 20, #3 entry	Recovered
2 ckt. D. Box	9th East, xc 2.5, #2 entry	Recovered
2 ½ Rolls of 48" Belt	9th East, xc 3, #2 entry	Recovered
8 ckt. D. Box	9th E. Sub xc 9, #3 entry	Recovered
Super Screeder	9th E. Sub xc 7, #3 entry	Recovered
5 HP pump	9th E. Sub xc 1, #3 entry	Recovered
Transformer	9th E. Sub xc 1, #3 entry	Recovered
High Voltage Cable	5th No. x18, #2 to xc11, #4	Abandoned
922 Forks, Tub of belt chains	5th No. xc 13, belt entry	Recovered
5 HP Pump	5th No. xc 17.5, #2 entry	Recovered
High Voltage	5th No. xc 11-14, #4 entry	Recovered
SCSRs in Action Packer	5th No. xc 21, #4 entry	Recovered
½ pallet omega block	9th E. Sub xc 18, #3 entry	Abandoned
½ pallet bond mix	9th E. Sub xc 18, #3 entry	Abandoned
¾ pallet crib	9th E. Sub xc 15, #4 entry	Recovered
Pallet of caps/wedges	9th E. Sub xc 14, #4 entry	Recovered
60mm emul. & return	9th E. xc 0-5, #2 entry	Abandoned
48" structure & pipe	9th E. xc 1.5 – 6, #1 entry	Abandoned
6" Poly pipe	9th E. xc 1- 5, #2 entry	Recovered
Old toolbox(junk) & trailer	9th E. Sub xc2, #3 entry	Abandoned
Transfer Chutes	8th & 9th East Headroller	Abandoned
1 length Structure	8th East Headroller	Abandoned
½ roll 48" belt	9th E. Sub xc 15, #4 entry	Abandoned
Junk piece of belt	9th E. Sub xc 14, #4 entry	Abandoned
Junk structure & old bolt racks	9th E. Sub xc 5, #3 entry	Abandoned
60" structure & pipe (150')	9th E. Sub xc 0-2, belt entry	Abandoned
Trash pieces of belt (100')	5th No. xc 12 & 13, #3 & #4 entries	Abandoned
Trash belt	10th East xc 2, #4 entry	Abandoned
Bretby with hose & cable (500')	10th East xc 0 – 4 , #3 entry	Abandoned
AFC Pan	10th E. x4, 5 No. x 16, 19, 20, 21	Abandoned

5th North Seals - Material Recovery

ADDITIONAL ITEMS FOUND ON BLM/DOGM ENVIRONMENTAL AUDIT [12/09/02]: (MENTIONED FOR RECOVERY)

ITEM	LOCATION	RECOVER / ABANDONED
Pump/controller/extinguisher	9th E. xc 6 #2 seal.	Recovered
Fire Extinguishers	All pump & electrical installations	Recovered
Mine Phone/Battery	9th E. x 1 ½ #3 entry	Recovered
B.O. 5 hp pump	9th E. xc 0.5 #1 entry	Recovered
5 hp pump (running)	9th E. Sub xc 7 #1 entry	Recovered
13 hp pump (running)	9th E. Sub xc 1 #1 entry	Recovered
Trash can full of rags & aerosol cans.	9th E Sub xc 9 between int. & belt entries	Removed
Trash can with phone battery in it.	10th E. xc 2.5 #2 entry	Removed
2 full tubs of mine sealant & mine phone	5th No. xc 22, #4 entry.	Recovered

Other noted materials:

6" culvert	9th E. Sub xc17 #1 to #3 entry	Recovered
12" culverts	Notches to the right of 9th E. Sub. Intake road	Recovered
1 new roll brattice & 20-30 bags of Packsetter grout.	10th E. xc 3 ½ #2 entry	Recovered

ENERGY WEST Mining Co.
PO Box 310
Huntington, Utah 84528

March 9, 2005

Mr. Jim Kohler
Solids Branch Chief
Bureau of Land Management
324 South State Street
Salt Lake City, Utah 84145-0155

Subject: **6TH NORTH [HIAWATHA] PANEL BLOCK: CONFIRMATION OF EQUIPMENT AND MATERIAL RECOVERY/ABANDONMENT, HAZARDOUS MATERIAL INSPECTION AND FINAL MINE ENTRY SEALING; ENERGY WEST MINING COMPANY, DEER CREEK MINE, HUNTINGTON, UTAH**

Mr. Kohler:

PacifiCorp, by and through its wholly-owned subsidiaries, Interwest Mining Company ("Interwest") as managing agent and Energy West Mining Company ("Energy West") as mine operator, hereby provides written confirmation to the BLM authorized officer [in accordance with 43 CFR 3484.1(c)(7)] regarding equipment and material recovery/abandonment, hazardous material inspection and final sealing approval for the portion of the Deer Creek Mine in the area comprising the 6th North [Hiawatha] panel block; included within Federal Coal Leases U-06039 Tract #1 and Tract #2, U-024317, SL-051221 and U-2810.

Please find attached general arrangement area drawings regarding the area of reference, along with final seal locations for the project [SEE ATTACHMENTS].

With the completion of the 8th Right longwall panel in September / 2004, Energy West Mining Company began mine recovery and preparation for final sealing of the 6th North [Hiawatha] panel block at Energy West's Deer Creek Mine. On November 2, 2004, as part of the BLM's quarterly mine inspection, this project was reviewed and fully discussed with the BLM mine inspector [Falk].

On December 13, 2004, prior to final sealing operations of the 6th North panel block, a joint (BLM/EW) On-Site Hazardous Material Inspection was conducted within the affected area of the 6th North Mains and gate road neck-off areas as well as in the 1st Right Sub-Mains and gate road neck-off areas [Falk, McKenzie BLM; John Christensen, EW]. The inspection (part of a routine procedure used by the overseeing governmental agency) is to identify materials that may need to be removed/recovered from or abandoned within the underground workings prior to final sealing operations.

Huntington Office:
(435) 687-9821
Fax (435) 687-2695
Purchasing Fax (435) 687-9092

Deer Creek Mine:
(435) 687-2317
Fax (435) 687-2285

Trail Mountain Mine:
(435) 748-2140
Fax (435) 748-5125

During the referenced inspection, no hazardous waste or unacceptable proposed abandoned material was encountered within the identified sealed area. At the time of the inspection, recovery efforts and seal construction was in progress. Please find attached a complete listing and status of equipment and materials that were within the affected sealed area. [*SEE ATTACHMENTS*]

Site recovery included, but was not limited to, removal of the majority of in-place conveyor drive equipment, portions of the in-place conveyor belt / structure, portions of the mine power feeder cables, monitoring cables, sensors, and high/pressure and discharge water pipe. Recovery exceptions are to include installed primary and secondary roof and rib support materials, general miscellaneous mine supplies and/or hardware items, portions of in-place 60" conveyor structure, portions of in-place high/pressure and discharge water pipeline, portions of communication and control cables and portions of bleeder electrical distribution cable. ***[SEE ATTACHMENTS]***

The material and equipment items identified for in-place abandonment have minimal commercial value due to present service condition and are evaluated to not be reasonable or economical to recover. The decision to abandon materials in-place is made with full consideration to the **absence** of any short term or long term effect to present and/or future underground or surface resources and/or operations. As discussed above, prior to final site sealing, a joint environmental audit was conducted of the applicable underground workings by the governmental agency [BLM] and Energy West to evaluate, verify and document in-place materials proposed for recovery and/or abandonment.

PacifiCorp submits that the proposed sealing and abandonment is in compliance with the terms, conditions and stipulations of the referenced leases. In support of this project Energy West submits that the following conditions have been fully satisfied:

(1) All practical and economical coal reserves have been mined from this area in accordance with the approved R2P2 and it's subsequent minor modifications.

(2) All associated mining equipment/machinery and materials have been recovered from this area with the exceptions of some mine materials as referenced in this document.

(3) A complete underground environmental audit of this area has been conducted on December 13, 2004. Representatives of the BLM and Energy West conducted and documented a full site audit of the referenced area where no hazardous waste or unacceptable proposed abandoned material were observed.

Final recovery and sealing of the 6th North [Hiawatha] panel block was completed on February 16, 2005. Energy West would like to thank the Price BLM Field Office and the BLM inspector for collaborating with Energy West in conducting such a timely review and site inspection of the 6th North area.

If you have any questions or require additional information and/or detail, please contact Larry LaFrentz [Energy West] at (435) 687-2317 or John Christensen at (435) 687-6630.

LICENSED PROFESSIONAL ENGINEER
JOHN CHRISTENSEN
3/21/05
No. 165851
STATE OF UTAH

Sincerely,

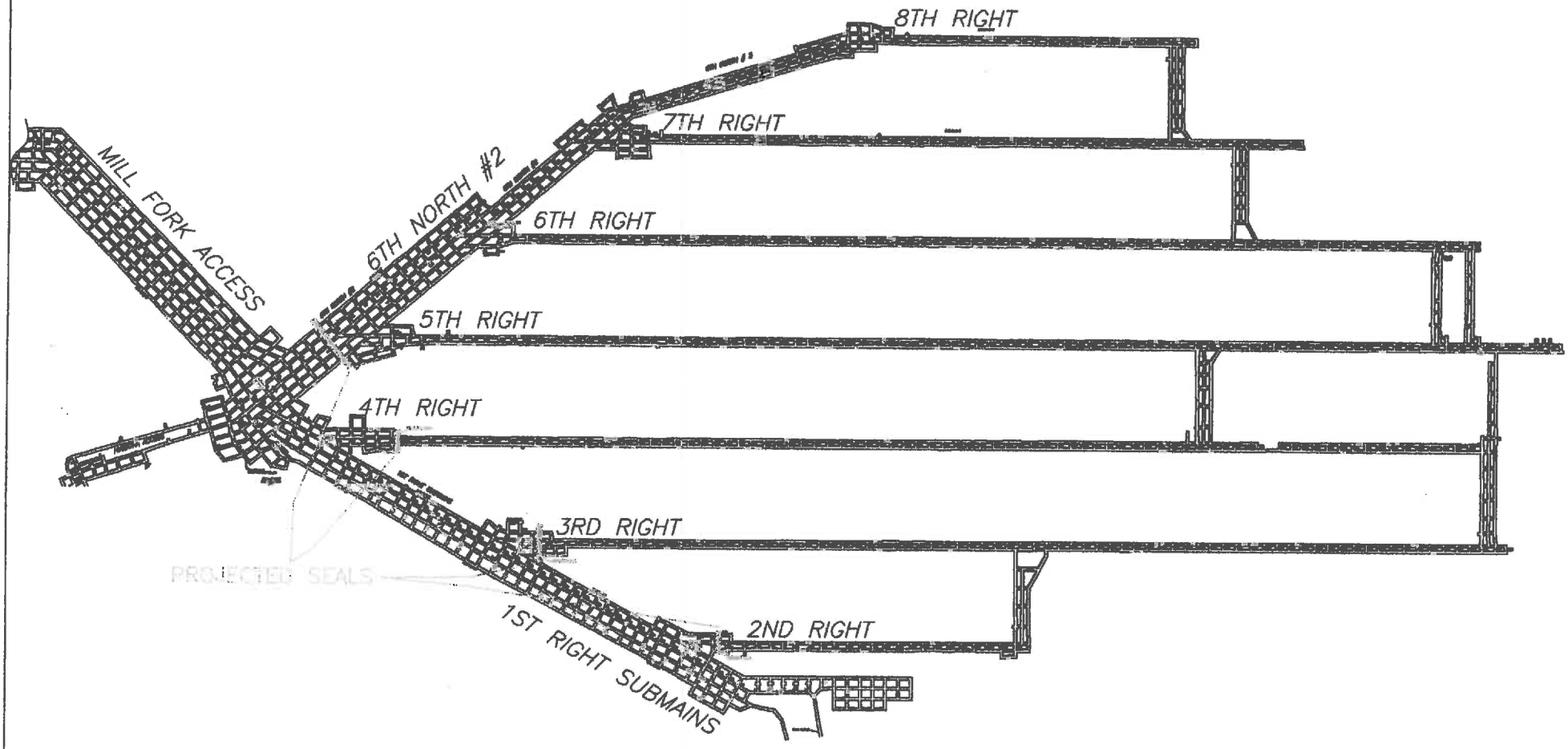
For: Carl Pollastro
Technical Services Manager
Interwest Mining Company

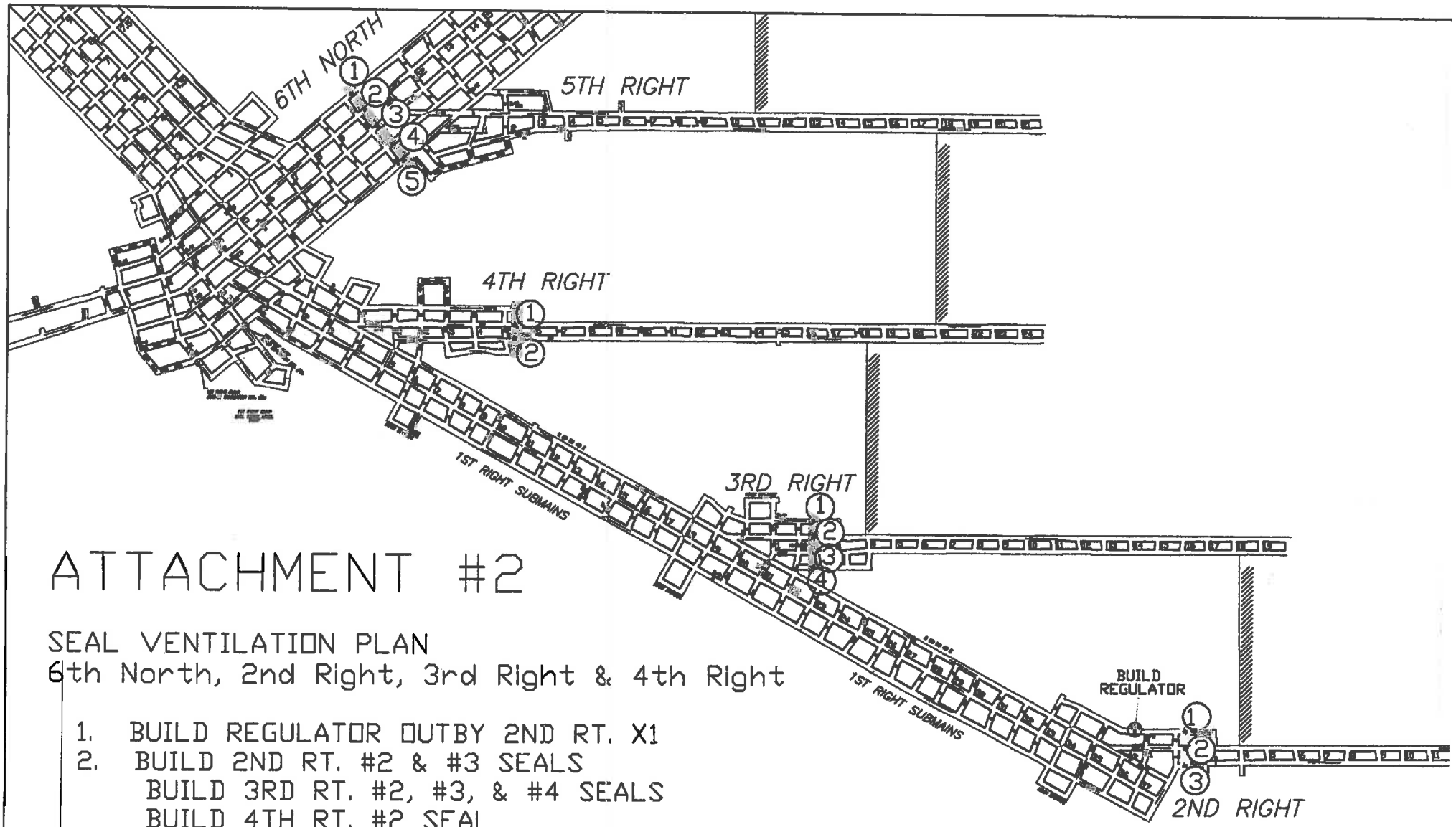
Three (3) Enclosures:

Enclosure #1: General Area Map, Deer Creek Mine 6th North (Hiawatha) Panel Block.
Enclosure #2: General Area Map, Deer Creek Mine 6th North (Hiawatha) Mine Entry Seal Locations.
Enclosure #3: Deer Creek Mine; Final 6th North Material/Equipment Recovery and Abandonment Listing.

cc:	Dee Jense,	IMC
	Bob King,	IMC
	Scott Child,	IMC
	Carl Pollastro,	EWMC
	Doug Johnson,	EWMC
	Earl Snow,	EWMC
	Frank Zmerzlikar,	EWMC
	Clayton Cox,	EWMC
	Cardel Mortensen	EWMC
	Chuck Semborski,	EWMC
	Louie Tonc	EWMC
	Kevin Tuttle	EWMC
	Ken Fleck	EWMC
	L.J. LaFrentz,	EWMC

ATTACHMENT #1





ATTACHMENT #2

SEAL VENTILATION PLAN
6th North, 2nd Right, 3rd Right & 4th Right

1. BUILD REGULATOR OUTBY 2ND RT. X1
2. BUILD 2ND RT. #2 & #3 SEALS
   BUILD 3RD RT. #2, #3, & #4 SEALS
   BUILD 4TH RT. #2 SEAL
   BUILD 6TH NORTH #2 & #3 SEALS
3. BUILD 3RD RT #1 & 4TH RT. #2
4. BUILD 6TH NO. #1 & #5 SEALS
5. BUILD 2ND RT. #1 & 6TH NO. #4

MATERIAL/EQUIPMENT INVENTORY
for 6TH NORTH, 4TH RIGHT, 3RD RIGHT and 2ND RIGHT

LOCATION	MATERIAL/ EQUIPMENT	STATUS 12/13/2004	FINAL STATUS 2/16/2005
6th No.2 Beltline	- 3400' 60" Structure, 6" pipes, etc.	Recover	Partially Left
6th No. 3 Beltline	- 1800' Structure, 6" pipes, etc.	Recover	Partially Left
7th Right	- Storage Unit, Headroller and LW move station, 5- 30x tires	Recover	Recovered
6th North #3 Including 8th Right	- Drive, Take-Up & Headroller winder, hose spools, shields, drive, storage Unit, Rolls of Belt	Recover	Recovered
2nd Right x3, #3	- 7 timber & 1/2 pallet of rock dust	Leave	Left
	- 12" culvert, 20 ft.	Leave	Left
	- H.V. cable (on ground)	Recover	Recovered
2nd Right Bleeder	- 6" Poly Pipe & 4/0 Cable	Partially	Partial
	Pumps & D. Boxes:	Recover	Recovered
	- 2nd Rt. X9, x24, Setup		
	- 3rd Rt. X51, x57, x63, x69, x77		
	- 4th Rt. X90		
	- 6th Rt. X74		
3rd Right, x2, #3	- 2 lengths of 6" Scalair	Recover	Recovered
3rd Right, x2, #3-4	- 14/3 Cable	Recover	Recovered
4th Right, x5.5, #2	- Dust pipe		Left
5th Right, x2, #3	-Dust pipe, 6/3 pump cable, phone line	Leave	Left
#2	- 6" Scalair pipe	Leave	Left
6th North, x10.5, #5	- 1/2 pallet of block	Leave	Left
6th No. x11, #3	- 20' structure & pipe (hung high)	Leave	Left
	- Belt cross under	Recover	Recovered
6th No. x14, #4	-Knack Tool Box	Recover	Recovered
6th No. x14, #2	-4 Rolls of Belt	Recover	Recovered
6th No. x15, #4	- Pallet of Rock Dust	Leave	Left
6th No. x15, #2	- 3 Rolls of Belt	Recover	Recovered
6th No. x19, #4	-Partial roll of new 4/0 Cable	Recover	Recovered
6th No. x20, #4	- Old man door	Recover	Left
6th No. x20-22, #5	- Dust pipe		Left
6th No. x20, #2	- Floor Mounted Headroller	Recover	Recovered
6th No. x21, #4	- 4/0 Cable Pieces, 50', 100'	Recover	Recovered
6th No. x22, #4	- Pump Tub (large steel)	Recover	Recovered
6th No. x21, #2	-Guarding, Tailpiece, TakeUp pc.	Recover	Recovered
6th No. x40, #2	- Pump Tub	Recover	Recovered
6th No. x41, #2	- 12 Timber (loose)		Recovered
6th No. x38-45, #3	- 6" Scalair Line (aprx. 700 ft.)	Recover	Recovered
6th No. 45 to &	- LW hose tubs, hose pallets, spool	Recover	Recovered

LICENSED PROFESSIONAL ENGINEER
JOHN CHRISTENSEN
3/21/05
No. 165651
STATE OF UTAH

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-06039
Partial Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

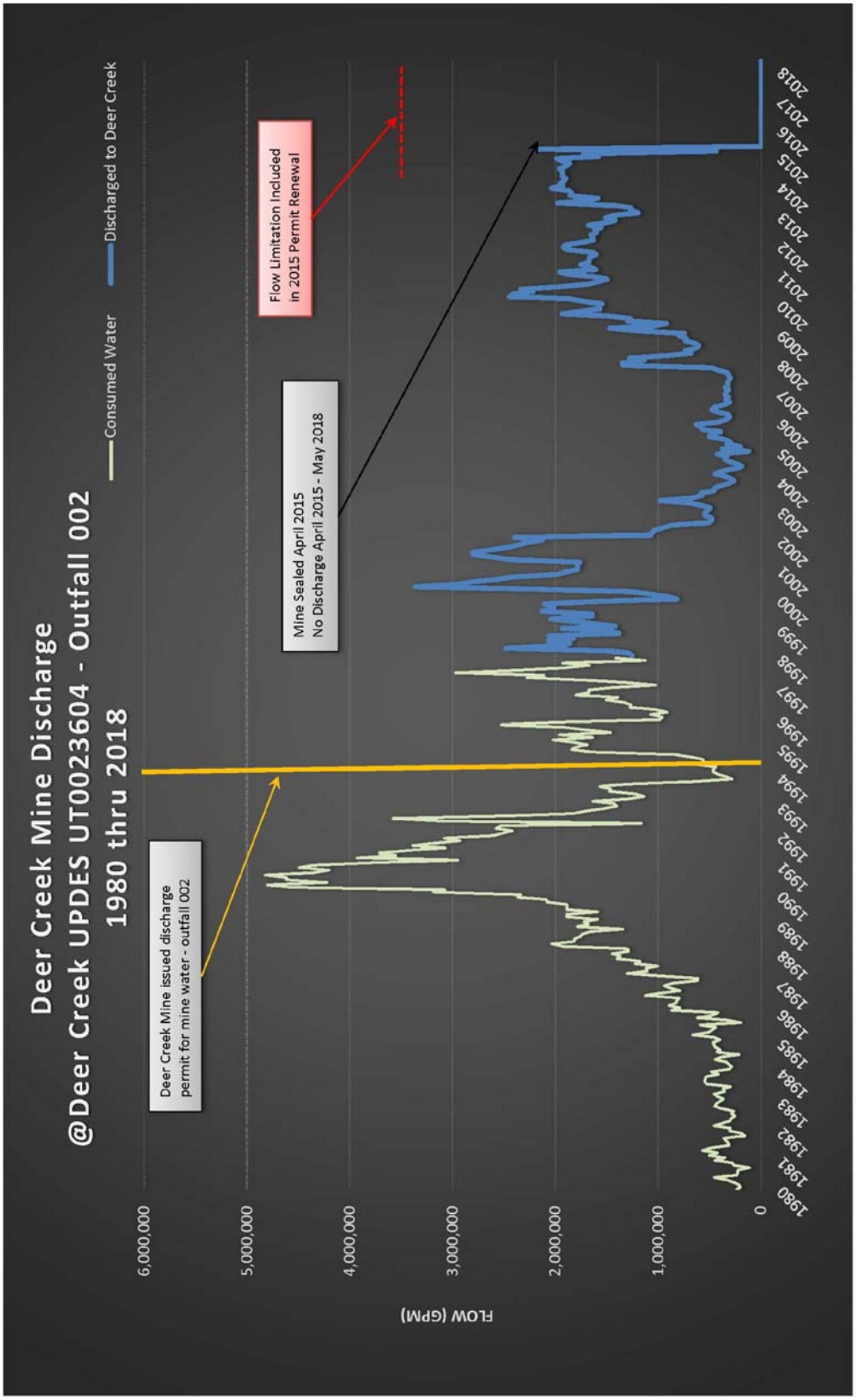
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



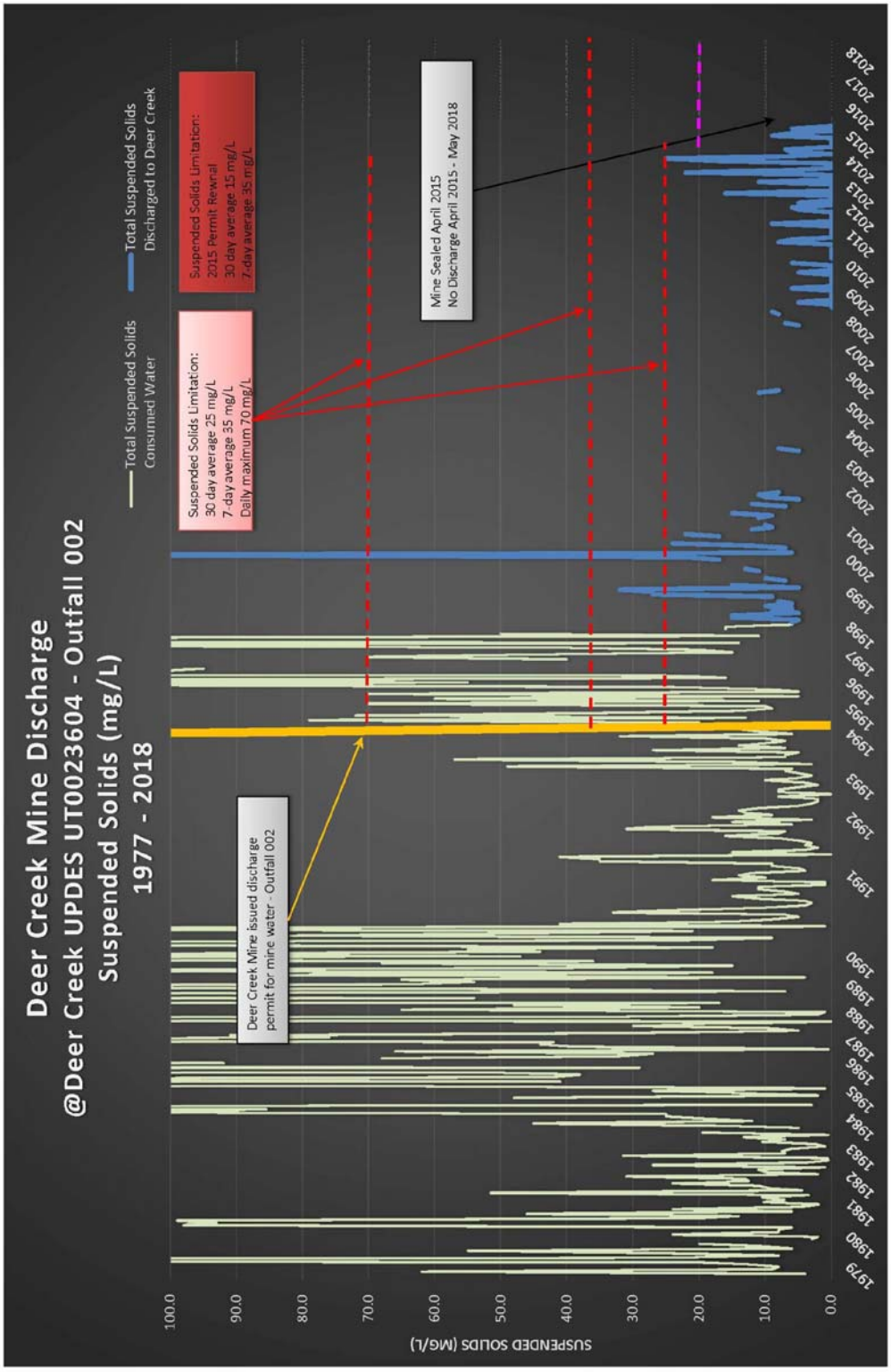
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



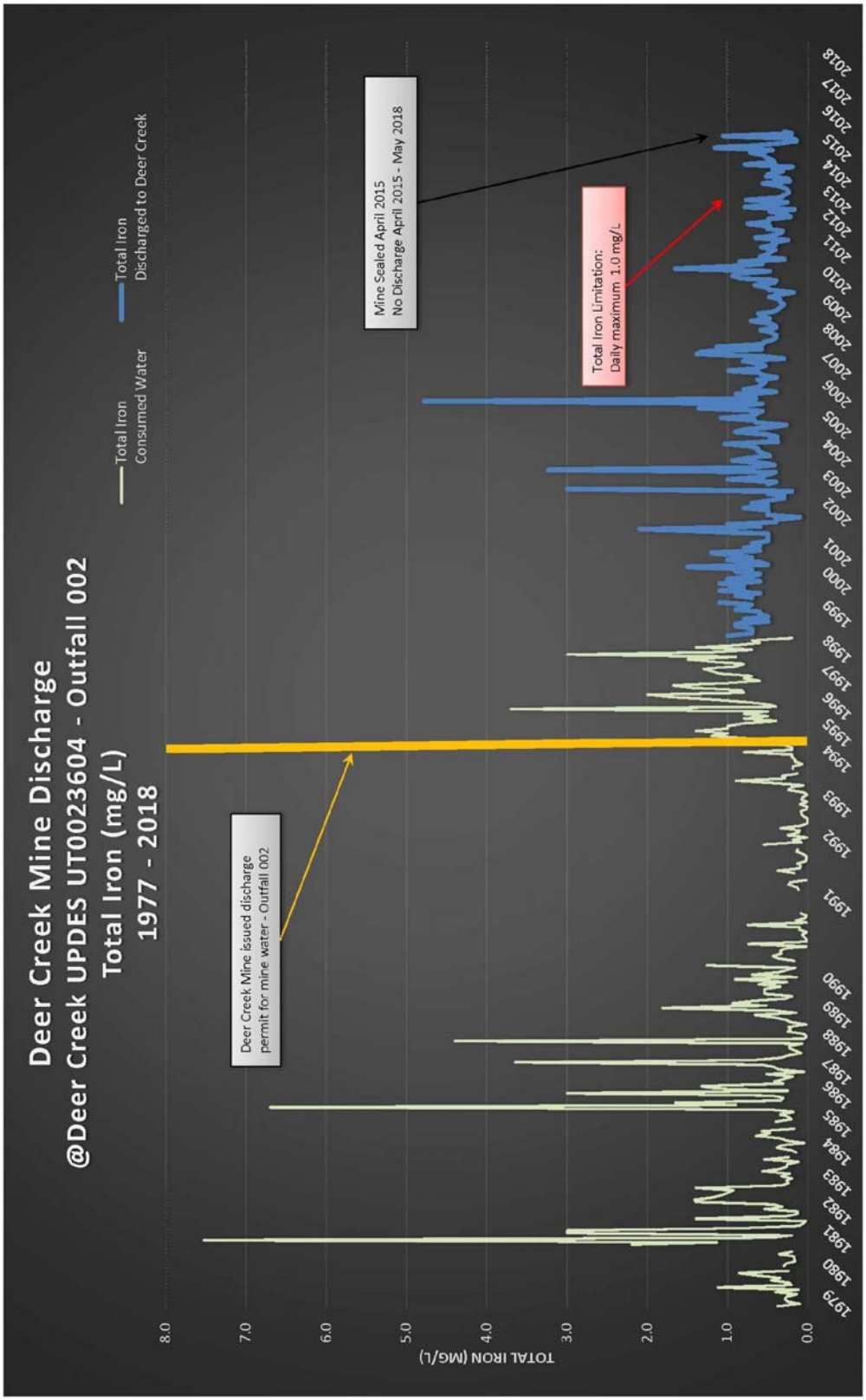
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



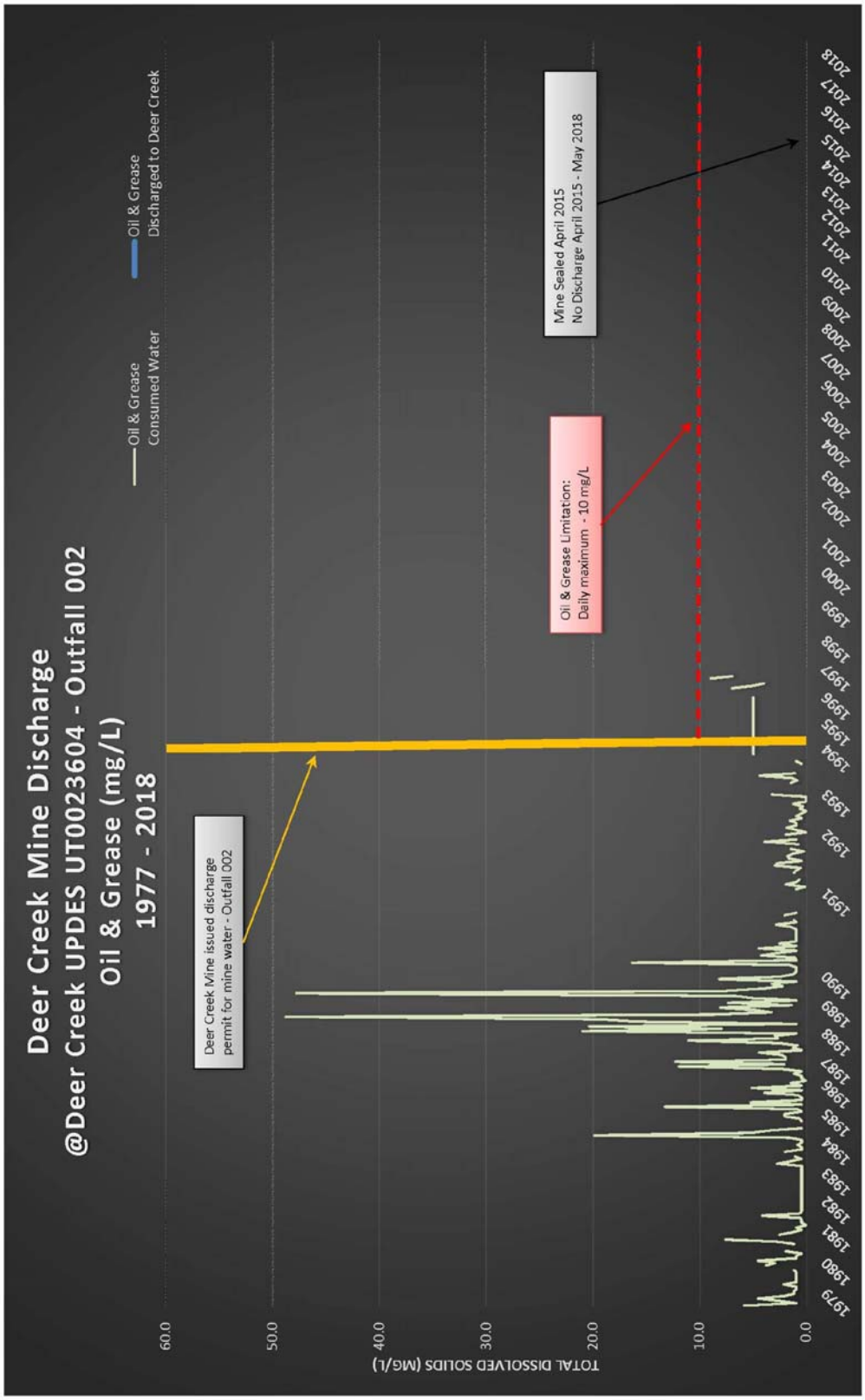
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



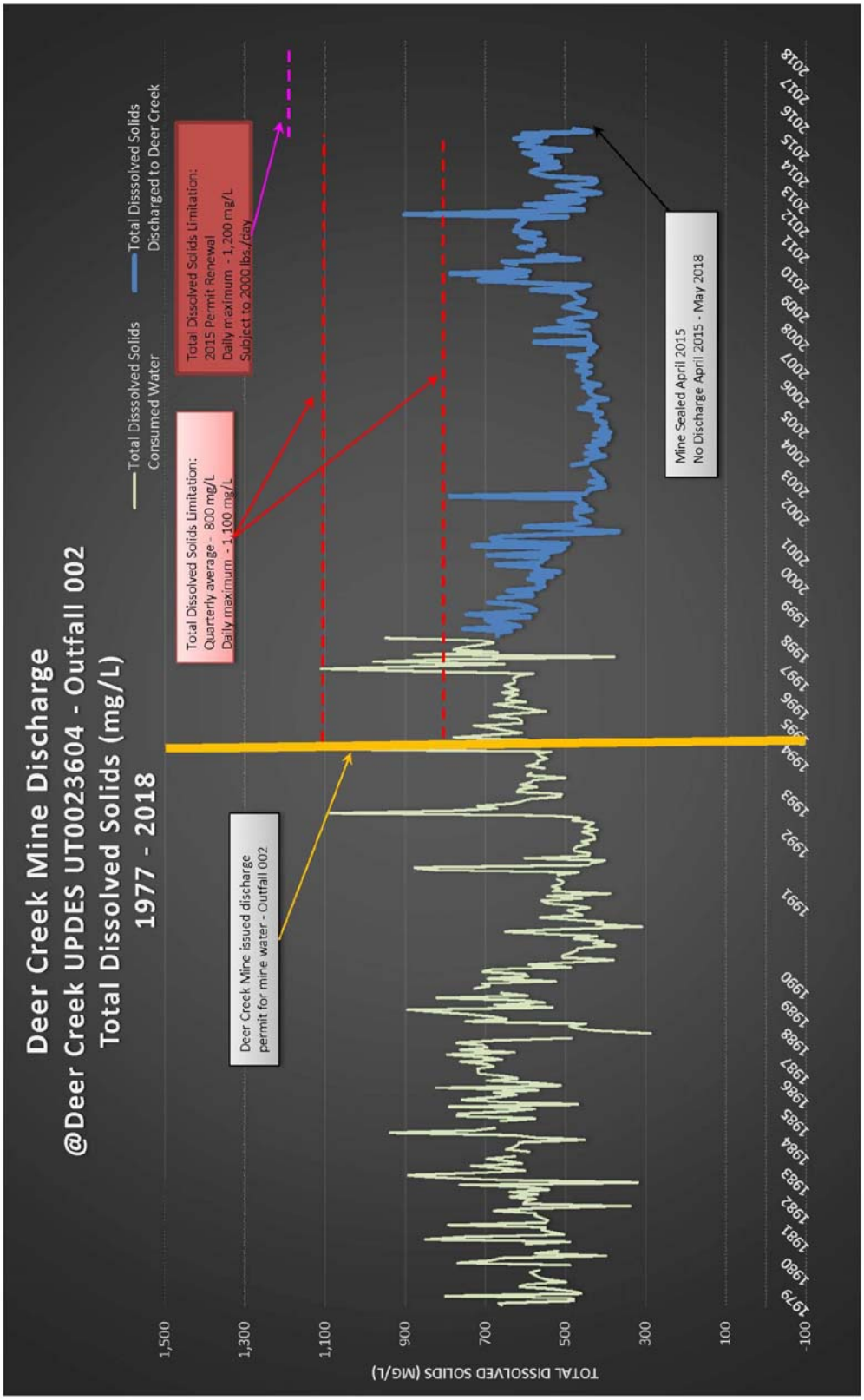
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



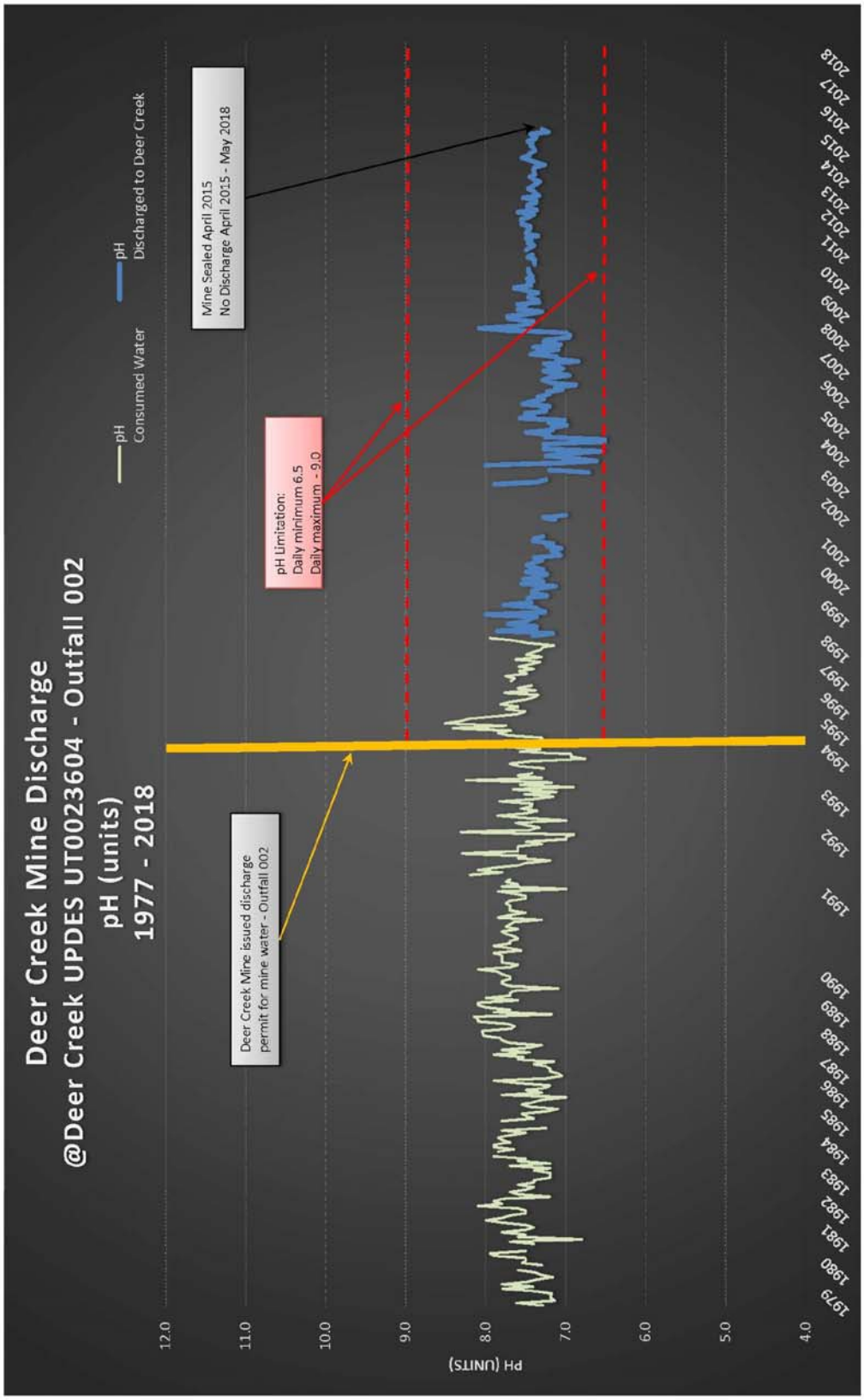
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTU-024317

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-024317, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-024317. The total acreage being surrendered is 400.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTU-024317 is described below:

Federal Coal Lease UTU-024317		
Lease Readjustment Effective Date:		5/1/2018 to 5/1/2028
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**400.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 20:	S½NE¼	80.00
Sec 21:	S½N½, SW¼	320.00
	Total Lease Acres for Full Relinquishment:	**400.00**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-024317

LEASE ACTIVITIES

1) Coal Lease Number: UTU-024317 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 400.00 Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of area relinquished. No areas retained. See also Figure 1 (a map depicting the area to be relinquished in its entirety).*

Original Lease Acreage: 400.00 Relinquished to date: 0.00 acres Remaining: 400.00 acres

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)? YES ☐ NO ☒ (If "YES", describe:

11) Date of initial mining: November 1998; last mining: August 2004.

12) Number of coal beds mined: 2 coal seams (Blind Canyon and Hiawatha)

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-024317

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to hydrographs*

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-024317

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
   - *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities? YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐ (If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).
27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

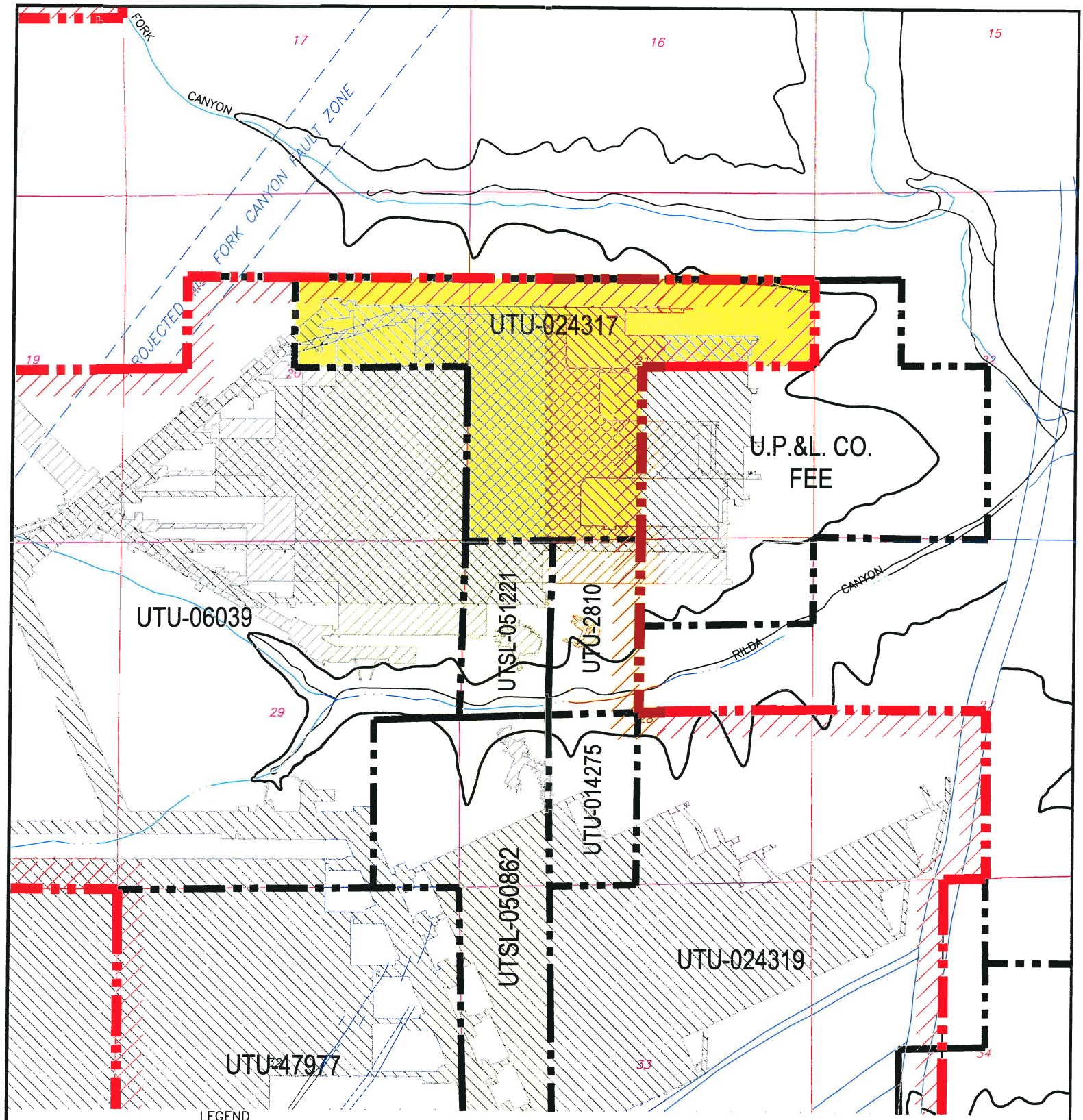
Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-024317

Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTU-024317 is described below:

Federal Coal Lease UTU-024317		
Lease Readjustment Effective Date:		5/1/2018 to 5/1/2028
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**400.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 20:	S½NE¼	80.00
Sec 21:	S½N½, SW¼	320.00
	Total Lease Acres for Full Relinquishment:	**400.00**
	Total Lease Acres Remaining:	**0.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-24317 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

CAD FILE NAME/DISK#: UTU-024317

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-024317

DRAWN BY:	K. LARSEN	FIGURE 1
SCALE:	1" =2000'	DRAWING #:
DATE:	APRIL 26, 2018	SHEET 1 OF 1 REV. ___

FEDERAL COAL LEASE UTU-024317
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-024317 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Hiawatha and Blind Canyon seams. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam took place between 11/1998 and 6/2001. Mining in the Hiawatha seam took place between 10/2001 and 8/2004. The Blind Canyon mine workings and longwall panels directly overlaid the Hiawatha mine workings.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for this area of East Mountain were collected in 1999. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

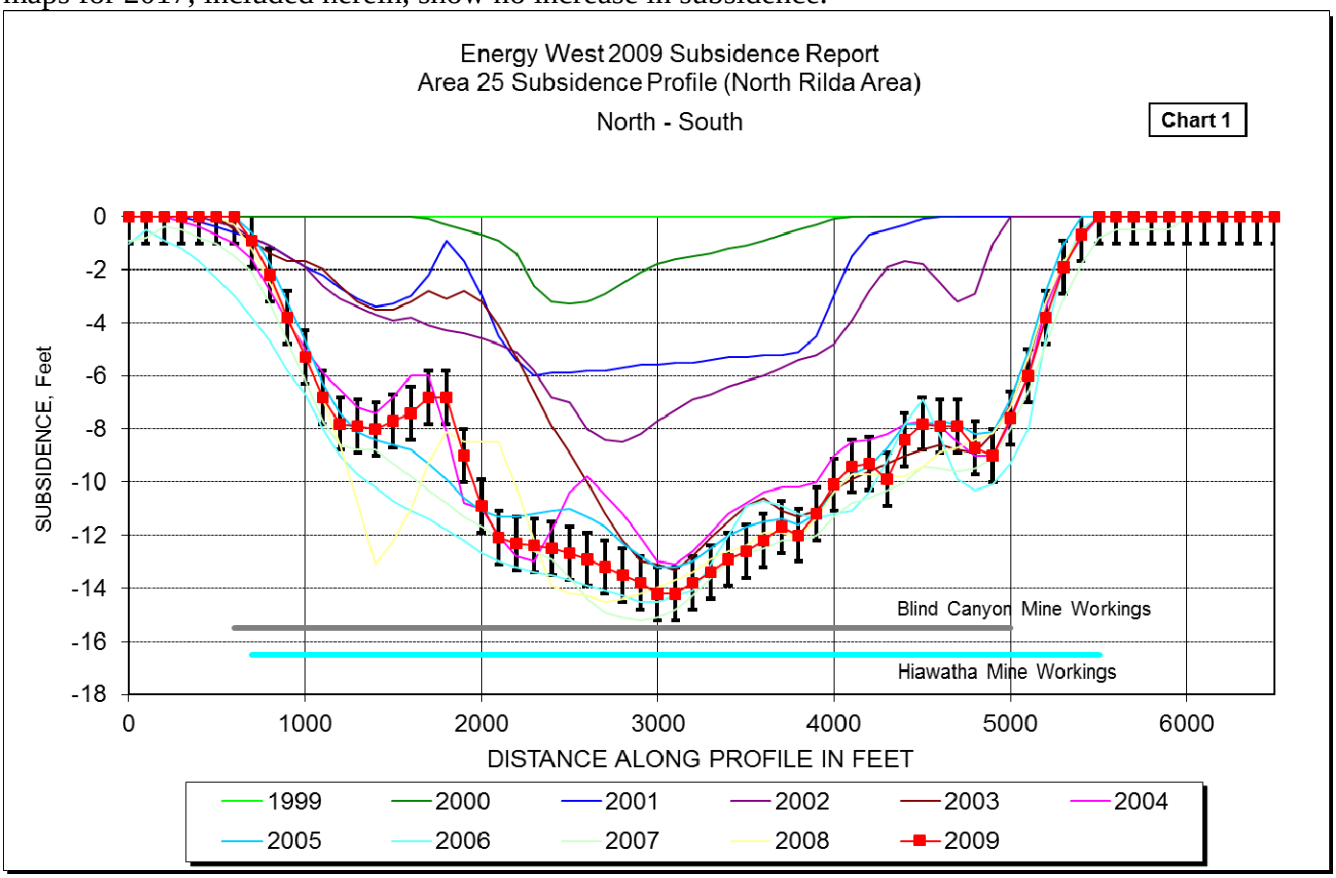
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

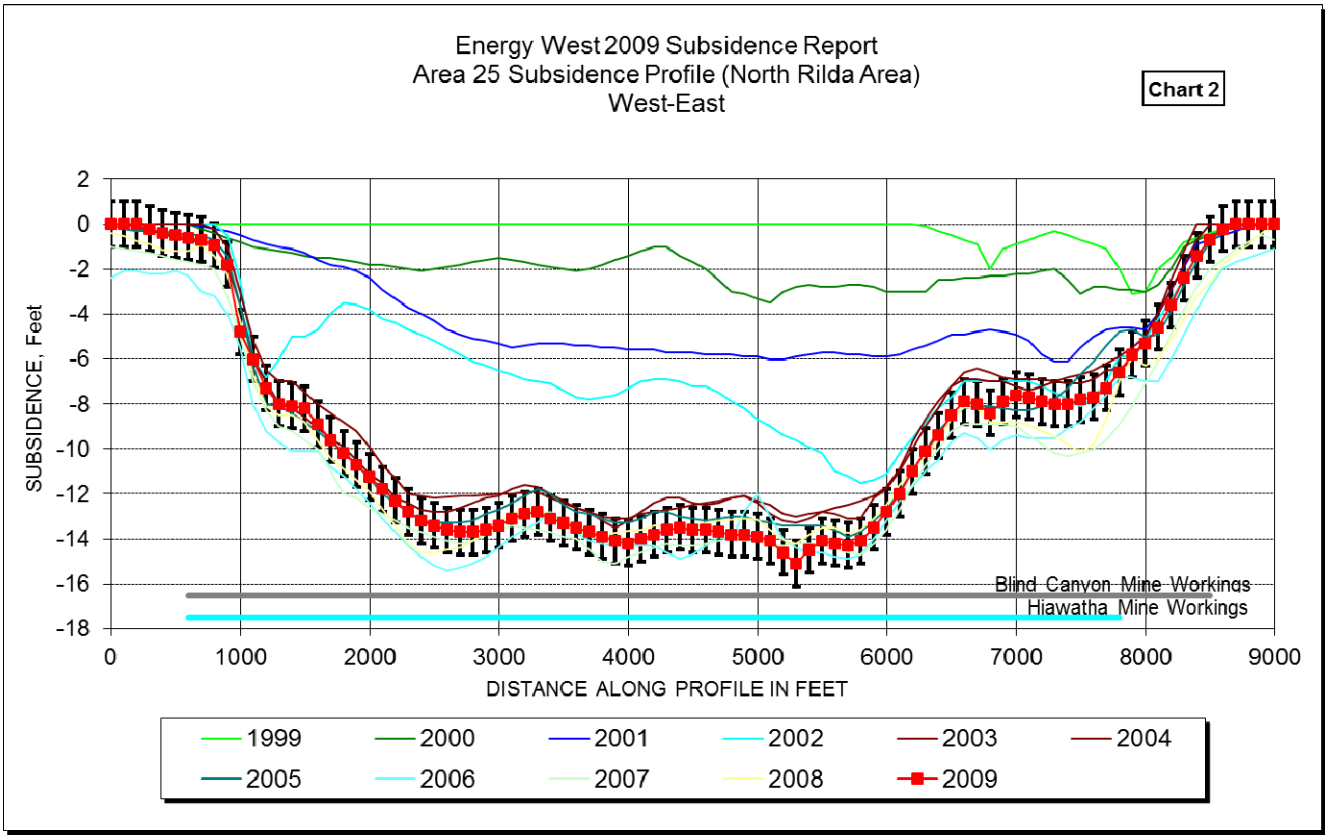
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-024317 Subsidence Data

Subsidence in the lease UTU-024317 area was monitored from 1999 to 2009. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1999 and 2009. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

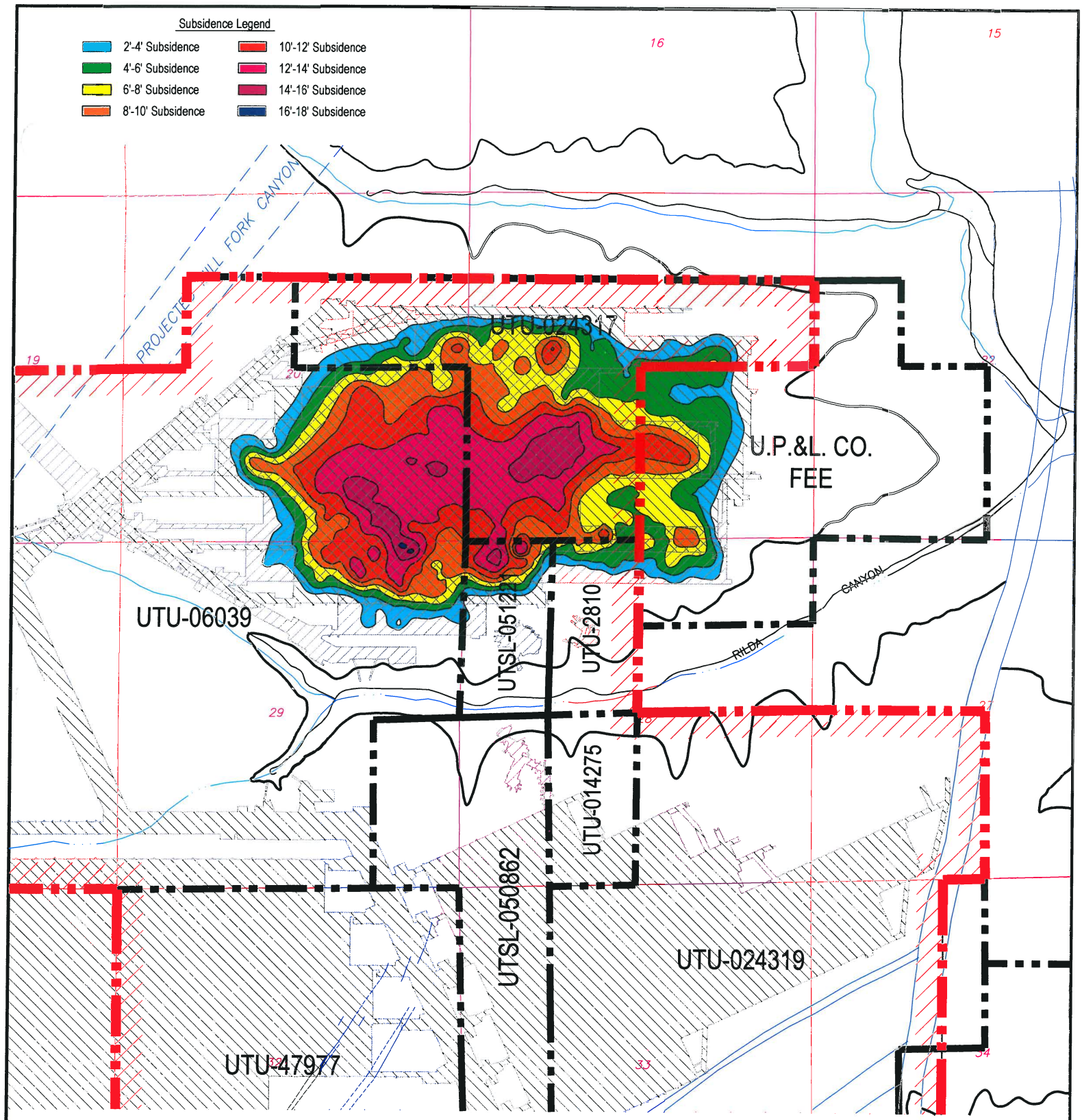
PacifiCorp delineated a series of two profiles covering the main longwall panel districts of Lease UTU-024317, including the dual-seam mining overlay area, are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 15 feet. Some ground cracking occurred during coal extraction. One crack that appeared on the north side of North Rilda Ridge was considered to be a potential hazard and was filled and reclaimed in 2004. Appropriate measures for protection of property and the public were taken during the subsidence of cliffs that were predicted to spall, including warning signs along the Rilda Canyon road to make the public aware of the potential hazards. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-024317. Conventional surveying methods for subsidence involving ground-mounted prisms, were used from 3/99 to 4/07 to measure subsidence of cliff escarpments on the south facing slope of North Rilda Ridge. The prism surveys clearly showed the pre-subsidence status of the cliffs, subsidence behavior during double seam undermining, and post- subsidence re-stabilization of the cliffs.

The proposed relinquishment area of Lease UTU-024317 is stable and subsidence is substantially complete.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-24317 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-024317

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

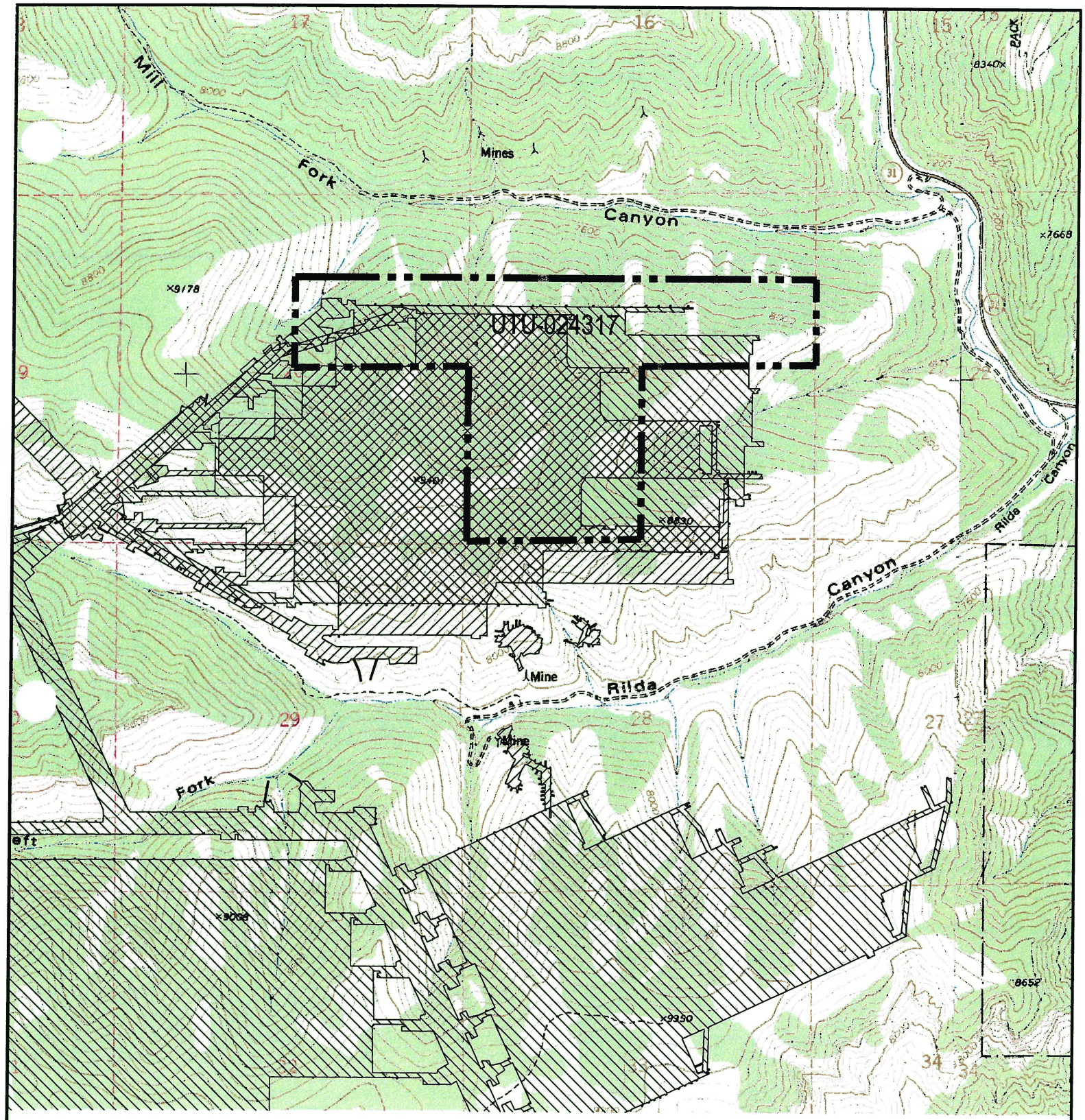
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-024317
SUBSIDENCE BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX A
SCALE:	1" =2000'	DRAWING #:
DATE:	APRIL 26, 2018	SHEET 1 OF 1 REV. ___

Deer Creek Mine
Federal Coal Lease UTU-024317 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-024317 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-024317. No restoration and/or mitigation efforts are required for Lease UTU-024317. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-024317 lease boundaries seam outcrop.



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INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

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EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-024317
TOPOGRAPHIC BASE MAP

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Deer Creek Mine
Federal Coal Lease UTU-024317 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 80 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). The U.S. Forest Service assumed control of the Left Fork portal site and access road located on this lease for the purpose of constructing sediment catchment basins for fire debris runoff. Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTU-024317 and surrounding area (Mill Fork Area). The western lease modification of UTU-024317 was considered to be part of the Mill Fork area of the mine, so the information presented here for the Mill Fork Area should be considered pertinent to the UTU-024317 lease as a whole.

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP). Lease UTU-024317 is adjacent to the Mill Fork Lease Area and includes within the adjacent ½ mile zone some of the springs that are part of the Mill Fork Lease Area monitoring plan.

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the

minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTU-024317.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The Mill Fork 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the Mill Fork 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. 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 PacifiCorp mining area covers portions of East Mountain and Trail Mountain, which are separated by Cottonwood Canyon, a deep, partially glaciated valley.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, but is not exposed in the Mill Fork Area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the Mill Fork Area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the Mill Fork Area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the Mill Fork Area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone are limited to a narrow north-south trending ridge located in the western half of the Mill Fork Area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the

ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the waterbearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal

from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd

North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited

flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity

results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 Area.

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 lease 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 fault within the Mill Fork Area is the Joes Valley Fault, which forms the western limit of the coal reserves in this area. The Joes Valley Fault is the largest and most prominent of several north south trending fault zones within the Wasatch Plateau coal field. Displacement of the fault is approximately 1,500 feet, downthrown on the western side. The fault creates a continuous north-south escarpment on the east side of Joes Valley. Several side canyons are cut into this escarpment on the western side of the lease area, all of which drain into Joes Valley. The fault zone itself is not visible along this escarpment, but the fault has been intercepted underground in the Genwal Mine to the north. Where the fault has been intercepted in the Genwal mine workings, a drag fold is present, indicated by a gentle downward folding of the strata along the fault zone, extending for a few hundred feet to the east of the fault.

The nearest known faulting outside of the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes to the southeast of the lease area. 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 40º E. Based on projections from maps of #4 Mine, this graben should pass by the southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area (including lease UTU-024317) and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were

sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk
Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The $\delta 2H$ and $\delta 18O$ compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.
7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years
    b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
    c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.

11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its CO2(g) in the soil zone where the partial pressure of CO2 greatly exceeds atmospheric levels. This CO2 combines with water to form carbonic acid according to

$$CO_2(g) + H_2O = H_2CO_3 \quad (1)$$

Carbonic acid dissociates into H+ and HCO3- as

$$H2CO3 = HCO3^- + H+ \quad (2)$$

The H+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H+ + CaMg(CO3)2 = Ca2+ + Mg2+ + 2HCO3^-, \text{ and} \quad (3)$$
(dolomite)

$$H+ + CaCO3 = Ca2+ + HCO3^- \quad (4)$$
(calcite)

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$CaSO_4 \bullet 2H_2O = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$
(gypsum)

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + \text{Na-clay} = 2Na^+ + \text{Ca-clay} \quad (9)$$

$$Mg^{2+} + Na\text{-clay} = 2Na^{+} + Mg\text{-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^{2}+-Mg^{2}+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^{-} type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^{-} type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^{-} type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater

system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in

their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^{+} concentrations range from 14 to 550.6 mg/l and Cl^{-} concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^{+} are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^{+} concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} -HCO_3^{-} type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^{+} and Cl^{-} contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^{+} source.

δ^2H and δ^{18}O

The δ^2H and δ^{18}O composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and $\delta^{18}O$ composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Interwest and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork area spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^3H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^3H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about

1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^{3}H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^{3}H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir downward into the “lower Blackhawk / Star Point aquifer” in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain

Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern

groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute significant groundwater to the discharge from the spring.

  Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – MILL FORK AREA

A. GROUNDWATER

Groundwater within the Mill Fork Area was monitored according to the schedules in established in the Deer Creek MRP. PacifiCorp has conducted baseline and operational monitoring of spring sources in and adjacent to the lease area. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the adjacent Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map); however, many springs share the same mode of occurrence and, in some cases, are related.

The ground water monitoring plan in Appendix C includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights
- Measurable flow based on historical surveys
- Reliable measuring point(s)

There are no surface springs located on the lease UTU-024317. The only springs that are near to the lease UTU-024317 are the North Emery Water Users Special Service District (NEWUSSD) alluvial springs approximately ½ mile to the south. A series of wells and flumes, as well as the output of the springs themselves, has been used to determine if the spring water flow or quality was affected by mining. As of the date of this application, there has been no demonstrated or indicated effects on the springs by mining activity in UTU-024317. The shallow alluvial nature

of these springs makes it highly unlikely that they would be affected by mining and highly likely that they will be significantly affected by the alterations to the Rilda Canyon surface drainage area by the wildfire within the drainage basin. The NEWUSSD spring area and monitoring points are entirely within lease acreages to be retained in leases UTU-06039, UTSL-051221, UTSL-050862, and UTU-2810. These areas will be monitored for at least another 10 years during the reclamation bond period dictated by the Utah Division of Oil, Gas, and Mining before relinquishment applications are made.

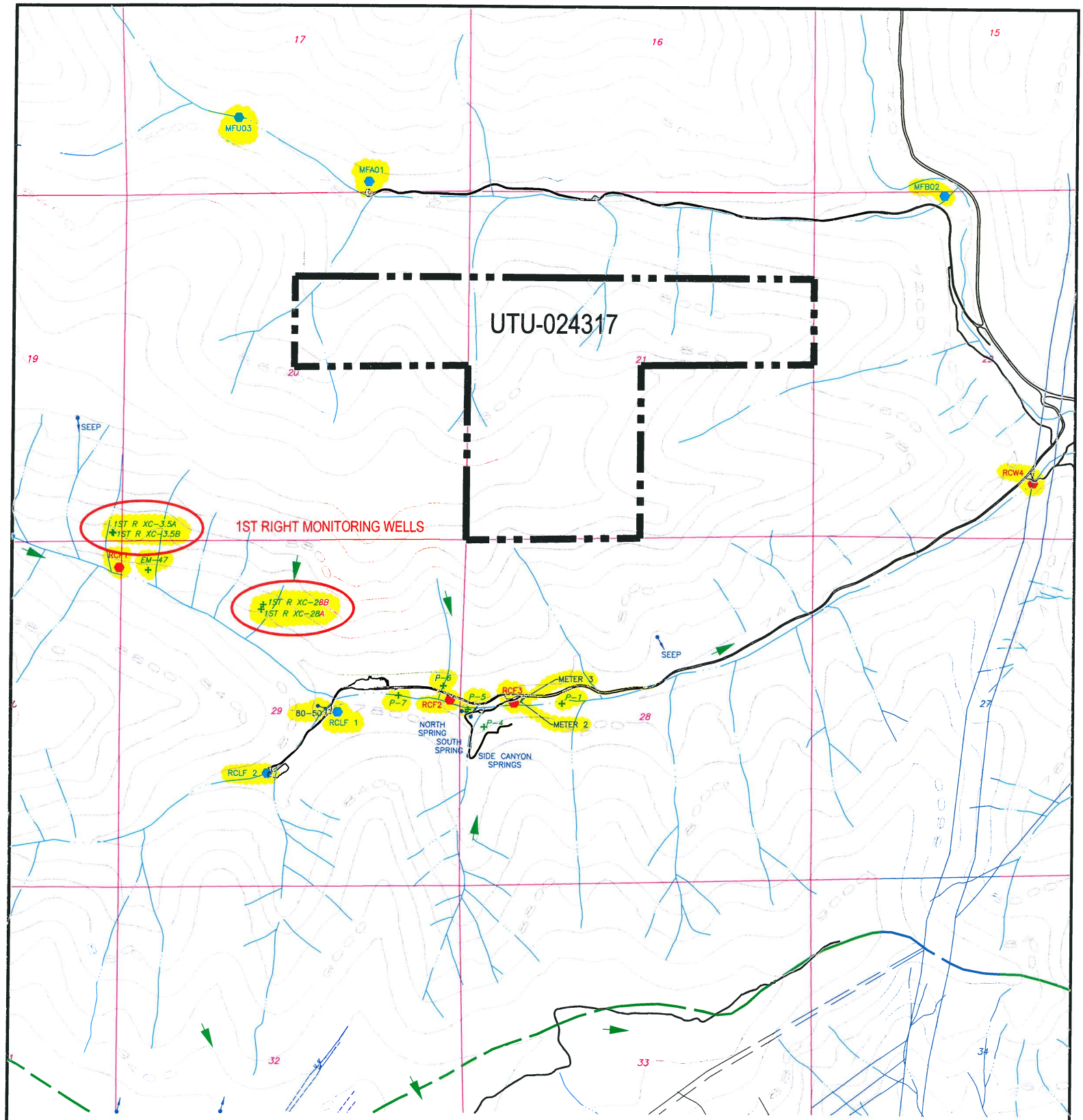
Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTU-024317 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTU-024317 are ephemeral. The majority of the surface flow from the lease block drains to the north into Mill Fork and south into Rilda Canyons and un-named drainages which report to Huntington Creek. As detailed in Appendices A and B, the effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.

Water quality and flow charts are presented for nearby surface measuring points MFA01, MFB02, and MFU03 in Mill Fork Canyon and RCF3 in Rilda Canyon.



CAD FILE NAME/DISK#: UTU-024317

LEGEND

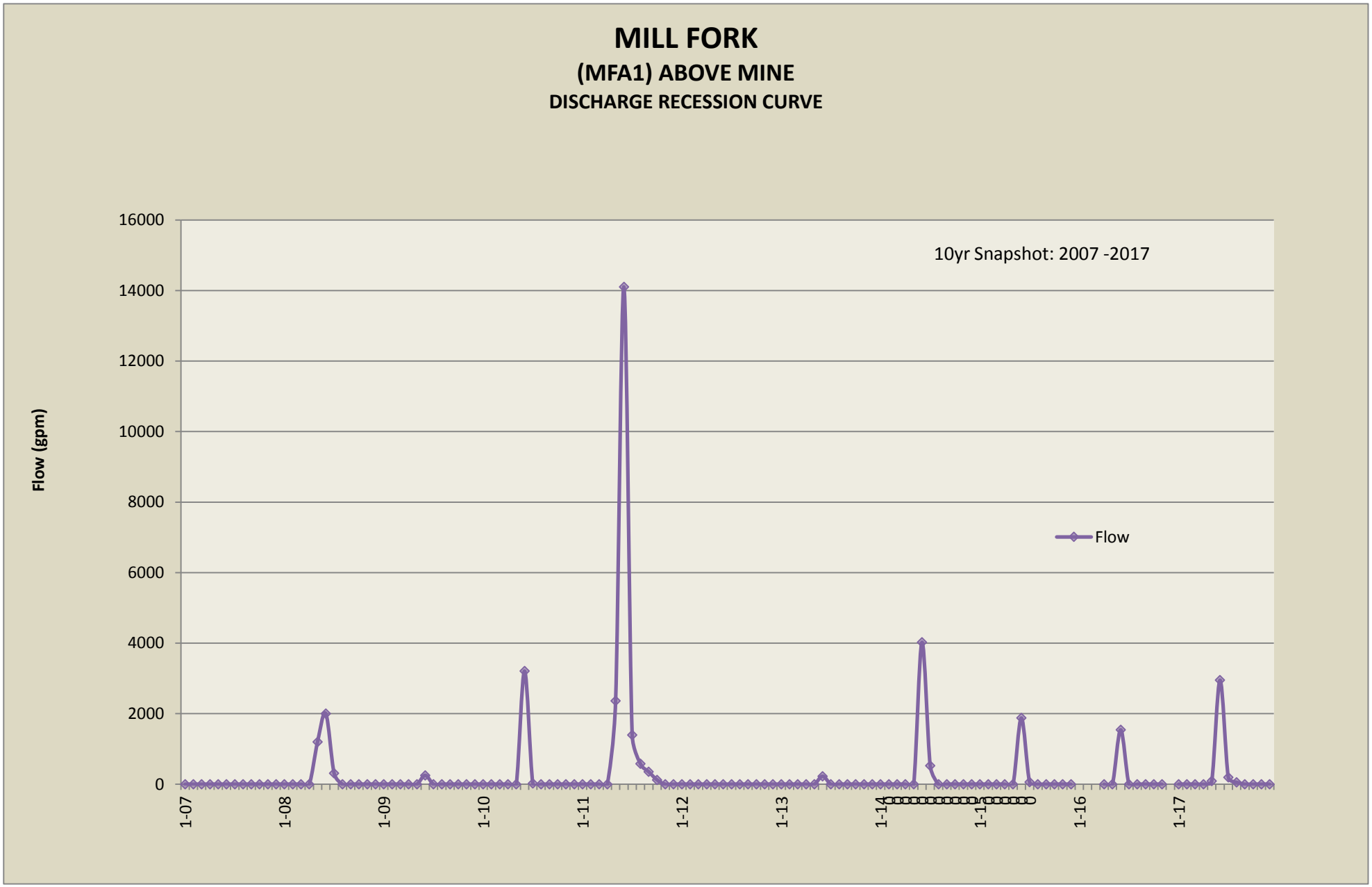
- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-024317
HYDROLOGIC DRAINAGE MAP

DRAWN BY:	K. LARSEN	APPENDIX C	
SCALE:	1" =2000'	DRAWING #:	
DATE:	APRIL 26, 2018	SHEET 1 OF 1	REV. ___

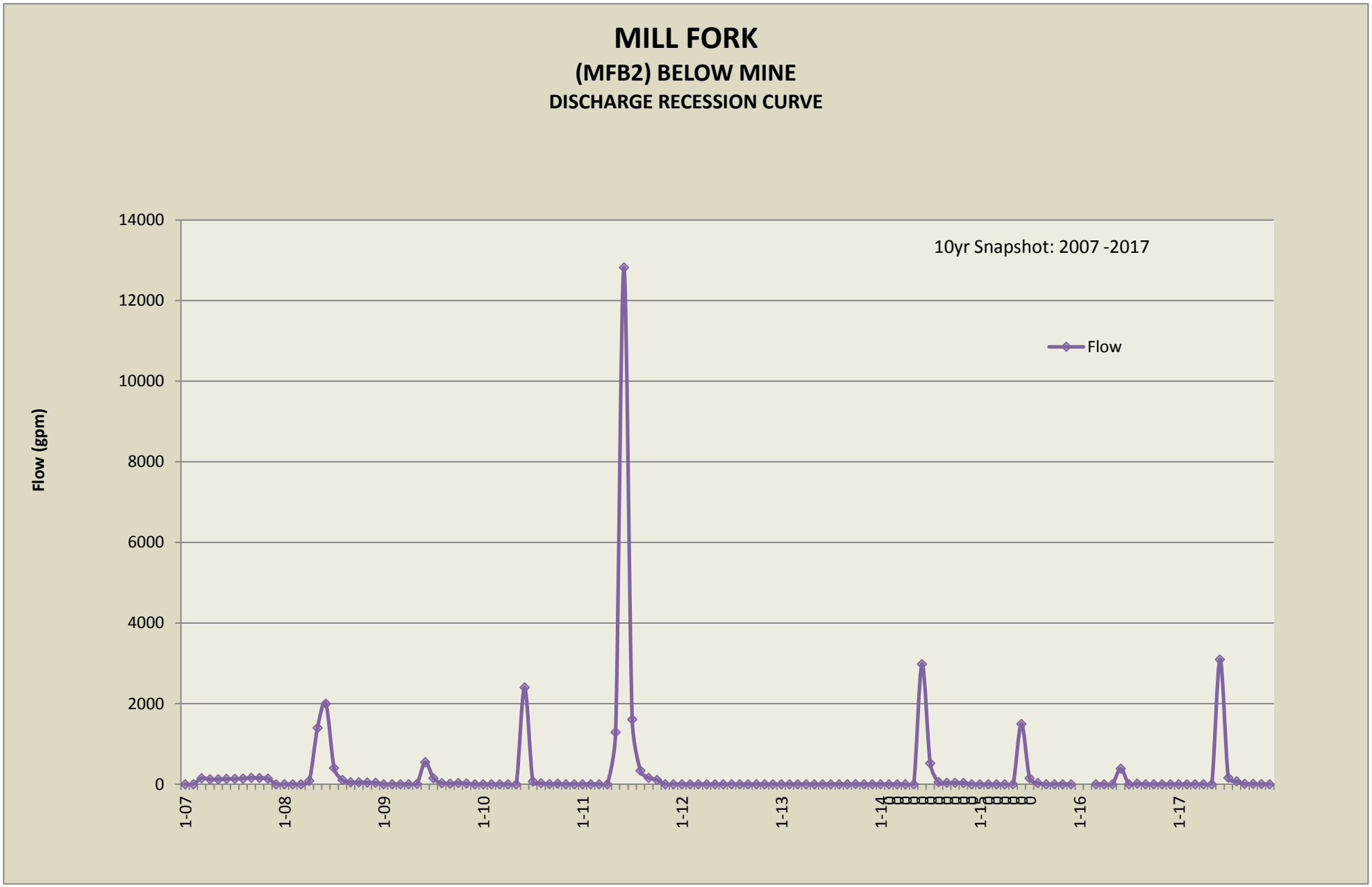

MILL FORK
(MFA1) ABOVE MINE
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow
Flow (gpm)
16000
14000
12000
10000
8000
6000
4000
2000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17

MILL FORK CANYON WATER QUALITY *

MFA1 - ABOVE MINE

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170607	0.0	225.0	56.3	0.0	2.0	449.0	220.0	0.4	0.0	19.3	0.0	0.0	8.5	1.3	16.6	23.0	72.0	258.0
No. of Analysis	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
2017																		
MIN	0	225	56	0	2	449	220	0	0	19	0	0	9	1	17	23	72	258
MAX	0	225	56	0	2	449	220	0	0	19	0	0	9	1	17	23	72	258
MEAN	0.00	225.00	56.31	0.00	2.00	449.00	220.00	0.38	0.00	19.25	0.00	0.00	8.53	1.29	16.58	23.00	72.00	258.00
2016**	0	228	50	0	2	438	198	1	0	18	0	0	9	1	27	30	55	313
2015**	0	214	50	11	2	471	200	2	0	19	0	0	9	1	25	29	244	356
2014**	0	252	57	0	2	483	220	0	0	19	0	0	9	1	20	29	85	285
2013**	0	230	59	0	2	550	230	5	0	20	0	0	9	1	33	44	546	290
2012**	No Flow During 2012																	
2011**																		
MIN	0	206	54.73	0	2	427	231	0	0	18.49	0	0	8.42	0.73	6.17	16	0	253
MAX	0	210	61.86	0	2	468	247	13.41	0	26.71	0	0	8.5	0.99	7.4	32	1426	256
MEAN	0	208	58.295	0	2	447.5	239	6.705	0	22.6	0	0	8.46	0.86	6.785	24	713	254.5
2010**	0	191	54.76	0	2	387	206	3.29	0	16.82	0	0	8.56	0.85	5.89	15	379	226
2009**	0.0	206	61.23	10	2	443	246.00	0	0.00	23	0	0.00	8.61	0.96	6	23	8	264
2008**		162	60.59	36	2	433	233	0.40		19.78			8.52	0.78	4.20	15	26	227
2007**	No Flow During 2007																	
2006**		220	63		3	463	251	0.08		23			8.47	1	4.84	20	12	265
HISTORICAL 1986-2016																		
MIN	0.0	153.0	32.0	0.0	2.0	180.0	198.0	0.0	0.0	13.0	0.0	0.0	8.0	0.7	1.0	12.0	0.0	176
MAX	0.0	400.0	82.0	36.0	24.0	813.0	462.0	13.4	0.5	73.0	0.0	0.0	8.6	3.0	33.3	223.0	1426.0	710
MEAN	0.0	260.8	57.2	7.2	7.8	502.9	281.3	1.3	0.1	33.7	0.0	0.0	8.3	1.5	11.4	54.4	122.7	323.848
COUNT	9	32	33	13	32	33	33	27	11	33	9	9	34	30	33	33	31	33

*** Quality parameters are reported as mg/l unless otherwise noted.**


MILL FORK
(MFB2) BELOW MINE
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow
Flow (gpm)
14000
12000
10000
8000
6000
4000
2000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17

MILL FORK CANYON WATER QUALITY *

MFB2 - BELOW MINE

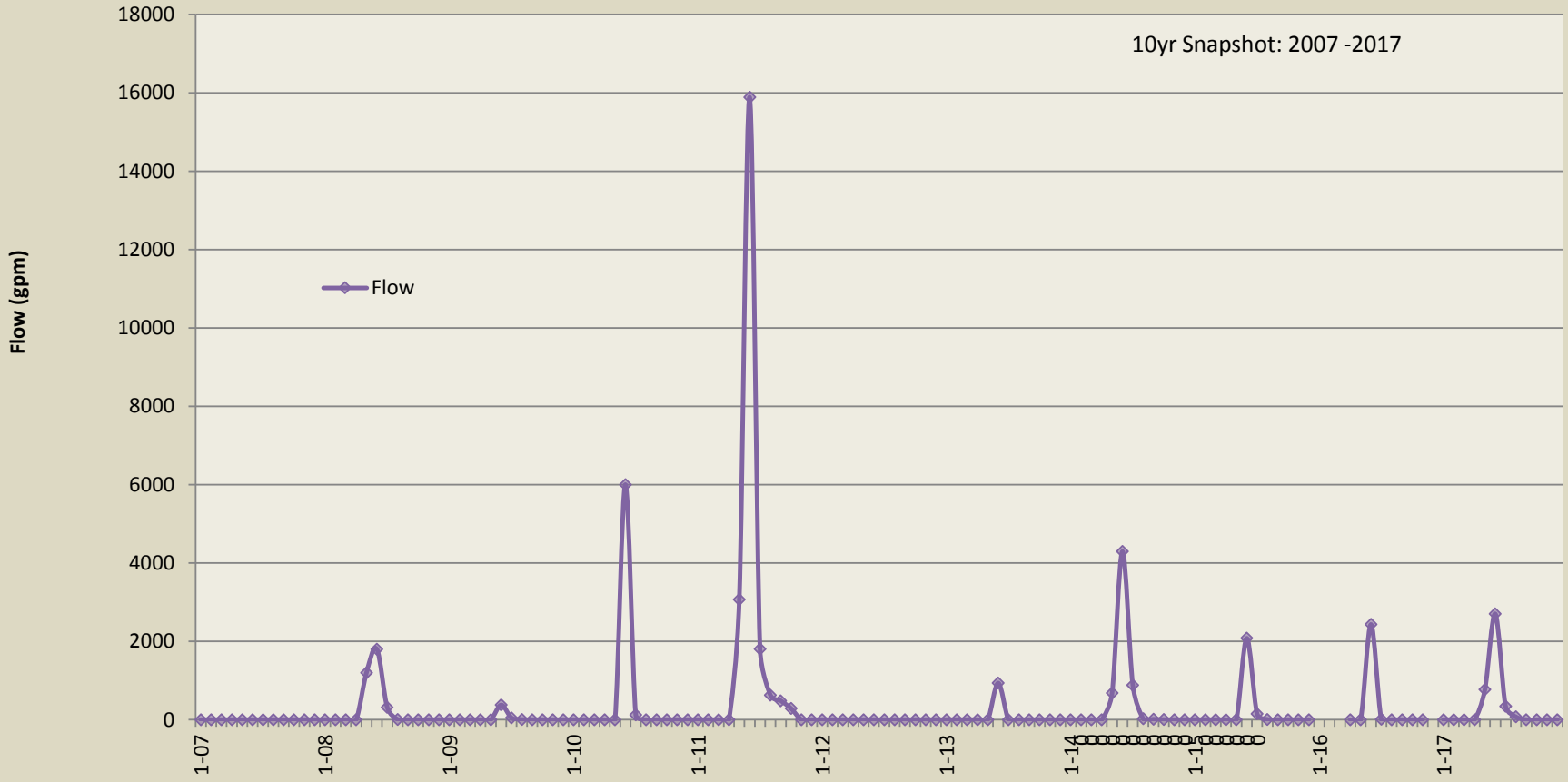
2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170607	0.0	231.0	58.4	0.0	2.0	475.0	234.0	0.5	0.0	21.5	0.0	0.0	8.5	1.4	16.9	28.0	135.0	285.0
20170907	0.0	269.0	45.4	8.0	7.0	682.0	286.0	0.0	0.0	42.0	0.0	0.0	8.6	2.6	16.2	94.0	0.0	392.0
No. of Analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017																		
MIN	0	231	45	0	2	475	234	0	0	22	0	0	9	1	16	28	0	285
MAX	0	269	58	8	7	682	286	1	0	42	0	0	9	3	17	94	135	392
MEAN	0.00	250.00	51.88	4.00	4.50	578.50	260.00	0.26	0.00	31.76	0.00	0.00	8.55	2.01	16.55	61.00	67.50	338.50
2016**	0	243	56	0	6	500	296	1	0	38	0	0	8	1	26	97	21	346
2015**	0	232	49	6	2	493	211	4	0	21	0	0	9	1	23	37	95	656
2014**																		
MIN	0	240	52	0	2	496	240	0	0	22	0	0	8	1	17	36	0	276
MAX	0	278	60	0	7	695	342	0	0	52	0	0	9	2	19	105	117	428
MEAN	0	259	56	0	5	596	291	0	0	37	0	0	9	2	18	71	59	352
2013**	NO FLOW DURING 2013																	
2012**	NO FLOW DURING 2012																	
2011**	0	217	63	0	2	441	239	18	0	20	0	0	8	1	6	19	1872	266
2010**																		
MIN		203	55	0	2	414	219	0	0	20	0	0	9	1	7	22	0	258
MAX		272	64	22	9	732	399	4	0	58	0	0	9	3	15	104	416	432
MEAN		238	60	11	6	573	309	2	0	39	0	0	9	2	11	63	208	345
2009**																		
MIN		267	59	0	6	628	347	0	0	43	0	0	9	2	12	70	0	357
MAX		269	67	0	10	759	408	0	0	63	0	0	9	3	15	117	18	473
MEAN		268	63	0	8	694	378	0	0	53	0	0	9	2	13	94	9	415
2008**																		
MIN		283	67	0	10	810	441			66	0		8	3	16	132	0	504
MAX		293	75	18	11	918	474			70	0		9	3	17	148	0	546
MEAN		288	71	9	11	864	458			68	0		8	3	17	140	0	525
2007**																		
MIN		315	70		11	956	438			64	0.003		8.13	2.32	17.40	124	7	561
MAX		351	82		14	1040	519			77	0.003		8.33	3.60	20.40	177	7	579
MEAN		336	77		12	984	487			71	0.003		8.23	2.94	19.23	154	7	571
2006**																		
MIN		251	66		5	564	296	0		32	0.002		8.41	1.29	7.06	39	17	324
MAX		332	77		12	924	447	0		62	0.002		8.43	2.58	16.98	132	17	497
MEAN		292	71		9	744	372	0		47	0.002		8.42	1.94	12.02	86	17	411
HISTORICAL 1986-2016																		
MIN	0.0	183.0	1.0	0.0	2.0	240.0	211.0	0.0	0.0	14.0	0.0	0.0	7.3	0.7	5.0	16.0	0.0	204
MAX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
MEAN	0.0	296.4	58.6	9.2	8.3	588.7	327.9	1.1	0.9	44.7	0.0	0.0	8.3	2.0	11.8	70.1	83.3	377.5
COUNT	13	50	50	25	51	52	51	31	18	51	16	12	52	50	51	51	36	50

*** Quality parameters are reported as mg/l unless otherwise noted.**

MILL FORK

(MFU03) ABOVE MILL FORK GRABEN

DISCHARGE RECESSION CURVE

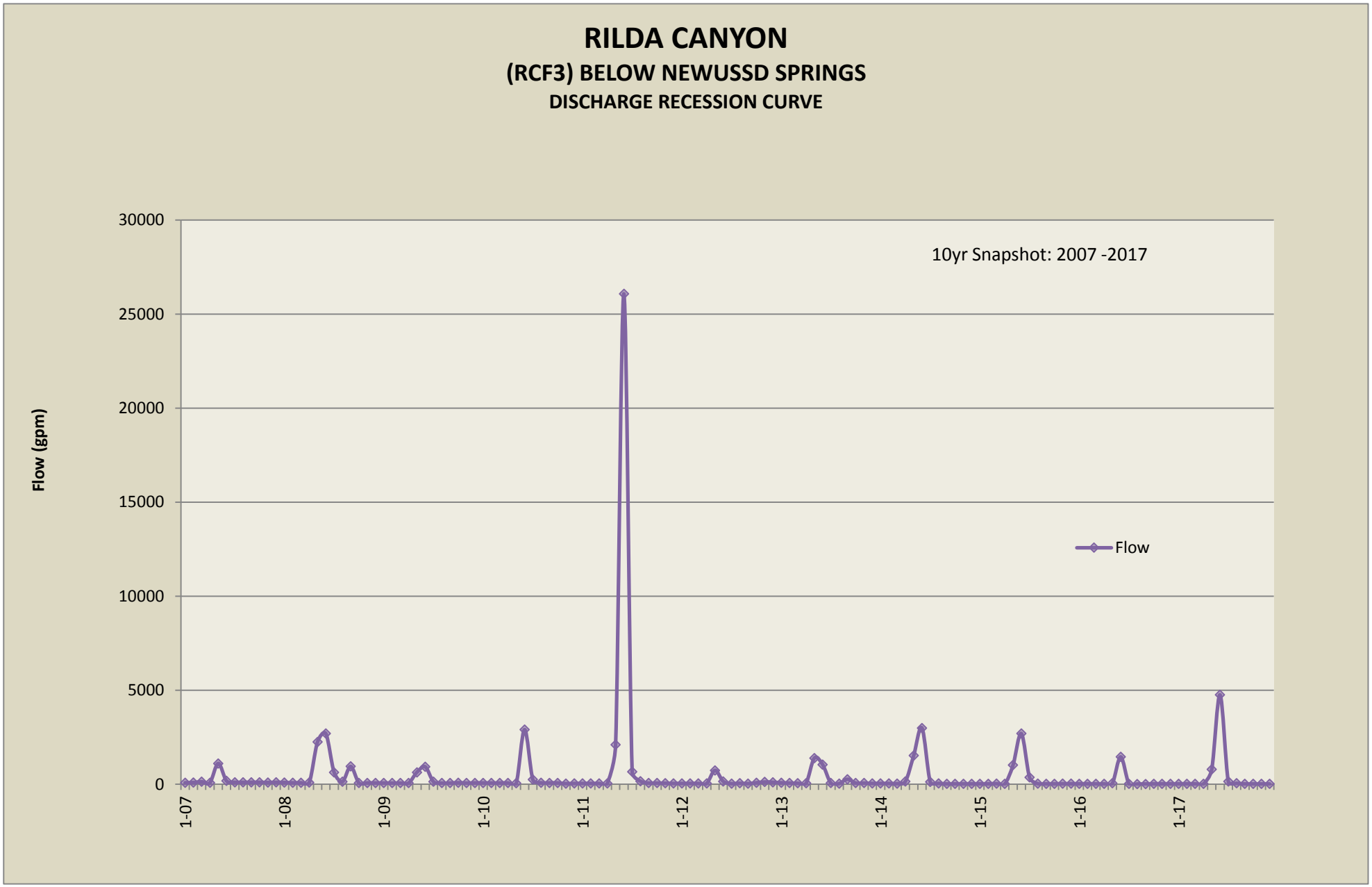


MILL FORK CANYON WATER QUALITY *

MFU3 - ABOVE MILL FORK FAULT

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170607	0.0	221	57.1	0.0	2.0	453	222.00	0.4	0.00	19.19	0.00	0.0	8.6	1.32	16.8	23	74	260
No. of Analysis	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
2017																		
MIN	0	221	57	0	2	453	222	0	0	19	0	0	9	1	17	23	74	260
MAX	0	221	57	0	2	453	222	0	0	19	0	0	9	1	17	23	74	260
MEAN	0.00	221.00	57.11	0.00	2.00	453.00	222.00	0.35	0.00	19.19	0.00	0.00	8.56	1.32	16.80	23.00	74.00	260.00
2016**	0	225	51	0	2	415	188	1	0	15	0	0	8	1	26	30	55	315
2015**	0	215	50	12	2	470	201	2	0	18	0	0	9	1	25	29	211	312
2014**																		
MIN	0	223	49	0	2	484	221	0	0	19	0	0	8	1	20	29	8	261
MAX	0	250	57	8	4	503	237	0	0	28	0	0	9	1	20	41	67	294
MEAN	0	237	53	4	3	494	229	0	0	24	0	0	9	1	20	35	38	278
2013**	0	245	60	0	2	535	232	10	0	20	0	0	9	1	34	44	1096	310
2012**	No Flow During 2012																	
2011**																		
MIN	0	207	63	0	5	427	235	4	0	19	0	0	8	1	6	16	1804	258
MAX	0	219	63	0	5	482	259	4	0	27	0	0	8	1	8	32	1804	259
MEAN	0	213	61	0	4	455	247	2	0	23	0	0	8	1	7	24	902	259
2010**	0	191	54.75	0	2	393	206.00	4	0.00	16.90	0	0.00	8.53	0.86	6	15	409	221
2009**	0	209	62.60	9	2	453	251.00	0	0.00	23.11	0	0.00	8.49	0.98	6	23	0	261
2008**	0.0	162	60.72	37	2	428	233	0.37	0	19.69	0.01	0	8.50	0.78	4.11	15	53	234
2007**	No Flow During 2007																	
2006**		221	61.80		3	468	246	0.08		22.30			8.33	1	4.72	20	9	275
HISTORICAL 1986-2016																		
MIN	0.0	162.0	49.0	0.0	2.0	393.0	188.0	0.0	0.0	14.5	0.0	0.0	8.2	0.7	4.1	15.0	0.0	221
MAX	0.0	251.0	64.2	37.0	5.0	535.0	259.0	9.8	0.0	27.9	0.0	0.0	8.6	1.4	34.3	44.0	1804.0	315
MEAN	0.0	216.2	57.7	7.8	2.5	455.7	229.6	1.5	0.0	20.8	0.0	0.0	8.4	0.9	12.4	25.4	313.5	267.571
COUNT	10	14	14	12	14	14	14	14	10	14	11	10	14.00	14	14	14	12	14

*** Quality parameters are reported as mg/l unless otherwise noted.**


RILDA CANYON
(RCF3) BELOW NEWUSSD SPRINGS
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
30000
25000
20000
15000
10000
5000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - ABOVE NEWUA SPRINGS

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170313	0.0	354.0	99.2	0.0	32.0	1013.0	8.1	493.0	0.2	0.1	59.6	0.0	0.0	8.1	4.2	28.5	177.0	0.0	611.0
20170608	0.0	222.0	60.7	0.0	2.0	449.0	10.2	239.0	0.5	0.0	21.2	0.0	0.0	8.6	1.0	5.4	15.0	165.0	252.0
20170907	6.0	320.0	82.0	0.0	15.0	885.0	10.4	407.0	0.1	0.0	49.1	0.0	0.0	8.6	3.1	20.9	137.0	0.0	514.0
20171205	0.0	331.0	90.7	0.0	12.0	901.0	13.1	443.0	0.1	0.0	52.6	0.0	0.0	8.0	3.4	21.6	143.0	8.0	575.0
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2017																			
MIN	0	222	61	0	2	449	8	239	0	0	21	0	0	8	1	5	15	0	
MAX	6	354	99	0	32	1013	13	493	1	0	60	0	0	9	4	29	177	165	
MEAN	0.00	306.75	83.14	0.00	15.25	812.00	10.45	395.50	0.23	0.01	45.62	0.01	0.00	8.32	2.91	19.11	118.00	43.25	
2016**																			
MIN	0.0	205.0	55.2	0.0	1.0	381.0	8.7	210.0	0.0	0.0	17.5	0.0	0.0	8.0	0.0	4.4	12.0	0.0	272.0
MAX	6.0	350.0	95.0	0.0	10.0	880.0	9.9	483.0	0.5	0.0	59.6	0.0	0.0	8.1	2.9	23.6	159.0	56.0	589.0
MEAN	1.5	302.8	82.3	0.0	7.8	746.5	9.4	398.5	0.3	0.0	46.8	0.0	0.0	8.1	2.1	18.5	115.0	19.3	493.0
2015**																			
MIN	0	218	52	0	2	419	10	218	0	0	22	0	0	8	1	5	14	0	277
MAX	0	343	87	0	10	895	10	454	3	0	58	0	0	9	3	24	157	221	583
MEAN	0	303	78	0	8	769	10	388	1	0	47	0	0	8	2	19	117	83	506
2014**																			
MIN	0	339	85	0	9	871	0	425	0	0	52	0	0	8	3	25	139	0	550
MAX	6	343	89	0	10	920	0	447	0	0	54	0	0	8	4	55	170	0	586
MEAN	3	341	87	0	10	896	0	436	0	0	53	0	0	8	3	40	155	0	568
2013**																			
MIN	0	205	53	0	1	155	0	221	0	0	20	0	0	8	1	7	17	0	214
MAX	5	339	97	11	10	901	0	486	12	0	59	0	0	9	3	25	154	1092	562
MEAN	3	274	76	3	6	599	0	351	3	0	39	0	0	8	2	16	88	284	386
2012**																			
MIN	0	250	67	0	4	576	8	297	0	0	32	0	0	8	1	12	56	0	334
MAX	30	350	101	0	10	921	8	495	0	0	59	0	0	8	3	26	159	8	556
MEAN	8	312	85	0	8	782	8	413	0	0	48	0	0	8	2	20	113	4	468
2011**																			
MIN	0	212	59.9	0	2.0	423	8.70	228	0.16	0.00	19.14	0.00	0.00	7.95	0.80	4.79	13.0	0.0	258
MAX	5	351	97.0	0	11.0	899	8.70	481	14.79	0.00	58.07	0.03	0.00	8.54	2.82	24.63	152.0	1786.0	573
MEAN	1	287	79.9	0	7.0	702	8.70	373	3.86	0.00	42.22	0.02	0.00	8.19	1.97	16.74	95.0	448.0	436
2010**																			
MIN					2.0	411	6.10	221	0.29		18.45	0.00		7.87	0.81	5.10	13.0	0.0	233
MAX					11.0	922	10.20	510	1.37		62.65	0.04		8.56	3.10	26.36	157.0	100.0	592
MEAN					7.3	765	8.80	419.75	0.65		48.58	0.02		8.14	2.42	19.78	111.3	34.0	488
2009**																			
MIN	0	217	62		2	462	8	251	0		23	0		8	1	7	26	6	288
MAX	15	374	108		10	1005	9	545	1		67	0		8	3	30	183	90	678
MEAN	9	330	91		8	840	8	448	1		53	0		8	3	22	130	31	550
2008**																			
MIN	0	179	61		2	470	9	242	1		22	0		8	1	5	18	8	247
MAX	20	378	115		10	1072	16	577	1		70	0		9	4	29	213	12	742
MEAN	10	322	97		8	911	12	471	1		55	0		8	3	23	147	10	571
2007**																			
MIN		285	77.6		6.0	834	10.09	378	0.20		44.70	0.02		7.54	1.86	15.60	90.0	5.0	438
MAX		400	132.0		12.0	1304	12.48	614	1.17		69.10	0.09		8.04	3.51	30.06	255.0	6.0	746
MEAN		370	111.2		10.2	1128.2	11.26	536.2	0.50		62.75	0.05		7.79	3.14	26.11	196.0	5.5	652.6
2006**																			
MIN		220	62		3.0	487	10.3	252	0.16		23.8	0		7.78	0.98	6.4	25	6	278
MAX		376	112		12.0	1073	12.5	563	0.30		69.0	0		8.18	3.32	26.8	185	18	626
MEAN		328	94		8.8	906	11.7	454	0.25		53.3	0		7.97	2.57	20.9	135	10	517
HISTORICAL 1989-2016																			
MIN	0.0	179.0	50.4	0.0	1.0	155.0	4.4	204.0	0.0	0.0	17.5	0.0	0.0	7.5	0.0	4.4	7.0	0.0	199.0
MAX	38.0	500.0	132.0	30.0	50.0	1304.0	15.5	748.0	14.8	0.4	70.2	0.2	5.0	8.8	5.0	55.0	255.0	1786.0	746.0
MEAN	6.6	344.7	84.5	3.1	8.7	748.0	8.7	403.5	0.7	0.0	45.5	0.0	1.1	8.1	2.3	17.9	107.3	67.5	464.1
COUNT	67	103	103	62	103	104	79	103	101	56	103	75	59	104	100	103	103	79	103

*** Quality parameters are reported as mg/l unless otherwise noted.**

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTU-024317 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production (in 2015) and after sealing and abandonment in 2017. Approximately 99 percent of the vegetation on the lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over all of the areas that were undermined. While PacifiCorp maintains that there were no reported effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion and re-seeding by the U.S. Forest Service will permanently change the vegetation characteristics of the area.

Vegetation of Lease UTU-024317 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type (mid-level vegetation provided by the Manti-LaSal National Forest Price Office) in the relinquishment area is shown below:

Vegetation Types – UTU-024317:

Aspen/Conifer	AS/C
Black Sagebrush	BLSB
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Mountain Mahogany	MM
Pinyon-Juniper	PJ
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires (such as the wildfire of June, 2018 that destroyed more than 99% of the vegetation on this lease), variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any

changes that might be caused by mining activities. None of the land owners, stakeholders, or regulatory agencies in the area have reported vegetation effects that might have been caused by mining. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

~~dominant overstory and a dominant understory species to be consistent with Utah Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

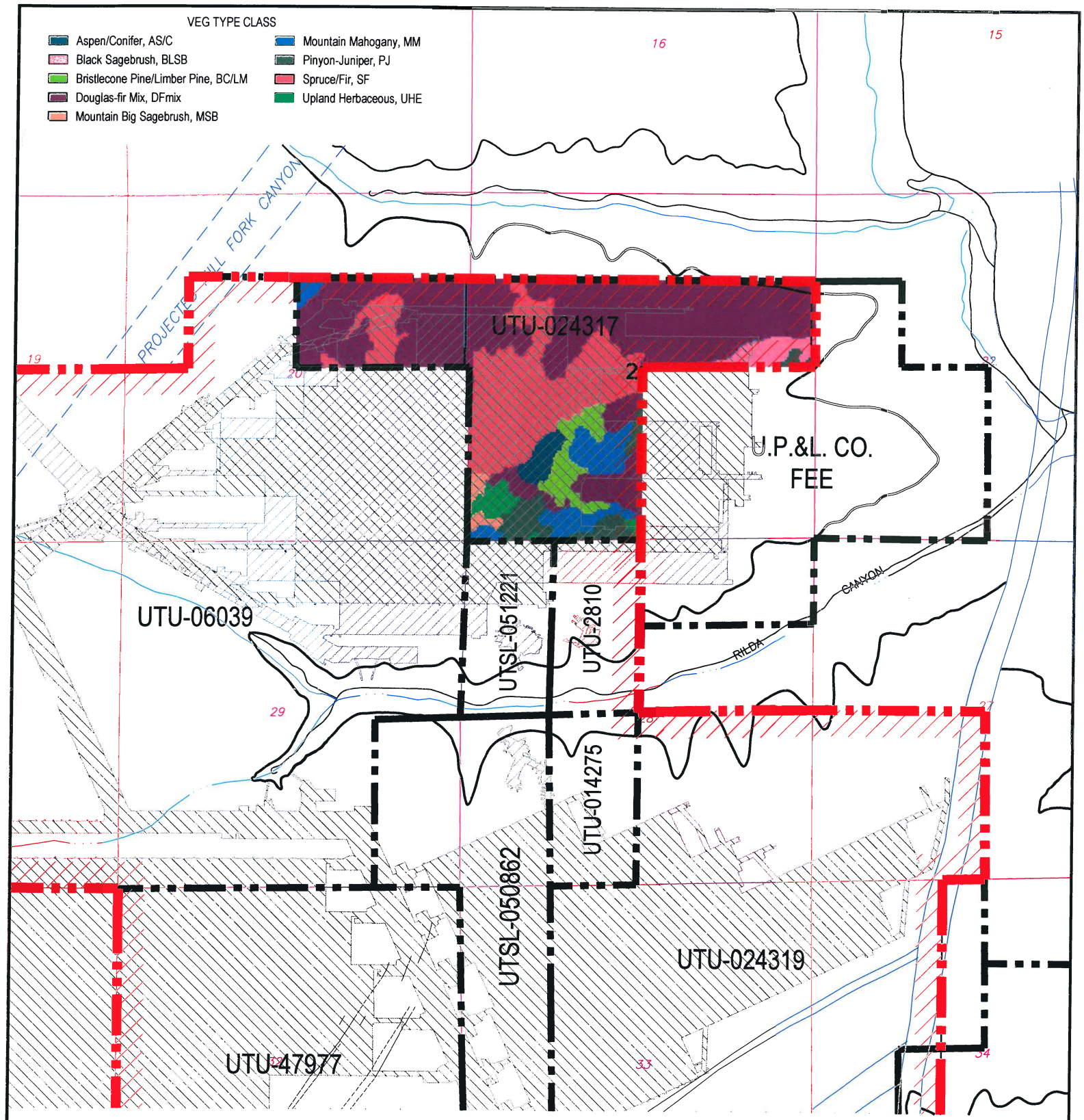
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-024317 area. There were no surface facilities or installations on this lease.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-24317 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-024317

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-024317
VEGETATION BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX D
SCALE:	1" =2000'	DRAWING #:
DATE:	APRIL 26, 2018	SHEET 1 OF 1 REV. ___

Deer Creek Mine
Federal Coal Lease UTU-024317 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in Lease UTU-024317.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-024317 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTU-024317 have taken place in January 2002, December 2002 (Blind Canyon Seam) and December 2004 (Hiawatha Seam). CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-024317 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 5th North, 9th East Submains, 8th – 15th East Sections, 6th North # Submains, 1st Right Mains, 2nd Through 8th Right Sections, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/3/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-024317 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 5th North, 9th East Submains, 8th – 15th East Sections, 6th North # Submains, 1st Right Mains, 2nd Through 8th Right Sections, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-024317 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 5th North, 9th East Submains, 8th – 15th East Sections, 6th North # Submains, 1st Right Mains, 2nd Through 8th Right Sections, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/3/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTU-024317 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 5th North, 9th East Submains, 8th – 15th East Sections, 6th North # Submains, 1st Right Mains, 2nd Through 8th Right Sections, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-024317 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 5th North, 9th East Submains, 8th – 15th East Sections, 6th North # Submains, 1st Right Mains, 2nd Through 8th Right Sections, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) #UTU-024317 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 5th North, 9th East Submains, 8th – 15th East Sections, 6th North # Submains, 1st Right Mains, 2nd Through 8th Right Sections, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 11/05 – 04/15

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-024317
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 5th North, 9th East Submains, 8th – 15th East Sections, 6th North # Submains, 1st Right Mains, 2nd Through 8th Right Sections, and Remainder of Mine Workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (11/98 - 08/04) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	11/98 - 8/04	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	11/98 - 8/04	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	11/98 - 8/04	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	11/98 - 8/04	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	11/98 - 8/04	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	11/98 - 8/04	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	11/98 - 8/04	Naptha	40 - 50%	64742-94-5	All Sections
	11/98 - 8/04	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	11/98 - 8/04	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	11/98 - 8/04	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	11/98 - 8/04	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	11/98 - 8/04	Propane	14%	74-98-6	All Sections
	11/98 - 8/04	Butane	13%	106-97-8	All Sections
	11/98 - 8/04	Toluene	17%	108-88-3	All Sections
	11/98 - 8/04	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	11/98 - 8/04	Napthalene	0.40%	91-20-3	All Sections
	11/98 - 8/04	Acetone	41%	67-64-1	All Sections
	11/98 - 8/04	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	11/98 - 8/04	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	11/98 - 8/04	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	11/98 - 8/04	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	11/98 - 8/04	Mineral Oil	20 - 25%	8042-47-5	All Sections
	11/98 - 8/04	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	11/98 - 8/04	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	11/98 - 8/04	Methanol	<20%	67-56-1	All Sections
	11/98 - 8/04	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	11/98 - 8/04	Heptane	69 - 79%	142-82-5	All Sections
	11/98 - 8/04	Ethyl Ether	11 - 21%	60-29-7	All Sections
	11/98 - 8/04	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	11/98 - 8/04	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	11/98 - 8/04	Heptane	60 - 70%	142-82-5	All Sections
	11/98 - 8/04	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	11/98 - 8/04	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	11/98 - 8/04	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	11/98 - 8/04	None			All Sections
Cat Transmission and Drive Train Oil	11/98 - 8/04	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	11/98 - 8/04	Monoethanolamine	<10%	141-41-3	All Sections
	11/98 - 8/04	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	11/98 - 8/04	Mineral Oil	70 - 95%	Mixture	All Sections
	11/98 - 8/04	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	11/98 - 8/04	Lubricant base oil	87 - 91%	Various	All Sections
	11/98 - 8/04	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	11/98 - 8/04	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	11/98 - 8/04	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	11/98 - 8/04	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	11/98 - 8/04	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	11/98 - 8/04	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	11/98 - 8/04	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	11/98 - 8/04	Trichloroethylene	95 - 99%	79-01-6	All Sections
	11/98 - 8/04	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	11/98 - 8/04	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	11/98 - 8/04	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	11/98 - 8/04	Deionized Water	1 - 3%	7732-18-5	All Sections
	11/98 - 8/04	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-024317
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 5th North, 9th East Submains, 8th – 15th East Sections, 6th North # Submains, 1st Right Mains, 2nd Through 8th Right Sections, and Remainder of Mine Workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (11/98 - 8/04) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	11/98 - 8/04	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	11/98 - 8/04	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	11/98 - 8/04	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	11/98 - 8/04	Calcium sulfate	2 - 10%		All Sections
	11/98 - 8/04	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	11/98 - 8/04	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	11/98 - 8/04	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	11/98 - 8/04	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	11/98 - 8/04	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	11/98 - 8/04	Lead	34%	7439-92-1	All Sections
	11/98 - 8/04	Lead Dioxide	31%	1309-60-0	All Sections
	11/98 - 8/04	Lead Sulfate	<1%	7446-14-2	All Sections
	11/98 - 8/04	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	11/98 - 8/04	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	11/98 - 8/04	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	11/98 - 8/04	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	11/98 - 8/04	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	11/98 - 8/04	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	11/98 - 8/04	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	11/98 - 8/04	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	11/98 - 8/04	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	11/98 - 8/04	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	11/98 - 8/04	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	11/98 - 8/04	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	11/98 - 8/04	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	11/98 - 8/04	Portland Cement		65997-15-1	All Sections
	11/98 - 8/04	Crystalline Silicon Dioxide		13397-24-5	All Sections
	11/98 - 8/04	Calcium Hydroxide		001-305-620	All Sections
	11/98 - 8/04	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	11/98 - 8/04	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	11/98 - 8/04	Polyglycols	60 - 100%	Mixture (2)	15 W
	11/98 - 8/04	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	11/98 - 8/04	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	11/98 - 8/04	Polyester Resin	5 - 15%	Not Reported	All Sections
	11/98 - 8/04	Styrene Monomer	3 - 7%	100-42-5	All Sections
	11/98 - 8/04	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	11/98 - 8/04	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	11/98 - 8/04	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	11/98 - 8/04	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	11/98 - 8/04	Isobutane	2 - 10%	75-28-5	All Sections
	11/98 - 8/04	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	11/98 - 8/04	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	11/98 - 8/04	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	11/98 - 8/04			64742-48-9	All Sections
	11/98 - 8/04			64742-88-7	All Sections
	11/98 - 8/04	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	11/98 - 8/04	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	11/98 - 8/04	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	11/98 - 8/04	Lubricant base oil	>99	Various	All Sections
	11/98 - 8/04	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	11/98 - 8/04	Lubricant base oil	87 - 91%	Various	All Sections
	11/98 - 8/04	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	11/98 - 8/04	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	11/98 - 8/04	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-024319
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

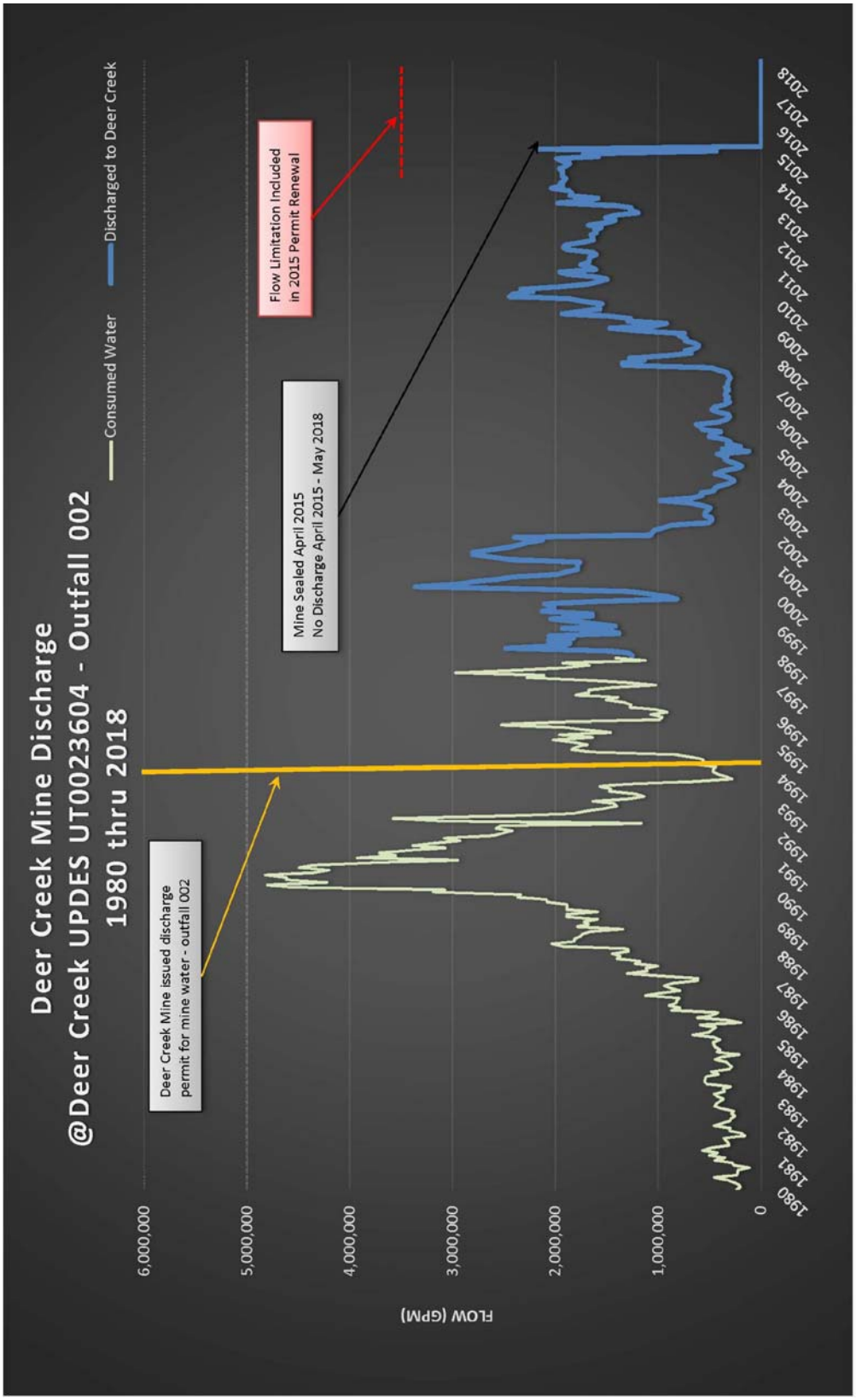
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



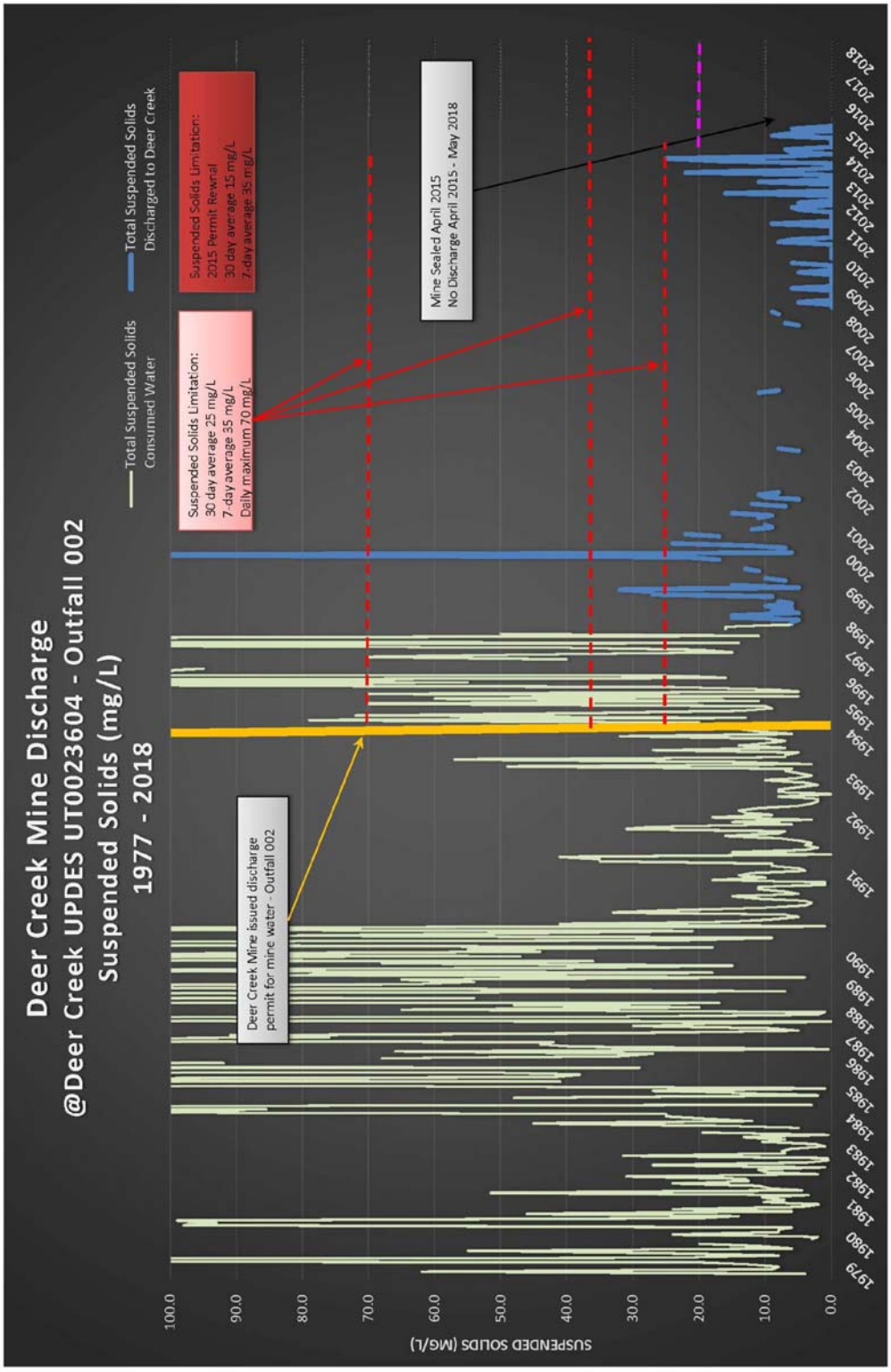
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



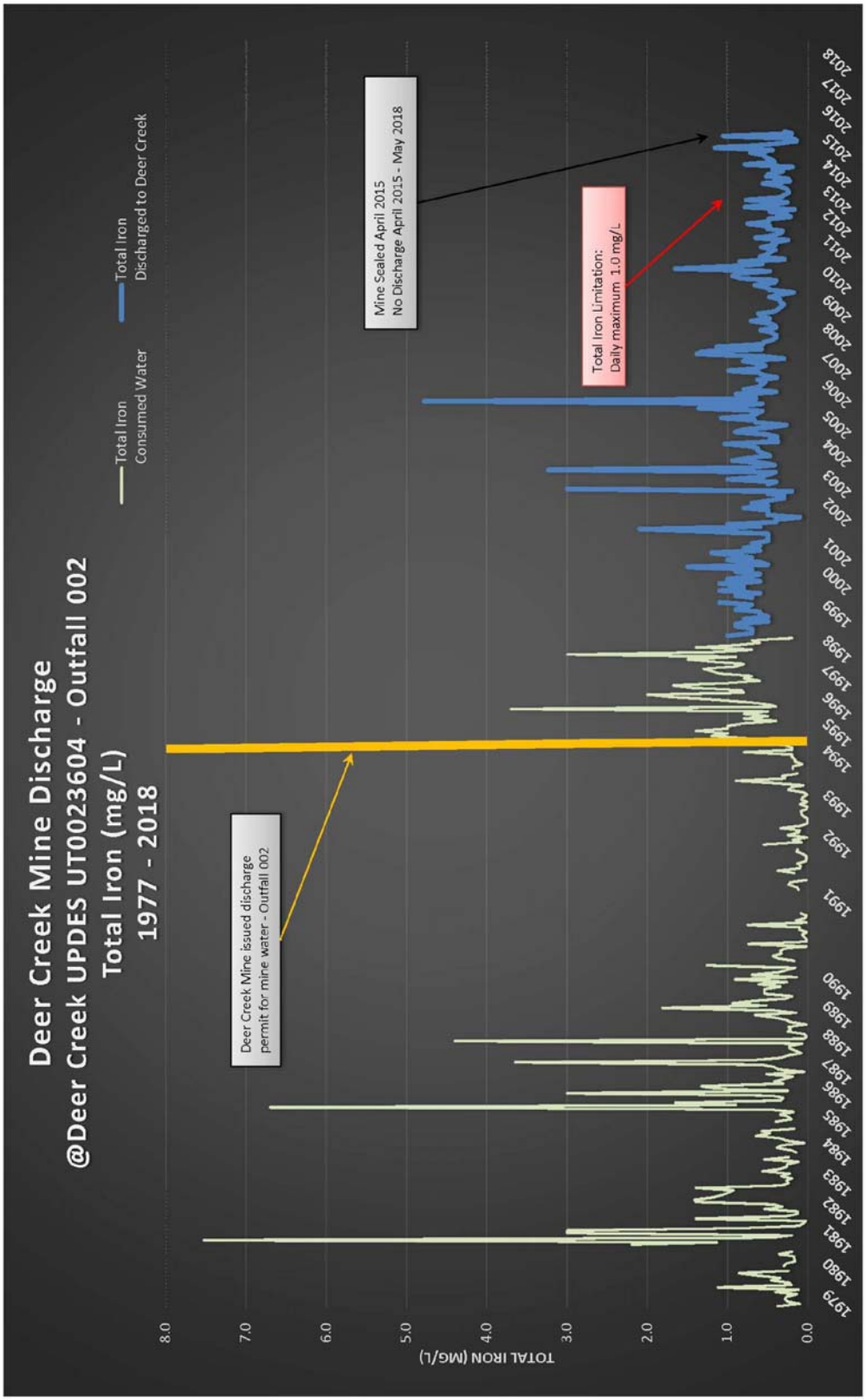
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



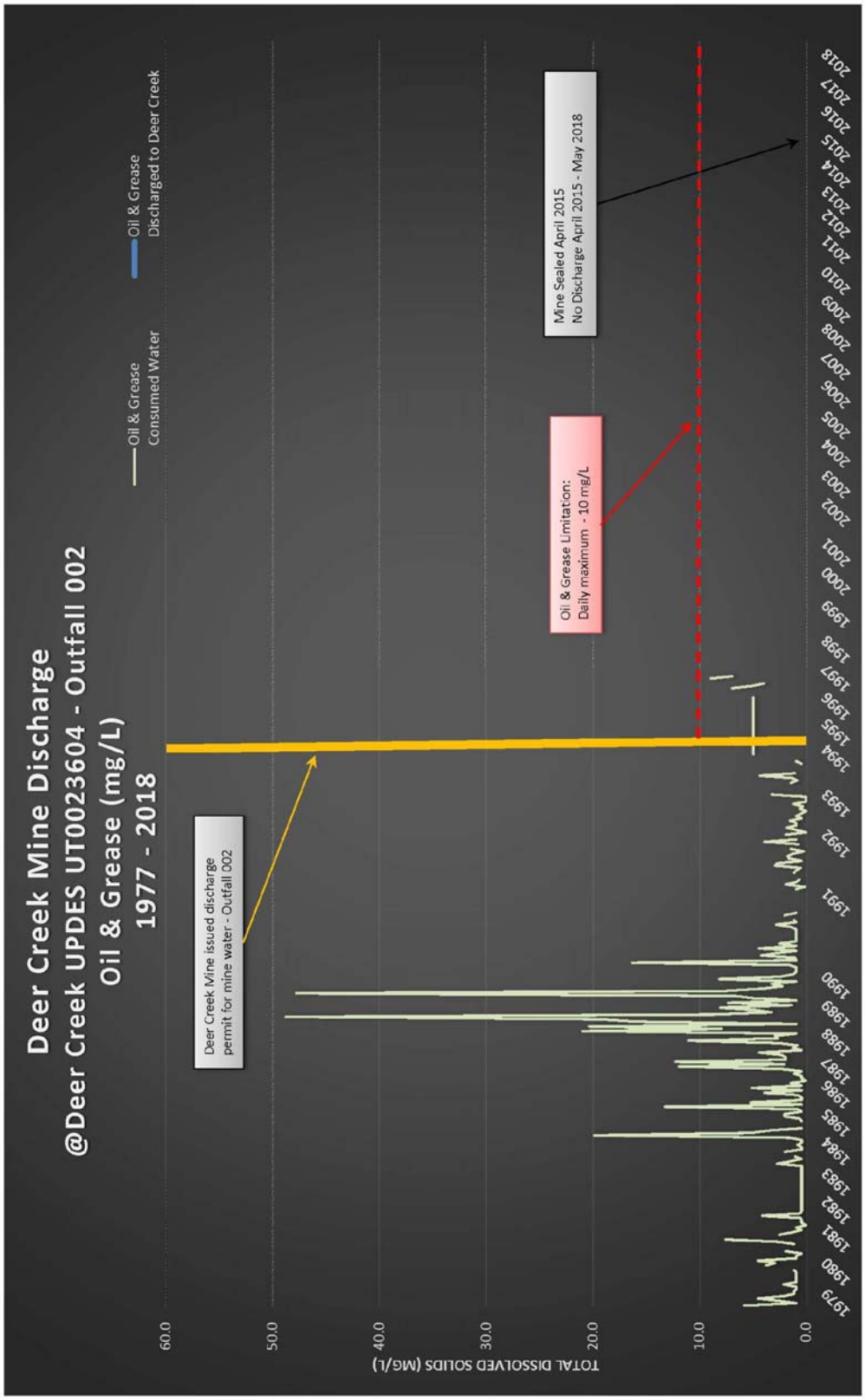
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



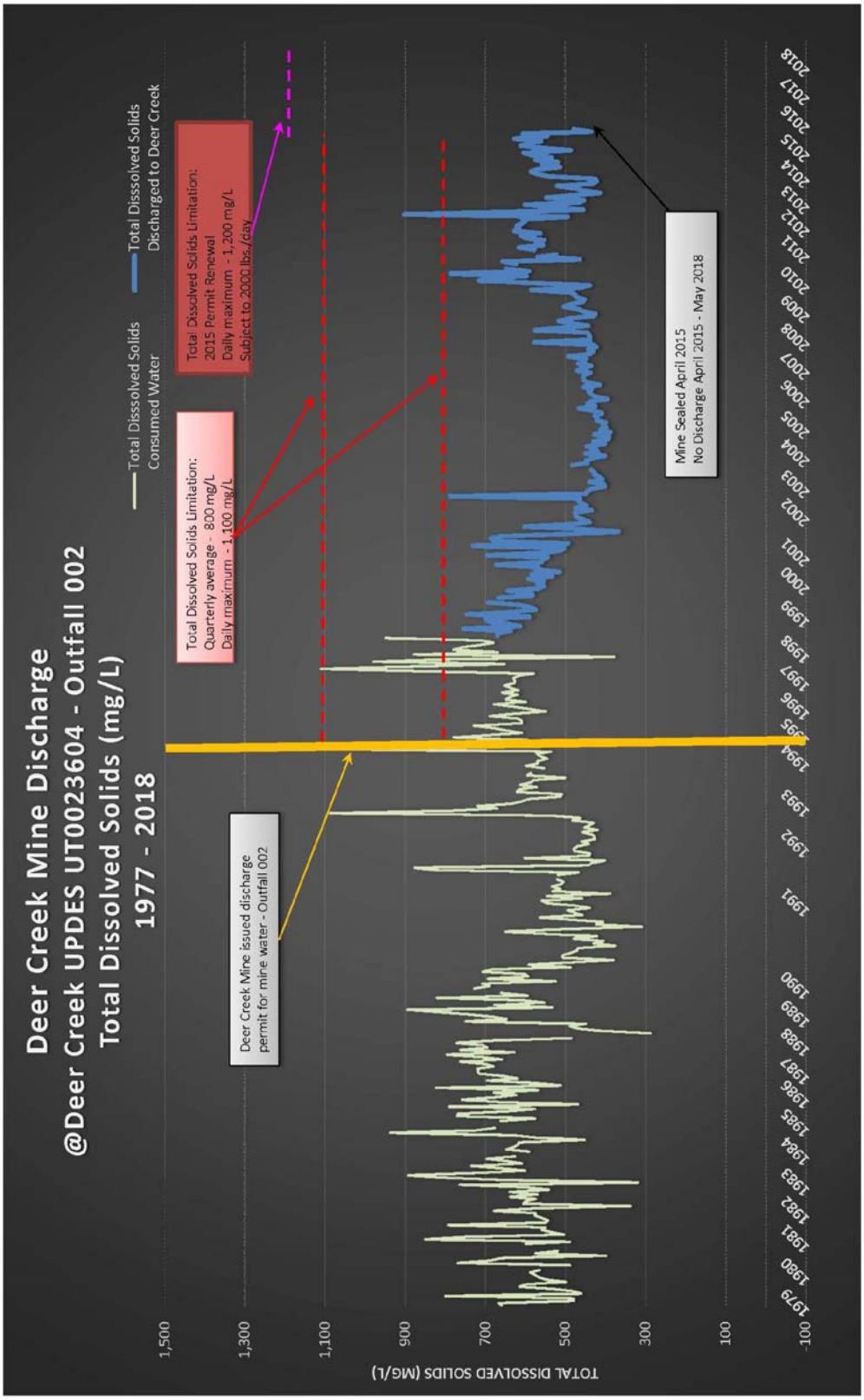
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



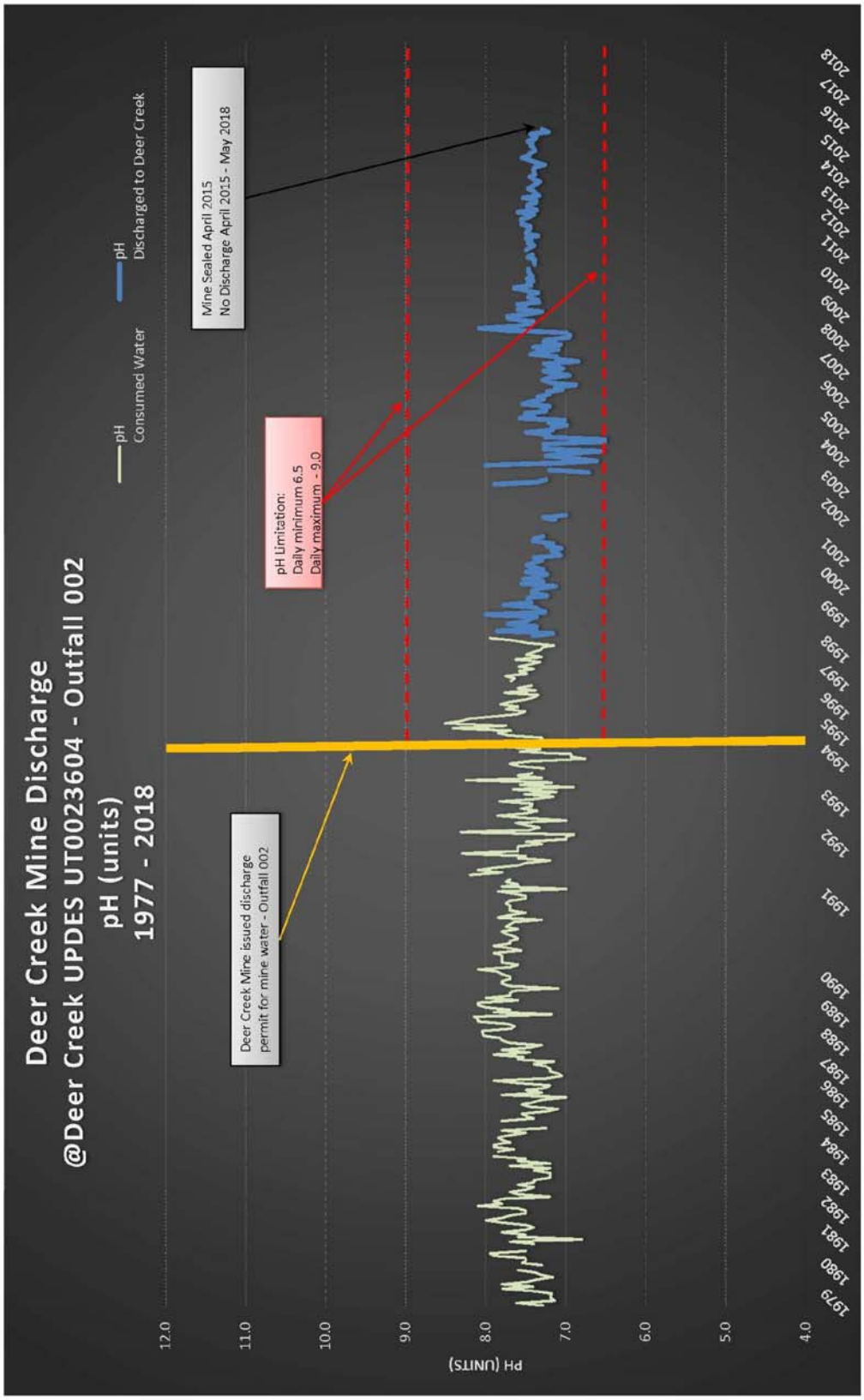
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Partial Relinquishment
Federal Coal Lease
UTSL-051221

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Partial Relinquishment of Federal Coal Lease UTSL-051221, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's partial relinquishment of acreage under federal coal lease UTSL-051221. The total acreage being surrendered is 60.00 acres. The total acreage being retained for reclamation purposes is 20.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government.

Partial Relinquishment

The legal description for the area of partial relinquishment of UTSL-051221 is described below:

Federal Coal Lease UTSL-051221		
Lease Readjustment Effective Date:		11/5/2014 to 11/5/2024
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**80.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 28:	NW¼NW¼, N½SW¼NW¼	60.00
	Total Lease Acreage Being Relinquished:	**60.00**
	Total Lease Acres Remaining:	**20.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec. 28	S½SW¼NW¼	**20.00**
	Total Lease Acreage Being Retained:	**20.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov, 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-051221

LEASE ACTIVITIES

1) Coal Lease Number: UTSL-051221 *(Partial Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 60.00; Entire lease? YES ☐ NO ☒ (See attached map.) Comments: *This is a partial relinquishment. Refer to Exhibit A for the legal descriptions of acreage relinquished and acreage retained. See also Figures 1 and 2 (a map depicting the areas to be relinquished and retained). Lease acreage to be retained: 20.00.*

Original Lease Acreage: 80.00 Relinquished to date: 0.00 acres Remaining: 80.00 acres

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)?
YES ☒ NO ☐ (If "YES", describe: *Surface support facilities in Rilda Canyon. All facilities have been removed and all disturbed lands are being reclaimed during 2018-2019 in accordance with DOGM mine permit C/015/0018. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-051221

11) Date of initial mining: November 2000; last mining: August 2003.

12) Number of coal beds mined: 2 coal seams (Blind Canyon and Hiawatha)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to hydrographs.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-051221

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D?
YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F?
YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
- *As of the date of this submittal. Refer to Appendix F*

24) Was there any surface disturbance conducted independent of mining activities?
YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐
(If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-051221

Exhibit A

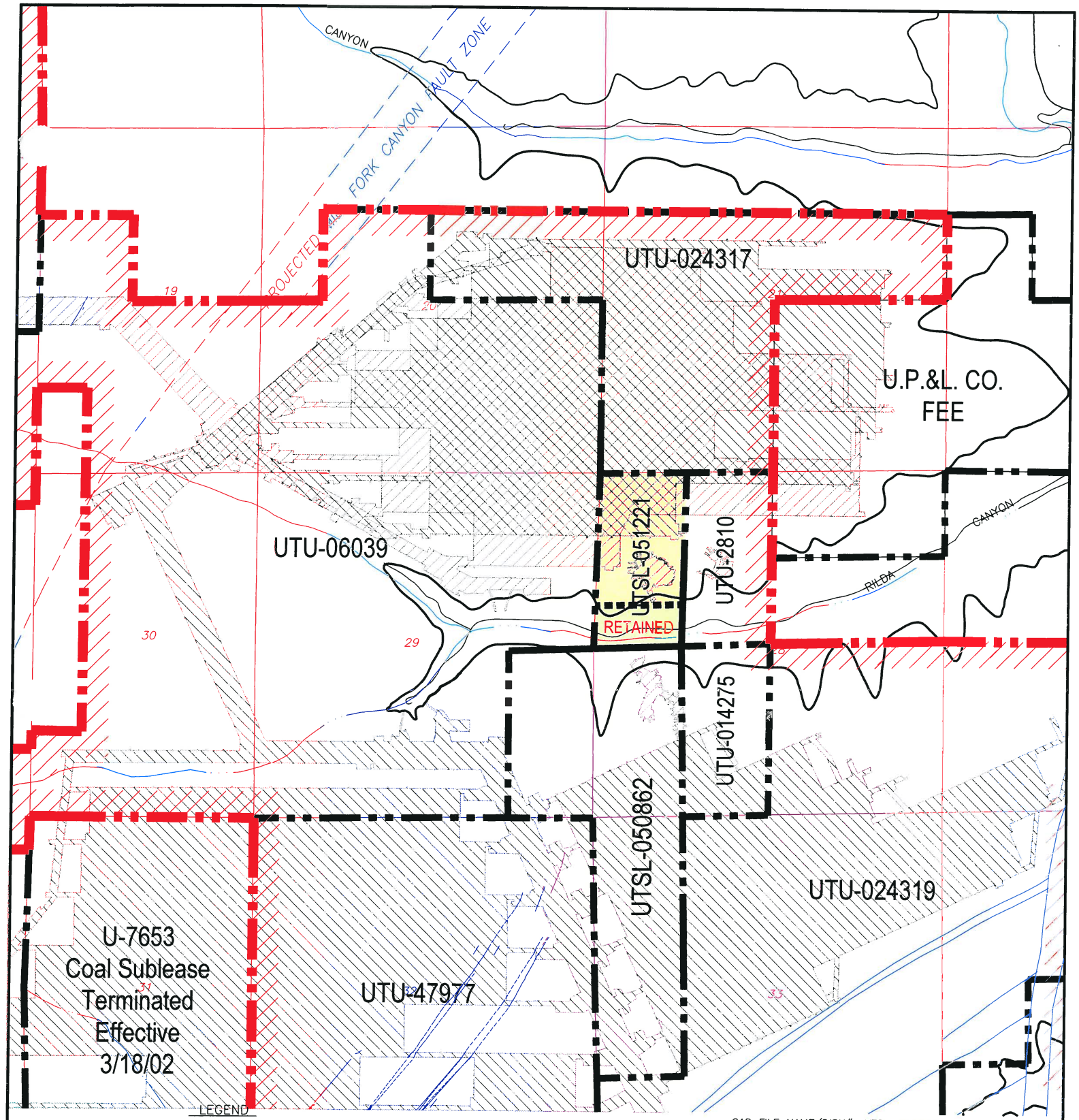
Partial Relinquishment

The legal description for the area of partial relinquishment of UTSL-051221 is described below:

Federal Coal Lease UTSL-051221		
Lease Readjustment Effective Date:		11/5/2014 to 11/5/2024
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**80.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 28:	NW¼NW¼, N½SW¼NW¼	60.00
	Total Lease Acreage Being Relinquished:	**60.00**
	Total Lease Acres Remaining:	**20.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec. 28	S½SW¼NW¼	**20.00**
	Total Lease Acreage Being Retained:	**20.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- SL-051221 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA
- FEDERAL COAL LEASE RETAINMENT AREA

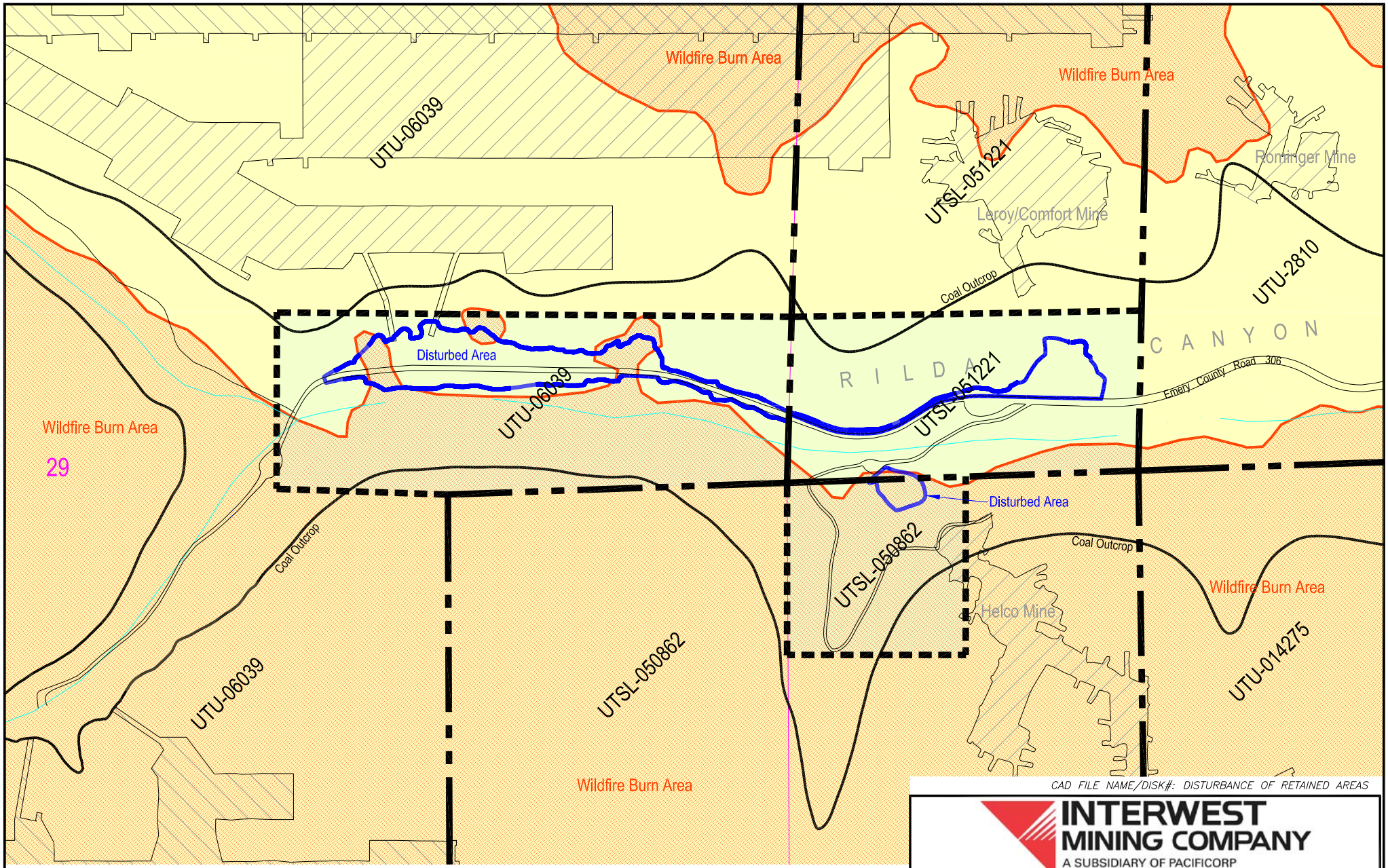
N

CAD FILE NAME/DISK#: UTSL-051221

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-051221

DRAWN BY:	K. LARSEN	FIGURE 1	
SCALE:	1" =2000'	DRAWING #:	
DATE:	APRIL 27, 2018	SHEET 1 OF 1	REV. ___



LEGEND

	DISTURBED AREA TO BE RECLAIMED
	COAL OUTCROP
	HIAWATHA SEAM MINE WORKINGS
	BLIND CANYON SEAM MINE WORKINGS
UTU-2810	FEDERAL LEASE NUMBER
	FEDERAL LEASE LINE
	FEDERAL COAL LEASE ACREAGE RETAINED
	FEDERAL COAL LEASE ACREAGE RELINQUISHED
	WILDFIRE BURN AREA - JUNE 2018

CAD FILE NAME/DISK#: DISTURBANCE OF RETAINED AREAS

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

DEER CREEK MINE/RILDA CANYON
FEDERAL COAL LEASE ACREAGE RETAINED
WITH DISTURBED AREA

DRAWN BY:	K. LARSEN	FIGURE 2	
SCALE:	1" =500'	DRAWING #:	
DATE:	OCTOBER 1, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTU-051221
Checklist and Data Documentation for
Federal Coal Partial Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTSL-051221 Partial Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Hiawatha and Blind Canyon seams. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam took place between 11/2000 and 10/2001. Mining in the Hiawatha seam took place between 10/2001 and 8/2004. The Blind Canyon mine workings and longwall panels directly overlaid the Hiawatha mine workings.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the Trail Mountain Area were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

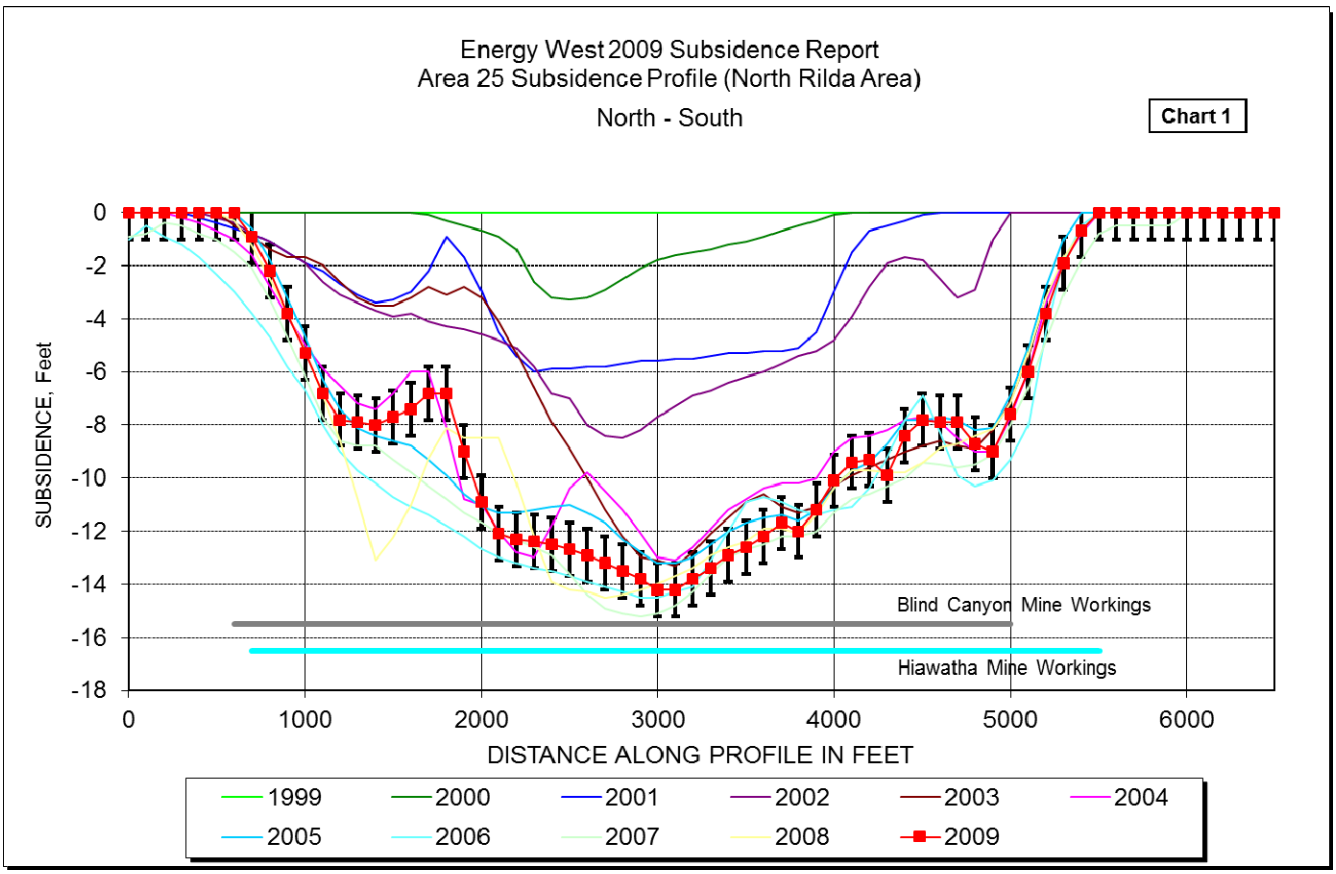
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

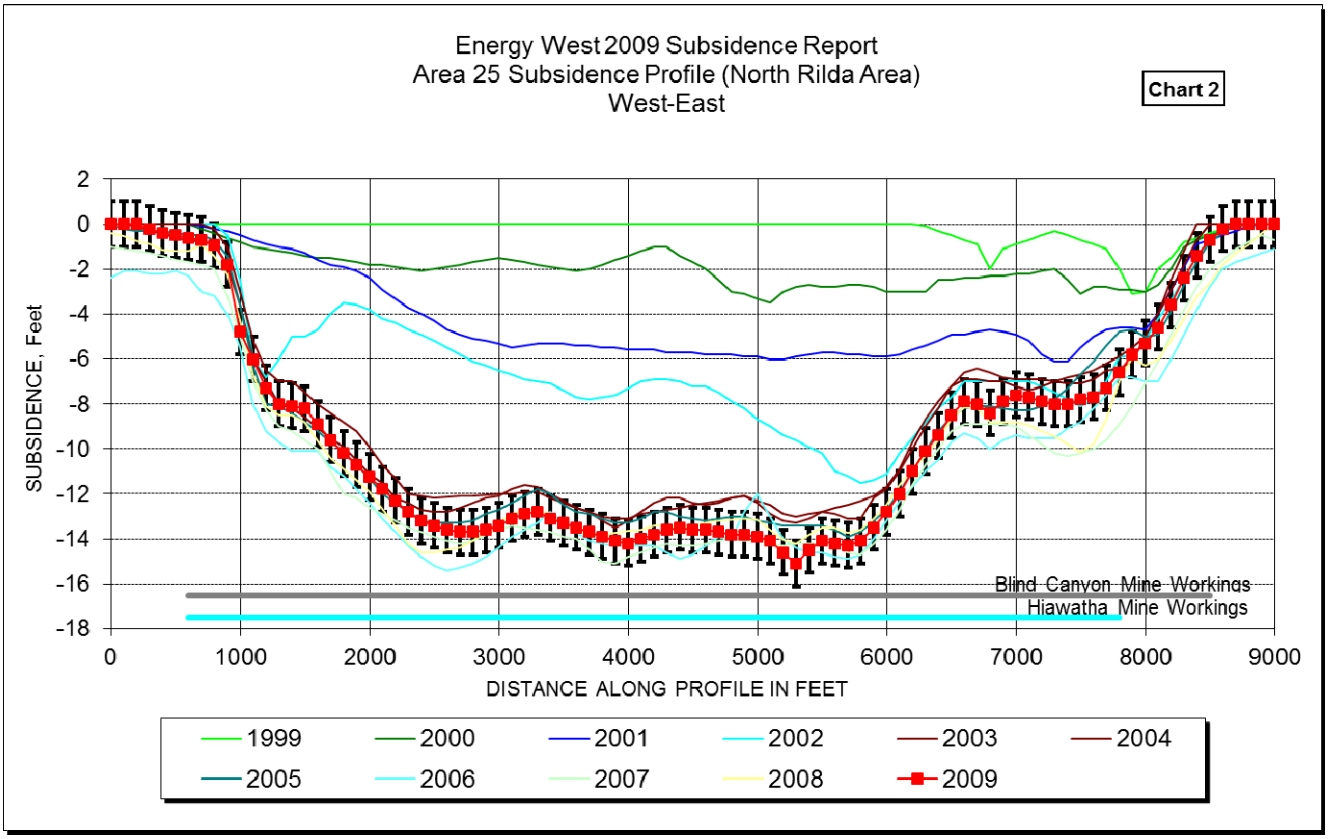
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-051221 Subsidence Data

Subsidence in the lease UTSL-051221 area was monitored from 1999 to 2009. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made in the area between 1999 and 2009. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

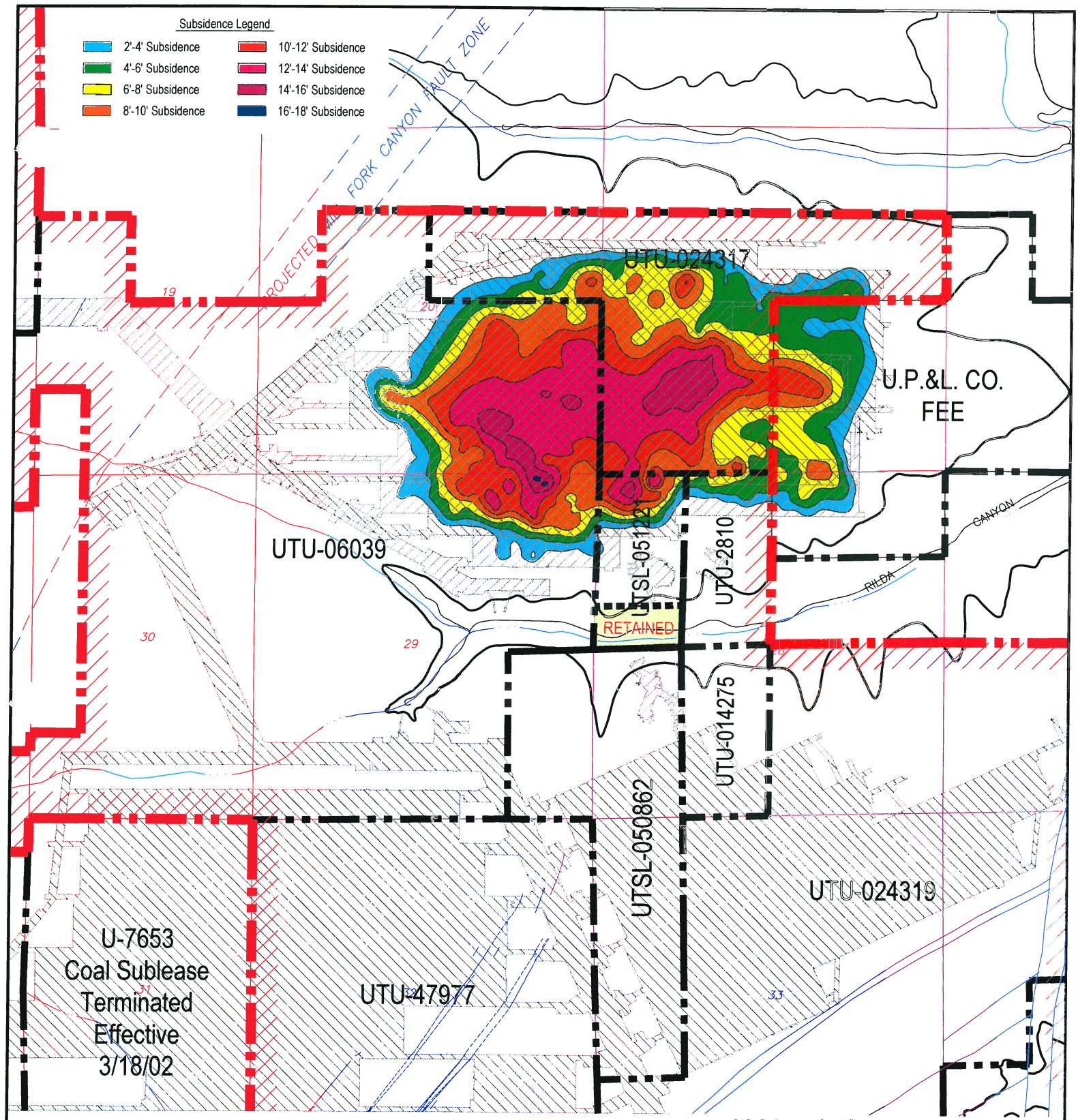
PacifiCorp delineated a series of two profiles covering the main longwall panel districts near Lease UTSL-051221, including the dual-seam mining overlay area, are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 14 feet. Some cliff spalling occurred during undermining. Appropriate measures for protection of property and the public were taken during the subsidence of cliffs that were predicted to spall, including warning signs along the Rilda Canyon road to make the public aware of the potential hazards. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTSL-051221. Conventional surveying methods for subsidence were used from 3/99 to 4/07 to measure subsidence in the vicinity cliff escarpments on the south facing slope of North Rilda Ridge. The prism surveys clearly showed the pre-subsidence status of the cliffs, subsidence behavior during double seam undermining, and post-subsidence re-stabilization of the cliffs.

The proposed relinquishment area of Lease UTSL-051221 is stable and subsidence is substantially complete.



CAD FILE NAME/DISK#: UTSL-051221

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- SL-051221 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
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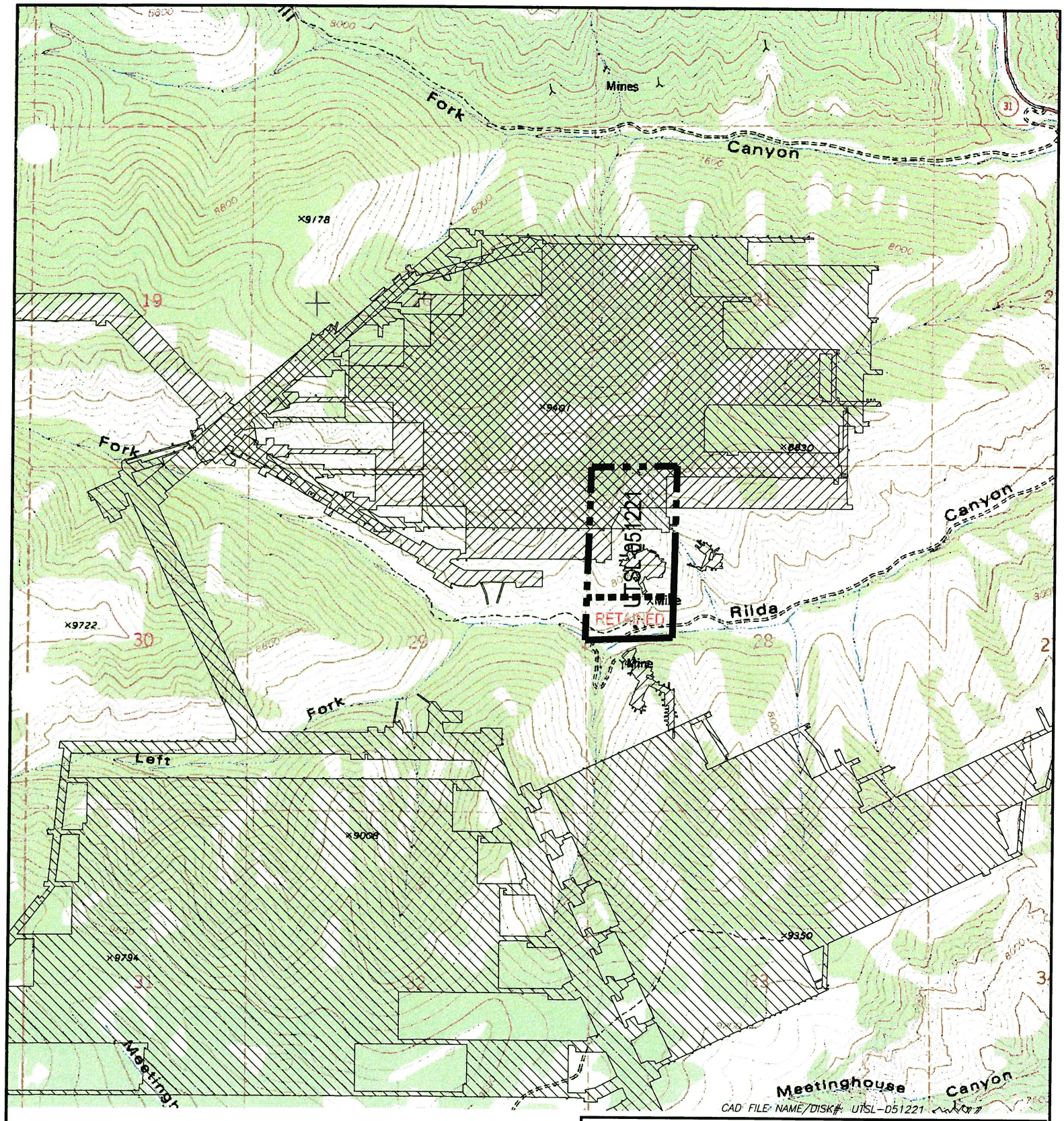
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-051221
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 27, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-051221 Partial Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-051221 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-051221. No restoration and/or mitigation efforts are required for Lease UTU-051221. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-051221 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTSL-051221

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

FEDERAL LEASE ACREAGE RETAINED

N

INTERWEST MINING COMPANY
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EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-051221
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 27, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-051221 Partial Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production (in 2015) and after sealing and abandonment in 2017. Approximately 86 percent of the vegetation on the lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTSL-051221 and surrounding area (North Rilda Ridge).

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP). Lease UTSL-051221 is near to the Mill Fork Lease area and includes within the adjacent ½ mile zone some of the surface sites that are part of the surface hydrology monitoring plan.

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTSL-051221.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The North Rilda Ridge 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the North Rilda Ridge 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. 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 PacifiCorp mining area covers portions of East Mountain.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable

calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, and is exposed in the North Rilda Ridge area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the North Rilda Ridge area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 of this 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the North Rilda Ridge area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the East Mountain area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet. There is no Flagstaff Limestone in the North Rilda Ridge area.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone

are limited to a narrow north-south trending ridge located several miles west of the North Rilda Ridge area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the water bearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 the North Rilda Ridge area.

Folding:

Strata in the North Rilda Ridge area are gently folded in two broad structural features. The Flat Canyon Anticline crosses to the west of the lease 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. The strata within Lease UTSL-05221 are located on the southeastern limb of the Flat Canyon Anticline, which is also the northwestern limb of the Straight Canyon Syncline. Strata dip about 2 - 4 degrees to the southeast.

Faulting:

There is no faulting within the UTSL-05221 lease area. The nearest known faulting to the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes about 1 mile to the northwest of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates

general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk

Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The δ2H and δ18O compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.
7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years

b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of

surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its CO2(g) in the soil zone where the partial pressure of CO2 greatly exceeds atmospheric levels. This CO2 combines with water to form carbonic acid according to

$$CO2(g) + H2O = H2CO3 \quad (1)$$

Carbonic acid dissociates into H+ and HCO3- as

$$H2CO3 = HCO3^- + H+ \quad (2)$$

The H+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H+ + \underset{\text{(dolomite)}}{CaMg(CO3)2} = Ca2+ + Mg2+ + 2HCO3^-, \text{ and} \quad (3)$$

$$H+ + \underset{\text{(calcite)}}{CaCO3} = Ca2+ + HCO3^- \quad (4)$$

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$\underset{\text{(gypsum)}}{CaSO_4 \cdot 2H_2O} = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute

concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-clay} = 2Na^+ + Ca\text{-clay} \quad (9)$$

$$Mg^{2+} + Na\text{-clay} = 2Na^+ + Mg\text{-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs

discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically

dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} -HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent

with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and $\delta^{18}O$

The δ^2H and $\delta^{18}O$ composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and $\delta^{18}O$ composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Interwest and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork area spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^3H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^3H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^3H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^3H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is

minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir

downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less

than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute

significant groundwater to the discharge from the spring.

Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – NORTH RILDA RIDGE AREA

A. GROUNDWATER

Groundwater within the North Rilda Ridge area was monitored according to the schedules in established in the Deer Creek MRP. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining. There are no surface springs within the lease area of UTSL-051221 that is to be relinquished. PacifiCorp has conducted baseline and operational monitoring of spring sources adjacent to the lease area. The nearest springs within ½ mile of the relinquishment boundary are located at the North Emery Water Users Special Service District Rilda Canyon Springs collection system, which taps a series of alluvial springs in the floor of Rilda Canyon.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the adjacent Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.

The ground water monitoring plan in Appendix C includes a selection of springs within ½ mile of the lease based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights

- Measurable flow based on historical surveys
- Reliable measuring point(s)

The following table outlines the rationale for springs selected for long term monitoring. Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency. The spring collection system operated by the North Emery Water Users Special Service District is within ½ mile. Data related to monitoring point RCF3 is included in Appendix C.

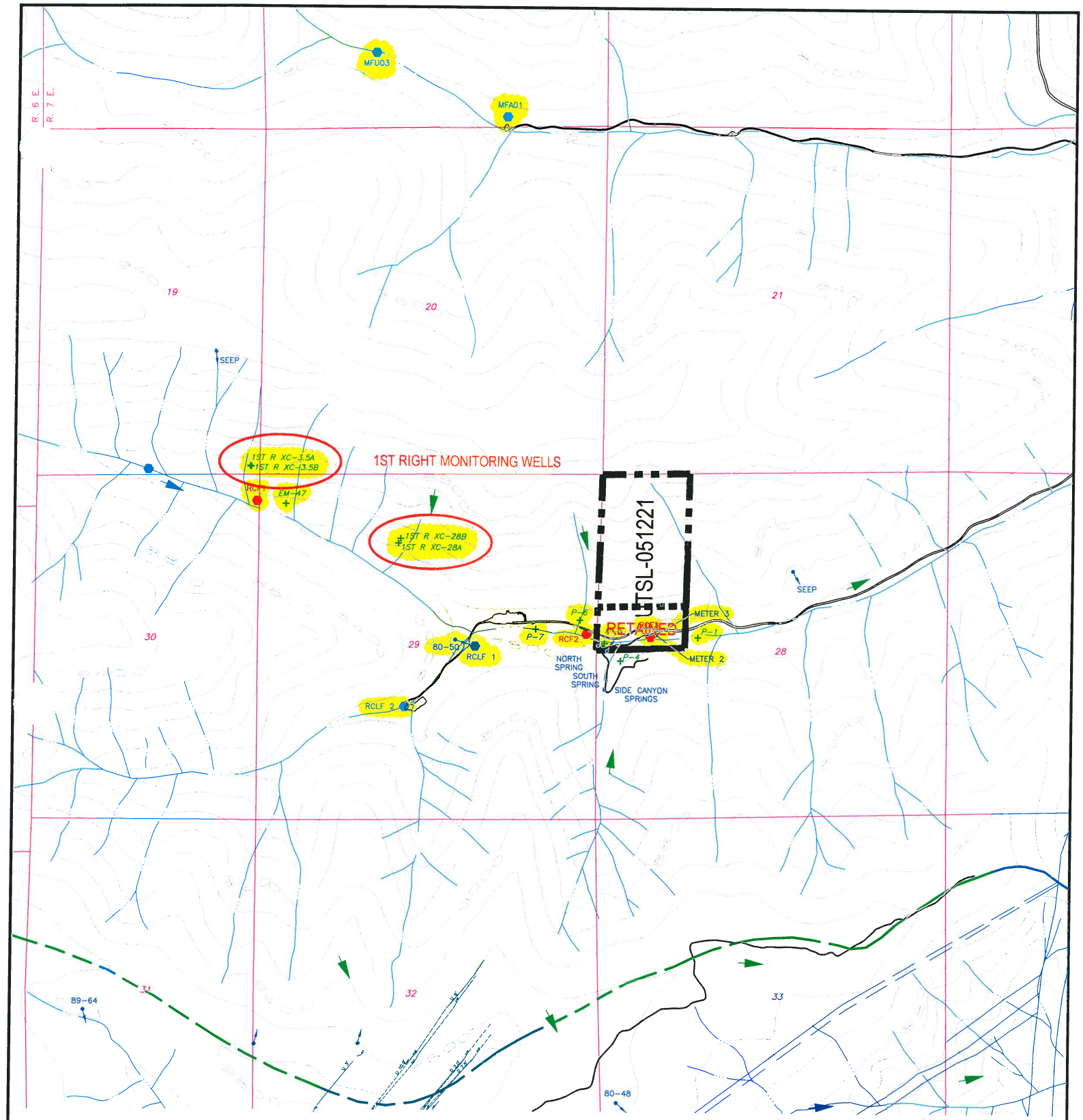
GROUNDWATER MONITORING PLAN - SPRINGS							
Spring	Stratigraphic Position	Projected Subsidence Zone	Regional Location	Water Rights	Historical Measurable Flow	Reliable Measuring Point	Comment
80-50	✓		✓		✓	✓	

Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTSL-051221 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTSL-051221 are ephemeral. The majority of the surface flow from the lease area drains to the south into Rilda Canyon which reports to Huntington Creek. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



CAD FILE NAME/DISK#: UTSL-051221

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-051221
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 27, 2018	SHEET 1 OF 1	REV.

Location: Section 29, Township 16 South, Range 7 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-06039.

Lease Association: Spring 80-50 is located within Federal Coal lease UTU-06039. The lease was originally issued effective May 1, 1953. Both the Hiawatha and Blind Canyon seams have been mined in this lease. Room and pillar mining began in the Blind Canyon Seam in November 1993 with the first longwall retreat in August 1999. Hiawatha seam development began in October 2000 with the first longwall retreat in April 2002. . No mining occurred in vicinity of 80-50.

Subsidence: No subsidence has been detected near 80-50. The 2008 Annual Subsidence Report reported that the subsidence west of the spring has been stable since at least 2005. 80-50 is outside of the subsided area.

For additional data related to subsidence refer to the 2008 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring 80-50. Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected from 2001 and has continued through 2017. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, and 5. The East Mountain weather station is located on the southern tip of East Mountain.
  - 80-50 is located on east facing hillside which is densely populated with spruce trees above the Rilda Canyon road (Emery County Road #306) turn around. Flow from spring 80-50 generally ranges from 0gpm/seep to a maximum of 3.5 gpm.

Geologic Mode of Occurrence for spring 80-50:

- Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.
- Geologic Formation: Blackhawk Formation (refer to Geologic Occurrence sheet).
- Stratigraphic Position: 100' above base.

Justification for removal from monitoring: 80-50 has been monitored by PacifiCorp from 1980 through 1986 and from 1996 through 2018. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in Lease UTU-88554 and adjacent Federal Lease UTU-84285 (west and north of UTU-06039) ceased as of January 7, 2015. Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site 80-50 be removed from the monitoring program.

EAST MOUNTAIN

EAST MOUNTAIN & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **80-50**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
2850’ S.	2230' W.	NW	29	16S	7E	7810

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
Blackhawk	None	None	100' above bottom

Location Comments: Spring located on east facing hillside which is densely populated with spruce trees.

Probable Recharge Area: Areas of higher elevations which are located to the west.

Relationship to Adjacent Springs: Spring not associated with any other springs.

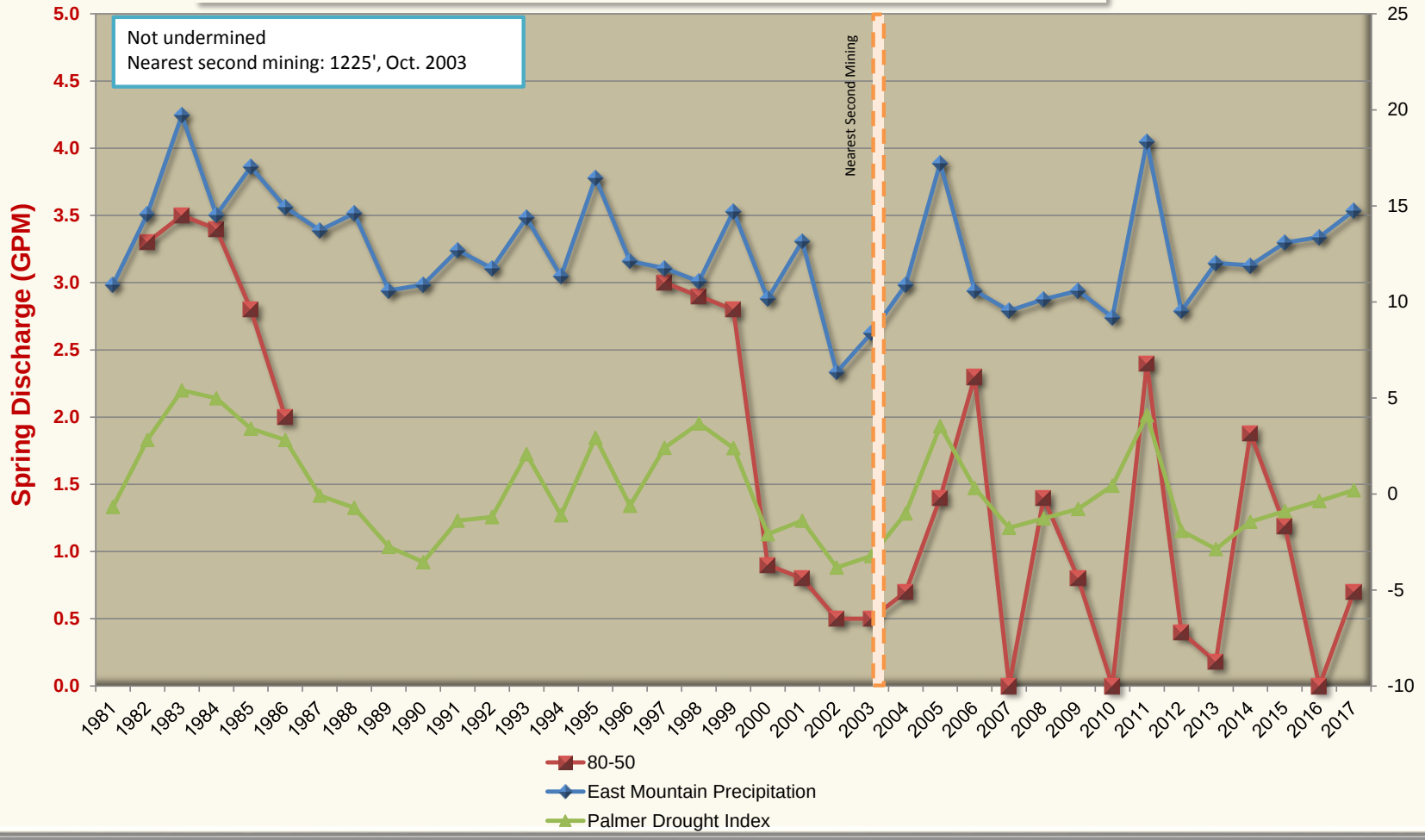
Geologic Occurrence of Spring:

Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.

Spring 80-50, May 22, 2018

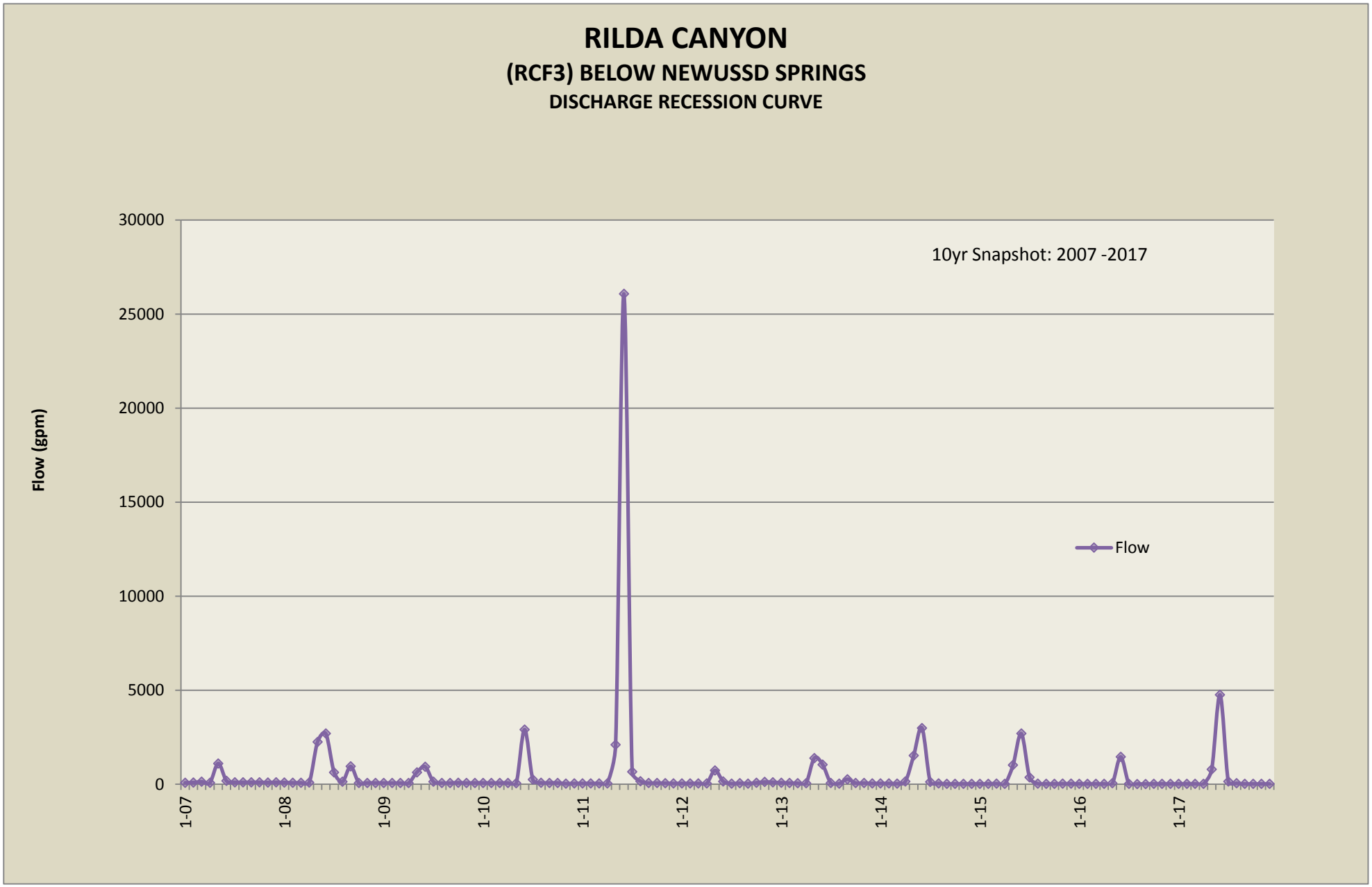
EAST MOUNTAIN SPRINGS - EAST MTN. SPRING: 80-50 Spring vs. PRECIPITATION

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION AND PALMER DROUGHT INDEX



East Mountain Spring: 80-50
Water Quality Data: Operational
Mine Association: Deer Creek Mine - East Mountain
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 1890'
Date of Nearest Mining: May-05

	Pre-Mining Data: 19770101 THROUGH 20031001				Post-Mining Data: 20031030 THROUGH 20171231				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	574	456	504.375	16	421	343	387.23	13	BICARBONATE
CALCIUM	150	44	59.8625	16	70.84	48.5	57.9692	13	CALCIUM
CARBONATE	0				0	0	0	9	CARBONATE
CHLORIDE	28	9	18.025	16	24	8	14.4615	13	CHLORIDE
CONDUCTIVITY	1298	872	1073.06	16	1249	800	991.538	13	CONDUCTIVITY
DISSOLVED OXYGEN	10.2	6.3	8.25	2	0				DISSOLVED OXYGEN
FLOW	3	0.38	1.436875	16	2.36	0.18	1.11538	13	FLOW
HARDNESS	670	452	566.214	14	679	420	525.384	13	HARDNESS
TOTAL IRON	0.8	0.063	0.4315	2	3.06	0	0.37363	11	TOTAL IRON
DISSOLVED IRON	0.4	0.33	0.365	2	0	0	0	9	DISSOLVED IRON
MAGNESIUM	133	27	98.63125	16	132	65.31	92.4038	13	MAGNESIUM
DISSOLVED MANGANESE	0				0.141	0	1.82222	9	DISSOLVED MANGANESE
MANGANESE	0				0.009	0	0.0009	10	MANGANESE
OIL AND GREASE	0				0				OIL AND GREASE
PH	8.14	7.04	7.748125	16	8.23	7.12	7.97692	13	PH
POTASSIUM	12	3	4.3125	16	3.58	2.53	3.03461	13	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	46	18	26.3125	16	25.5	19.18	21.943	13	SODIUM
SULFATE	252	114	184.525	16	256	89	154	13	SULFATE
SUSPENDED SOLIDS	79	1.5	40.25	2	0				SUSPENDED SOLIDS
TEMPERATURE	8.3	6.3	7.51875	16	11.4	7.6	9.15384	13	TEMPERATURE
TOTAL DISSOLVED SOLIDS	810	494	651.625	16	721	470	588.153	13	TOTAL DISSOLVED SOLIDS


RILDA CANYON
(RCF3) BELOW NEWUSSD SPRINGS
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
30000
25000
20000
15000
10000
5000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - BELOW NEWUA SPRINGS

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170313	0.0	354.0	99.2	0.0	32.0	1013.0	8.1	493.0	0.2	0.1	59.6	0.0	0.0	8.1	4.2	28.5	177.0	0.0	611.0
20170608	0.0	222.0	60.7	0.0	2.0	449.0	10.2	239.0	0.5	0.0	21.2	0.0	0.0	8.6	1.0	5.4	15.0	165.0	252.0
20170907	6.0	320.0	82.0	0.0	15.0	885.0	10.4	407.0	0.1	0.0	49.1	0.0	0.0	8.6	3.1	20.9	137.0	0.0	514.0
20171205	0.0	331.0	90.7	0.0	12.0	901.0	13.1	443.0	0.1	0.0	52.6	0.0	0.0	8.0	3.4	21.6	143.0	8.0	575.0
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2017																			
MIN	0	222	61	0	2	449	8	239	0	0	21	0	0	8	1	5	15	0	
MAX	6	354	99	0	32	1013	13	493	1	0	60	0	0	9	4	29	177	165	
MEAN	0.00	306.75	83.14	0.00	15.25	812.00	10.45	395.50	0.23	0.01	45.62	0.01	0.00	8.32	2.91	19.11	118.00	43.25	
2016**																			
MIN	0.0	205.0	55.2	0.0	1.0	381.0	8.7	210.0	0.0	0.0	17.5	0.0	0.0	8.0	0.0	4.4	12.0	0.0	272.0
MAX	6.0	350.0	95.0	0.0	10.0	880.0	9.9	483.0	0.5	0.0	59.6	0.0	0.0	8.1	2.9	23.6	159.0	56.0	589.0
MEAN	1.5	302.8	82.3	0.0	7.8	746.5	9.4	398.5	0.3	0.0	46.8	0.0	0.0	8.1	2.1	18.5	115.0	19.3	493.0
2015**																			
MIN	0	218	52	0	2	419	10	218	0	0	22	0	0	8	1	5	14	0	277
MAX	0	343	87	0	10	895	10	454	3	0	58	0	0	9	3	24	157	221	583
MEAN	0	303	78	0	8	769	10	388	1	0	47	0	0	8	2	19	117	83	506
2014**																			
MIN	0	339	85	0	9	871	0	425	0	0	52	0	0	8	3	25	139	0	550
MAX	6	343	89	0	10	920	0	447	0	0	54	0	0	8	4	55	170	0	586
MEAN	3	341	87	0	10	896	0	436	0	0	53	0	0	8	3	40	155	0	568
2013**																			
MIN	0	205	53	0	1	155	0	221	0	0	20	0	0	8	1	7	17	0	214
MAX	5	339	97	11	10	901	0	486	12	0	59	0	0	9	3	25	154	1092	562
MEAN	3	274	76	3	6	599	0	351	3	0	39	0	0	8	2	16	88	284	386
2012**																			
MIN	0	250	67	0	4	576	8	297	0	0	32	0	0	8	1	12	56	0	334
MAX	30	350	101	0	10	921	8	495	0	0	59	0	0	8	3	26	159	8	556
MEAN	8	312	85	0	8	782	8	413	0	0	48	0	0	8	2	20	113	4	468
2011**																			
MIN	0	212	59.9	0	2.0	423	8.70	228	0.16	0.00	19.14	0.00	0.00	7.95	0.80	4.79	13.0	0.0	258
MAX	5	351	97.0	0	11.0	899	8.70	481	14.79	0.00	58.07	0.03	0.00	8.54	2.82	24.63	152.0	1786.0	573
MEAN	1	287	79.9	0	7.0	702	8.70	373	3.86	0.00	42.22	0.02	0.00	8.19	1.97	16.74	95.0	448.0	436
2010**																			
MIN					2.0	411	6.10	221	0.29		18.45	0.00		7.87	0.81	5.10	13.0	0.0	233
MAX					11.0	922	10.20	510	1.37		62.65	0.04		8.56	3.10	26.36	157.0	100.0	592
MEAN					7.3	765	8.80	419.75	0.65		48.58	0.02		8.14	2.42	19.78	111.3	34.0	488
2009**																			
MIN	0	217	62		2	462	8	251	0		23	0		8	1	7	26	6	288
MAX	15	374	108		10	1005	9	545	1		67	0		8	3	30	183	90	678
MEAN	9	330	91		8	840	8	448	1		53	0		8	3	22	130	31	550
2008**																			
MIN	0	179	61		2	470	9	242	1		22	0		8	1	5	18	8	247
MAX	20	378	115		10	1072	16	577	1		70	0		9	4	29	213	12	742
MEAN	10	322	97		8	911	12	471	1		55	0		8	3	23	147	10	571
2007**																			
MIN		285	77.6		6.0	834	10.09	378	0.20		44.70	0.02		7.54	1.86	15.60	90.0	5.0	438
MAX		400	132.0		12.0	1304	12.48	614	1.17		69.10	0.09		8.04	3.51	30.06	255.0	6.0	746
MEAN		370	111.2		10.2	1128.2	11.26	536.2	0.50		62.75	0.05		7.79	3.14	26.11	196.0	5.5	652.6
2006**																			
MIN		220	62		3.0	487	10.3	252	0.16		23.8	0		7.78	0.98	6.4	25	6	278
MAX		376	112		12.0	1073	12.5	563	0.30		69.0	0		8.18	3.32	26.8	185	18	626
MEAN		328	94		8.8	906	11.7	454	0.25		53.3	0		7.97	2.57	20.9	135	10	517
HISTORICAL 1989-2016																			
MIN	0.0	179.0	50.4	0.0	1.0	155.0	4.4	204.0	0.0	0.0	17.5	0.0	0.0	7.5	0.0	4.4	7.0	0.0	199.0
MAX	38.0	500.0	132.0	30.0	50.0	1304.0	15.5	748.0	14.8	0.4	70.2	0.2	5.0	8.8	5.0	55.0	255.0	1786.0	746.0
MEAN	6.6	344.7	84.5	3.1	8.7	748.0	8.7	403.5	0.7	0.0	45.5	0.0	1.1	8.1	2.3	17.9	107.3	67.5	464.1
COUNT	67	103	103	62	103	104	79	103	101	56	103	75	59	104	100	103	103	79	103

*** Quality parameters are reported as mg/l unless otherwise noted.**
**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTSL-051221 Partial Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 80 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface vegetation characteristics of the area.

Vegetation of Lease UTSL-051221 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTSL-051221:

Mountain Mahogany	MM
Pinyon-Juniper	PJ
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

Stat. of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR
OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTSL-051221 area. There were no surface facilities or installations on this lease.

Deer Creek Mine
Federal Coal Lease UTSL-051221 Partial Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 80 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface vegetation characteristics of the area.

Vegetation of Lease UTSL-051221 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTSL-051221:

Mountain Mahogany	MM
Pinyon-Juniper	PJ
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

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This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

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Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

Stat. of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR
OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

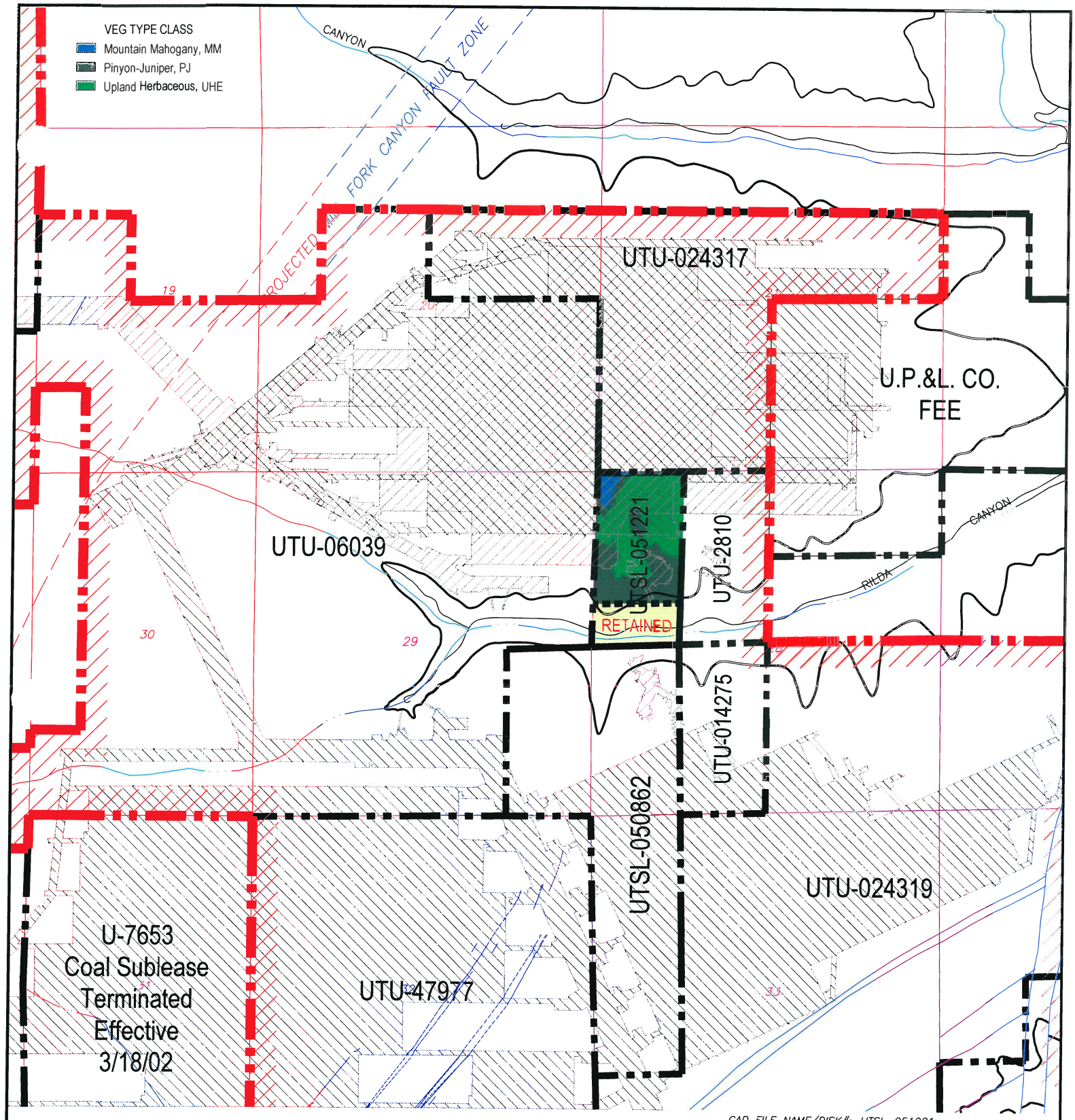
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTSL-051221 area. There were no surface facilities or installations on this lease.



CAD FILE NAME/DISK#: UTSL-051221

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- SL-051221 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-051221
VEGETATION BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX D
SCALE:	1" =2000'	DRAWING #:
DATE:	APRIL 27, 2018	SHEET 1 OF 1 REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-051221 Partial Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in Lease UTSL-051221.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTSL-051221 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTSL-051221 have taken place in January 2002, December 2002 (Blind Canyon Seam) and December 2004 (Hiawatha Seam). CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTSL-051221 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTSL-051221 have taken place in January 2002, December 2002 (Blind Canyon Seam) and December 2004 (Hiawatha Seam). CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-051221 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 2nd Right, 3rd Right Sections, 2R-3R Bleeder, 8th East, 9th East Sections, 8E-9E Bleeder

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-051221 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 2nd Right, 3rd Right Sections, 2R-3R Bleeder, 8th East, 9th East Sections, 8E-9E Bleeder

Coal Bed Blind Canyon and Hiawatha Coal Seams

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTSL-051221 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 2nd Right, 3rd Right Sections, 2R-3R Bleeder, 8th East, 9th East Sections, 8E-9E Bleeder

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/13/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTSL-051221 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 2nd Right, 3rd Right Sections, 2R-3R Bleeder, 8th East, 9th East Sections, 8E-9E Bleeder

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) #UTSL-051221 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 2nd Right, 3rd Right Sections, 2R-3R Bleeder, 8th East, 9th East Sections, 8E-9E Bleeder

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
None			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTSL-051221 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 2nd Right, 3rd Right Sections, 2R-3R Bleeder, 8th East, 9th East Sections, 8E-9E Bleeder

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 11/00 – 04/15

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTSL-051221
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 2nd Right, 3rd Right Sections, 2R-3R Bleeder, 8th East, 9th East Sections, 8E-9E Bleeder and Remainder of Mine Workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (11/00 - 08/03) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	11/00 - 8/03	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	11/00 - 8/03	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	11/00 - 8/03	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	11/00 - 8/03	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	11/00 - 8/03	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	11/00 - 8/03	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	11/00 - 8/03	Naptha	40 - 50%	64742-94-5	All Sections
	11/00 - 8/03	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	11/00 - 8/03	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	11/00 - 8/03	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	11/00 - 8/03	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	11/00 - 8/03	Propane	14%	74-98-6	All Sections
	11/00 - 8/03	Butane	13%	106-97-8	All Sections
	11/00 - 8/03	Toluene	17%	108-88-3	All Sections
	11/00 - 8/03	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	11/00 - 8/03	Napthalene	0.40%	91-20-3	All Sections
	11/00 - 8/03	Acetone	41%	67-64-1	All Sections
	11/00 - 8/03	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	11/00 - 8/03	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	11/00 - 8/03	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	11/00 - 8/03	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	11/00 - 8/03	Mineral Oil	20 - 25%	8042-47-5	All Sections
	11/00 - 8/03	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	11/00 - 8/03	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	11/00 - 8/03	Methanol	<20%	67-56-1	All Sections
	11/00 - 8/03	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	11/00 - 8/03	Heptane	69 - 79%	142-82-5	All Sections
	11/00 - 8/03	Ethyl Ether	11 - 21%	60-29-7	All Sections
	11/00 - 8/03	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	11/00 - 8/03	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	11/00 - 8/03	Heptane	60 - 70%	142-82-5	All Sections
	11/00 - 8/03	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	11/00 - 8/03	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	11/00 - 8/03	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	11/00 - 8/03	None			All Sections
Cat Transmission and Drive Train Oil	11/00 - 8/03	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	11/00 - 8/03	Monoethanolamine	<10%	141-41-3	All Sections
	11/00 - 8/03	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	11/00 - 8/03	Mineral Oil	70 - 95%	Mixture	All Sections
	11/00 - 8/03	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	11/00 - 8/03	Lubricant base oil	87 - 91%	Various	All Sections
	11/00 - 8/03	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	11/00 - 8/03	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	11/00 - 8/03	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	11/00 - 8/03	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	11/00 - 8/03	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	11/00 - 8/03	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	11/00 - 8/03	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	11/00 - 8/03	Trichloroethylene	95 - 99%	79-01-6	All Sections
	11/00 - 8/03	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	11/00 - 8/03	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	11/00 - 8/03	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	11/00 - 8/03	Deionized Water	1 - 3%	7732-18-5	All Sections
	11/00 - 8/03	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA
Lease(s) UTSL-051221
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 2nd Right, 3rd Right Sections, 2R-3R Bleeder, 8th East, 9th East Sections, 8E-9E Bleeder and Remainder of Mine Workings

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (11/00 - 8/03) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	11/00 - 8/03	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	11/00 - 8/03	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	11/00 - 8/03	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	11/00 - 8/03	Calcium sulfate	2 - 10%		All Sections
	11/00 - 8/03	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	11/00 - 8/03	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	11/00 - 8/03	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	11/00 - 8/03	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	11/00 - 8/03	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	11/00 - 8/03	Lead	34%	7439-92-1	All Sections
	11/00 - 8/03	Lead Dioxide	31%	1309-60-0	All Sections
	11/00 - 8/03	Lead Sulfate	<1%	7446-14-2	All Sections
	11/00 - 8/03	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	11/00 - 8/03	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	11/00 - 8/03	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	11/00 - 8/03	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	11/00 - 8/03	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	11/00 - 8/03	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	11/00 - 8/03	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	11/00 - 8/03	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	11/00 - 8/03	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	11/00 - 8/03	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	11/00 - 8/03	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	11/00 - 8/03	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	11/00 - 8/03	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	11/00 - 8/03	Portland Cement		65997-15-1	All Sections
	11/00 - 8/03	Crystalline Silicon Dioxide		13397-24-5	All Sections
	11/00 - 8/03	Calcium Hydroxide		001-305-620	All Sections
	11/00 - 8/03	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	11/00 - 8/03	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	11/00 - 8/03	Polyglycols	60 - 100%	Mixture (2)	15 W
	11/00 - 8/03	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	11/00 - 8/03	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	11/00 - 8/03	Polyester Resin	5 - 15%	Not Reported	All Sections
	11/00 - 8/03	Styrene Monomer	3 - 7%	100-42-5	All Sections
	11/00 - 8/03	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	11/00 - 8/03	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	11/00 - 8/03	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	11/00 - 8/03	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	11/00 - 8/03	Isobutane	2 - 10%	75-28-5	All Sections
	11/00 - 8/03	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	11/00 - 8/03	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	11/00 - 8/03	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	11/00 - 8/03			64742-48-9	All Sections
	11/00 - 8/03			64742-88-7	All Sections
	11/00 - 8/03	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	11/00 - 8/03	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	11/00 - 8/03	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	11/00 - 8/03	Lubricant base oil	>99	Various	All Sections
	11/00 - 8/03	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	11/00 - 8/03	Lubricant base oil	87 - 91%	Various	All Sections
	11/00 - 8/03	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	11/00 - 8/03	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	11/00 - 8/03	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTSL-051221
Partial Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

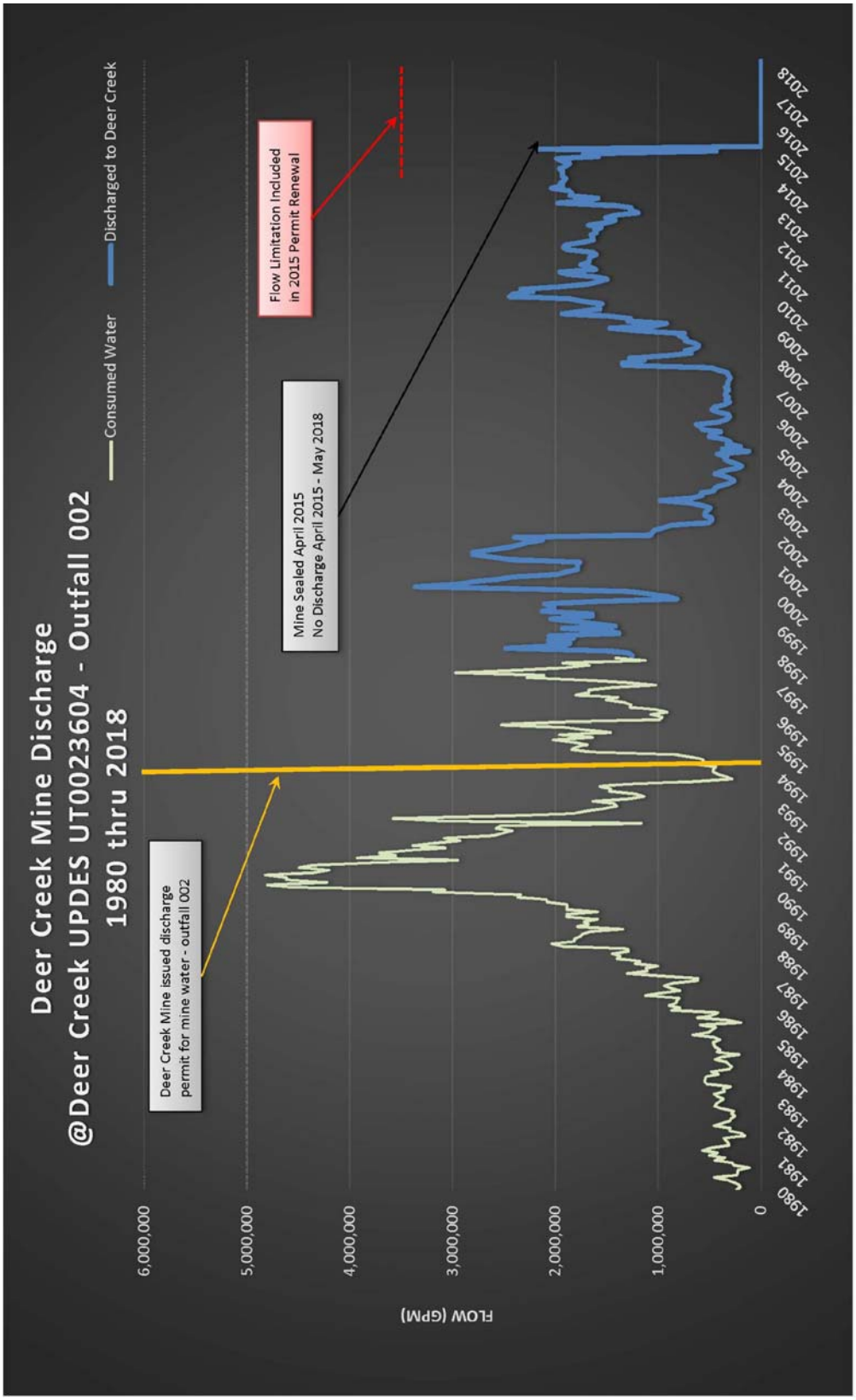
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



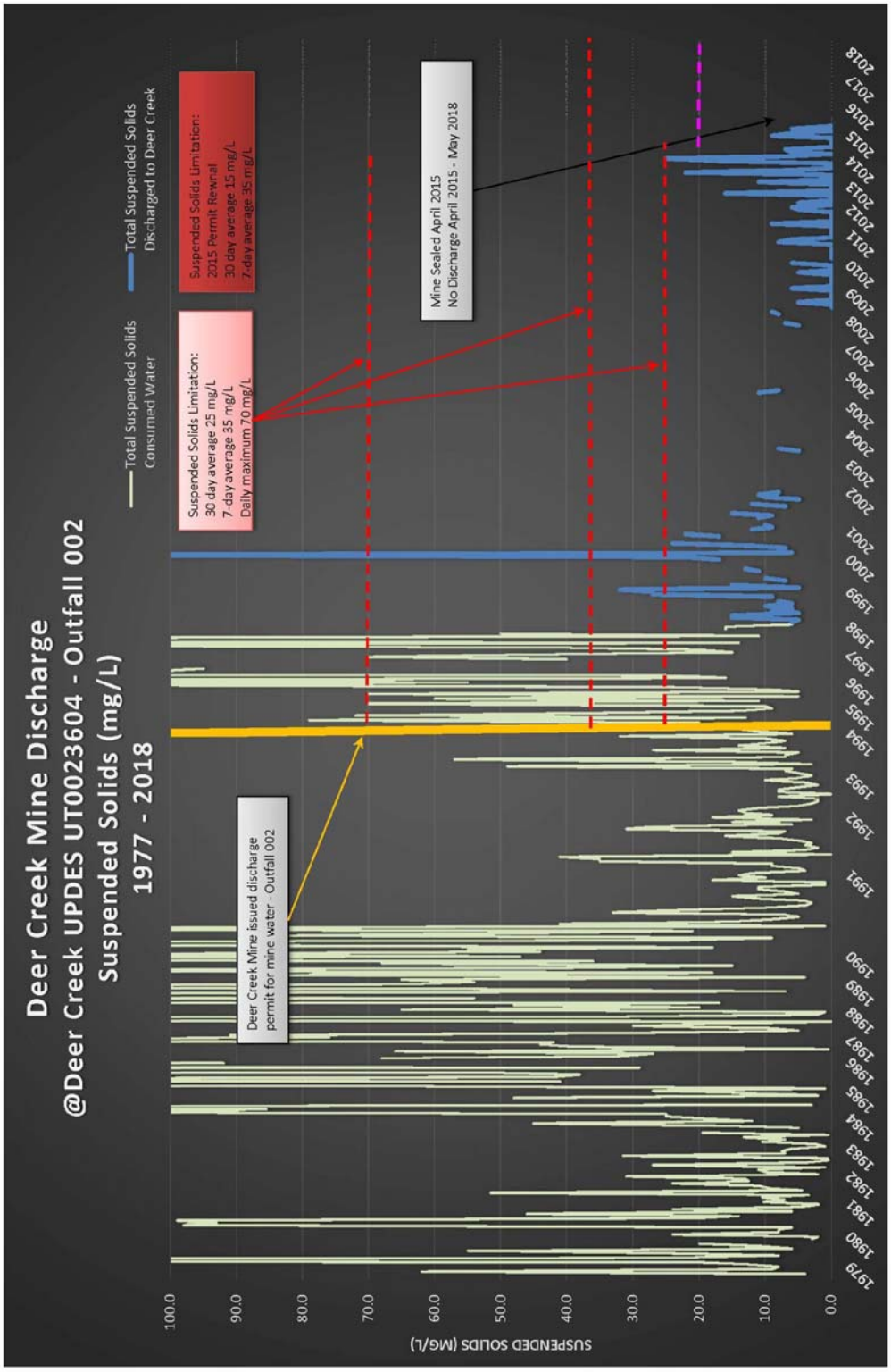
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



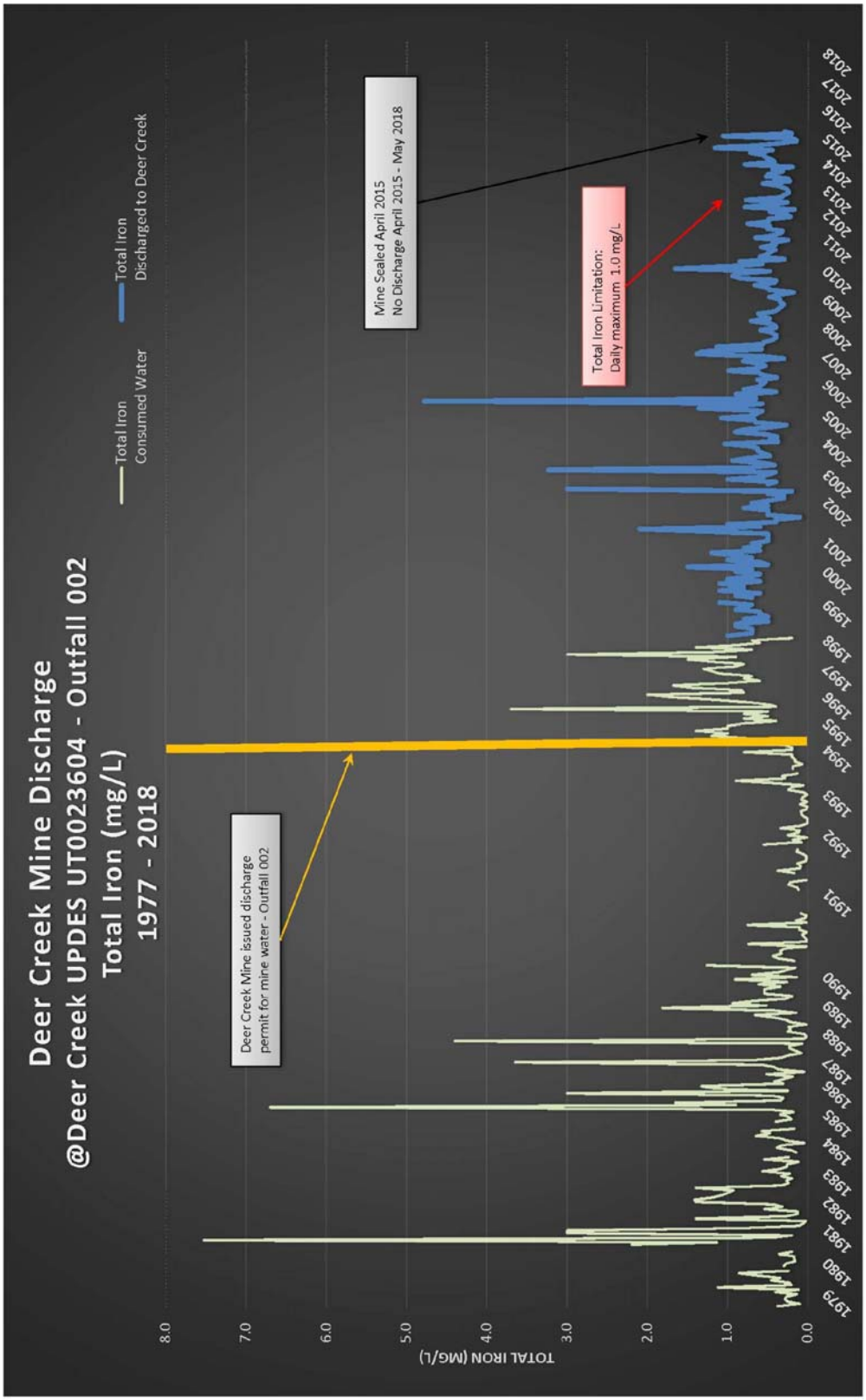
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



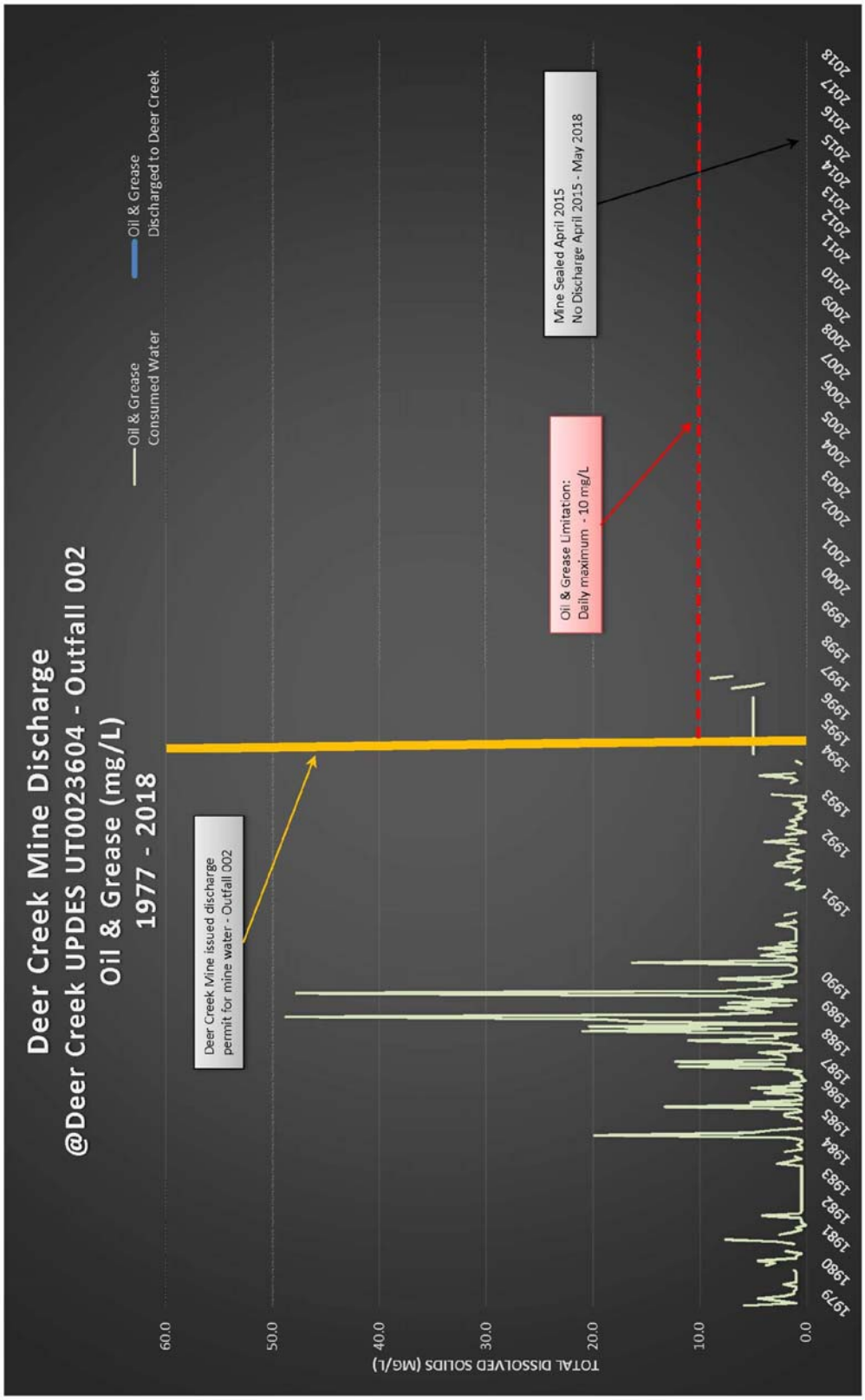
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



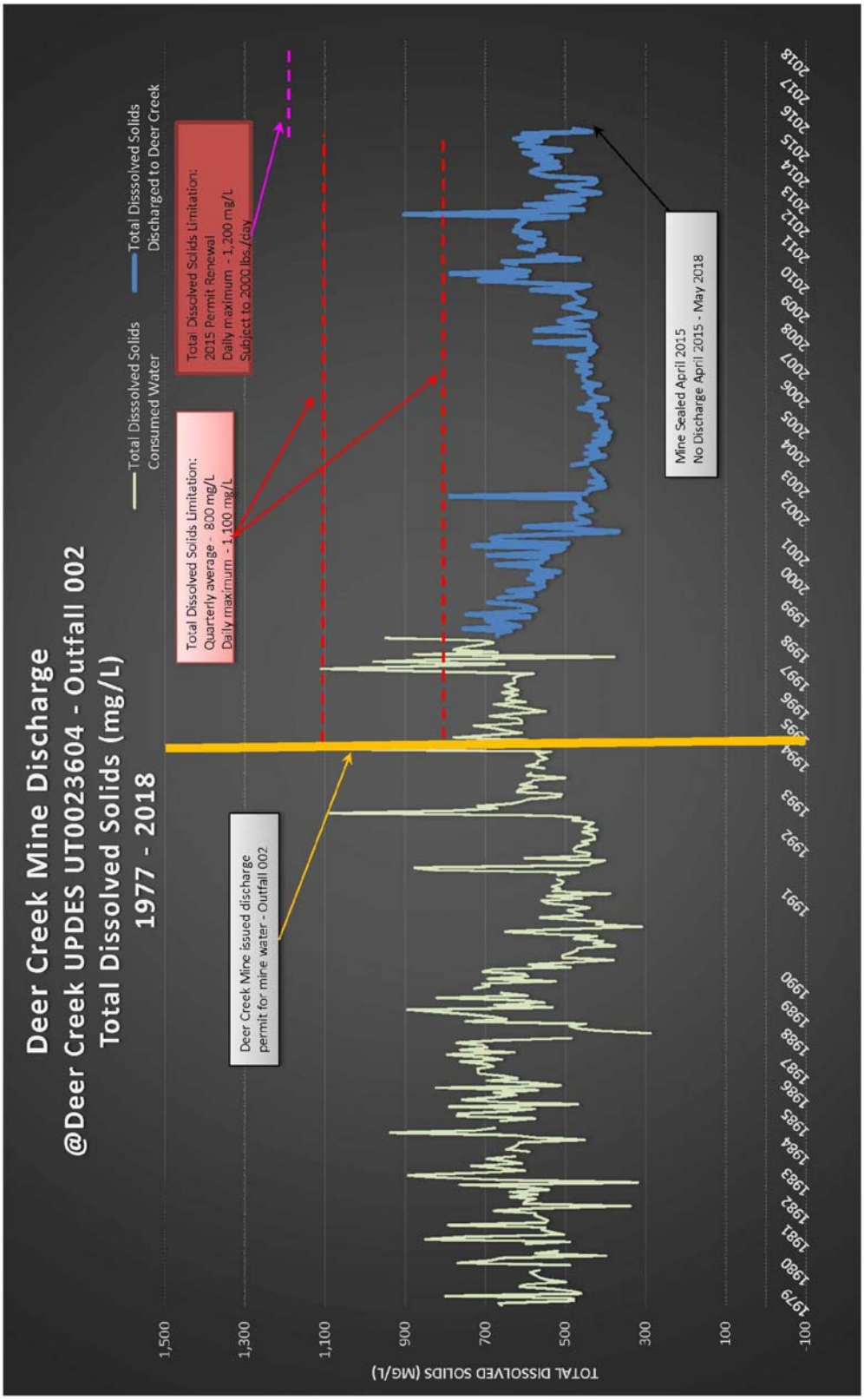
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



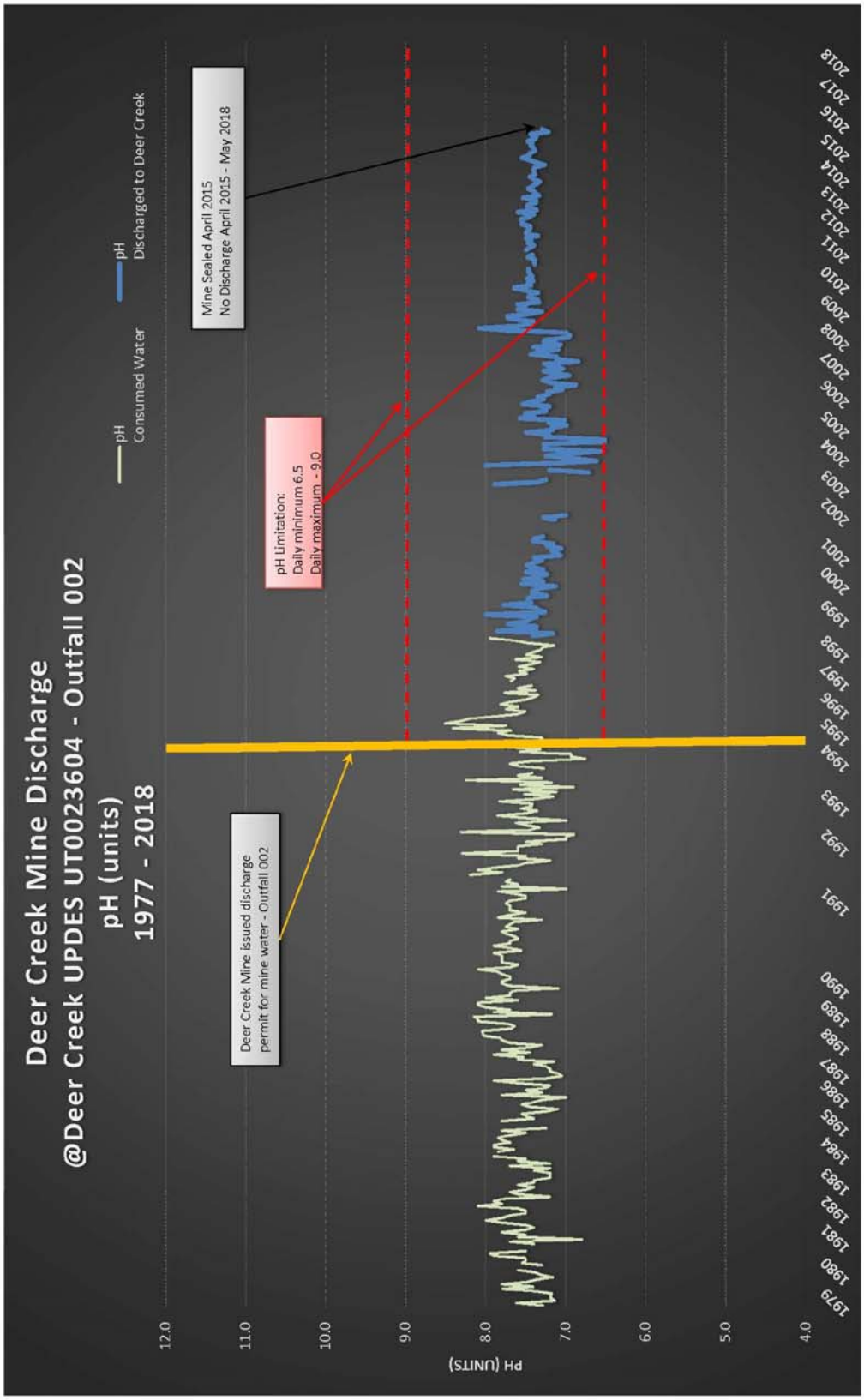
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTU-2810

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-2810, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-2810. The total acreage being surrendered is 80.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government.

Full Relinquishment

The legal description for the area of full relinquishment of UTU-2810 is described below:

Federal Coal Lease UTU-2810		
Lease Readjustment Effective Date:		10/1/2017 to 10/1/2027
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**80.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 28:	E½NW¼	80.00
	Total Lease Acreage Being Relinquished:	**80.00**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-2810

LEASE ACTIVITIES

1) Coal Lease Number: UTU-2810 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 80.00; Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of acreage relinquished. No areas retained. See also Figure 1 (a map depicting the area to be relinquished in its entirety).*

Original Lease Acreage: 80.00 Relinquished to date: 0.00 acres Remaining: 80.00 acres

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)? YES ☐ NO ☒ (If "YES", describe:

11) Date of initial mining: December 2000; last mining: March 2003.

12) Number of coal beds mined: 2 coal seams (Blind Canyon and Hiawatha)

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-2810

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to hydrographs*

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-2810

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
   - *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities? YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐ (If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

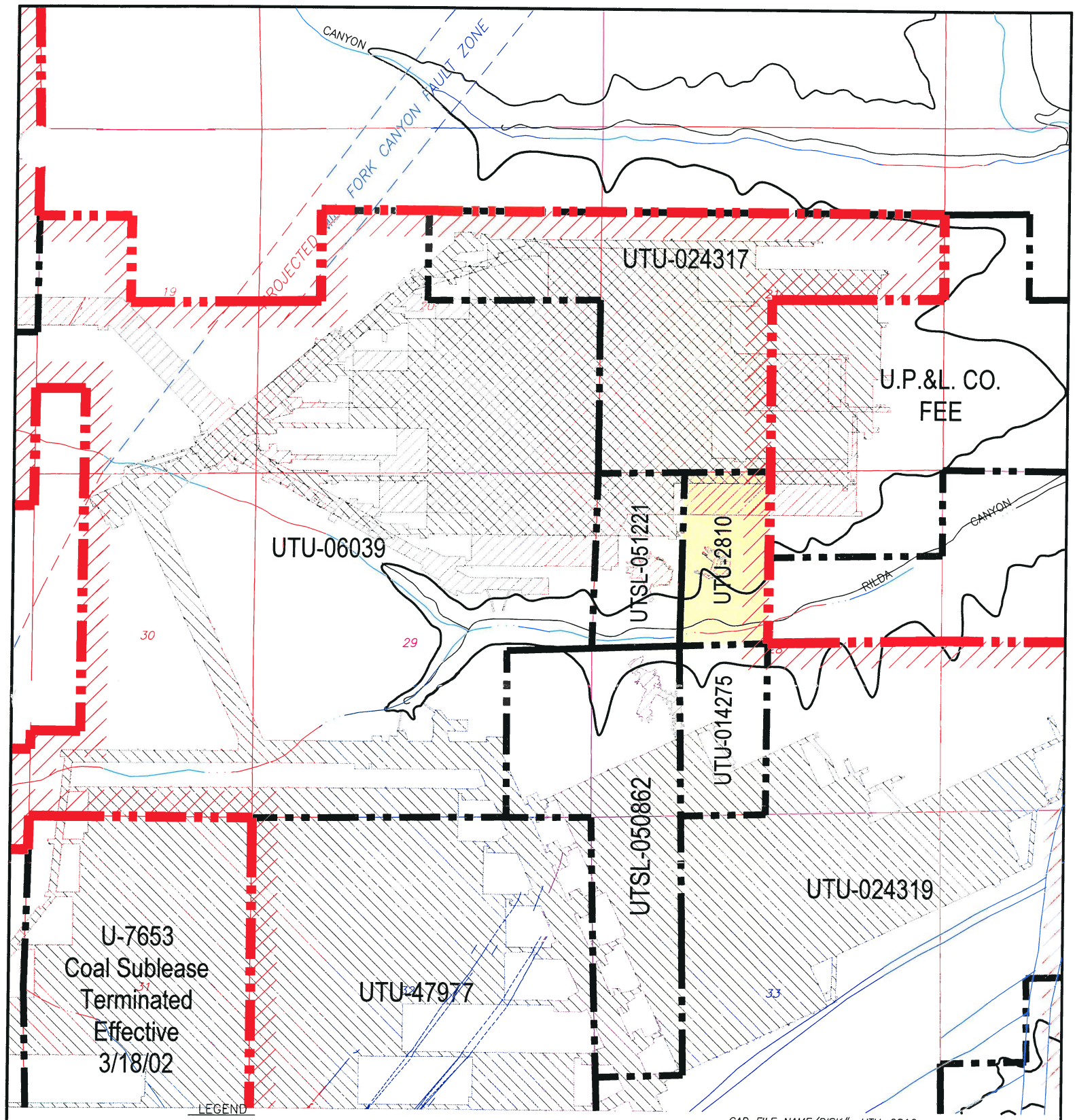
Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-2810

Exhibit A

Partial Relinquishment

The legal description for the area of full relinquishment of UTU-2810 is described below:

Federal Coal Lease UTU-2810		
Lease Readjustment Effective Date:		10/1/2017 to 10/1/2027
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**80.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 28:	E½NW¼	80.00
	Total Lease Acres for Full Relinquished:	**80.00**
	Total Lease Acres Remaining:	**0.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-2810 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

CAD FILE NAME/DISK#: UTU-2810

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-2810

DRAWN BY:	K. LARSEN	FIGURE 1	
SCALE:	1" =2000'	DRAWING #:	
DATE:	APRIL 27, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTU-2810
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-2810 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Hiawatha and Blind Canyon seams. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam took place between 12/2000 and 5/2001. Mining in the Hiawatha seam took place between 9/2002 and 3/2003. The Blind Canyon mine workings and longwall panels directly overlaid the Hiawatha mine workings.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the Trail Mountain Area were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

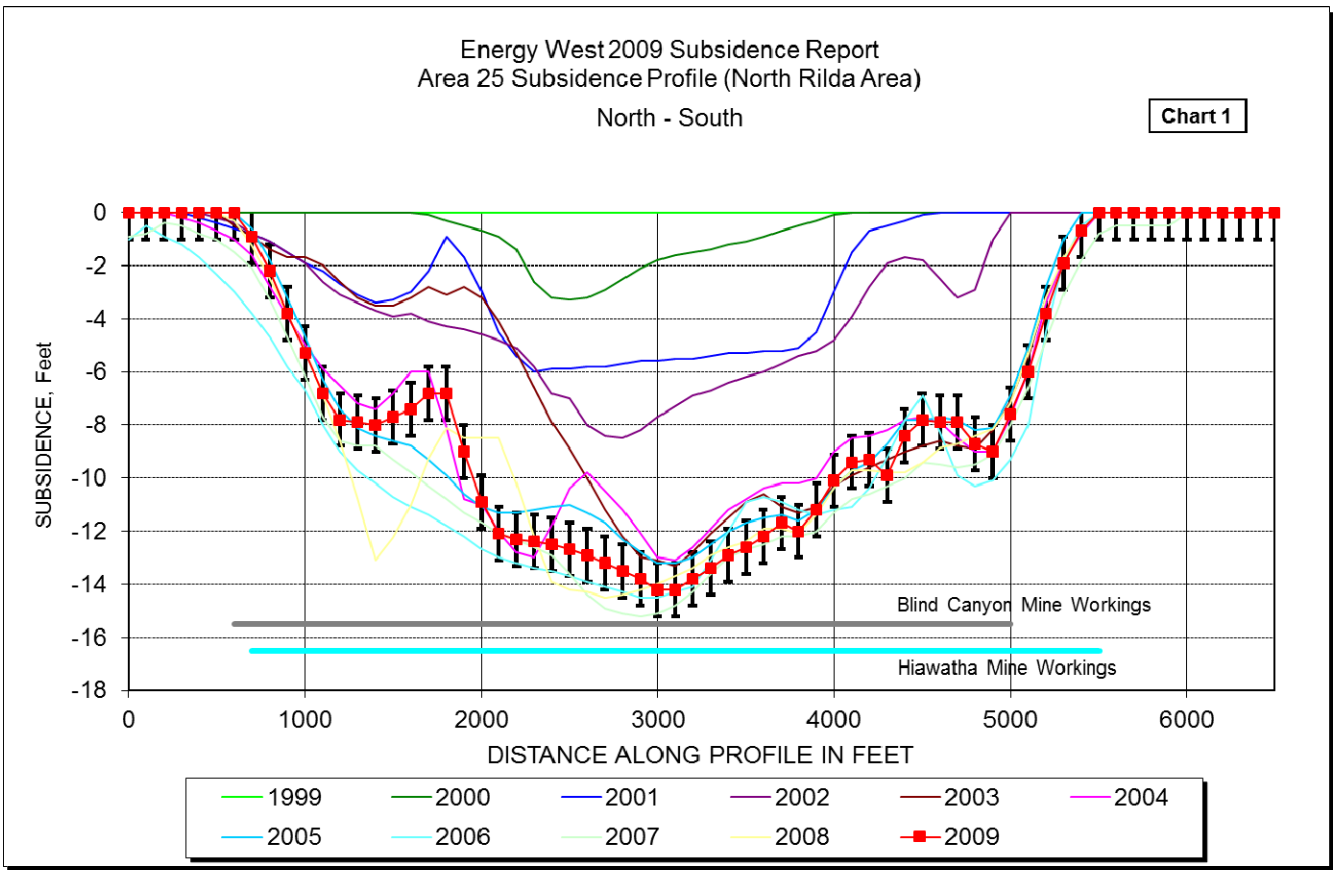
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

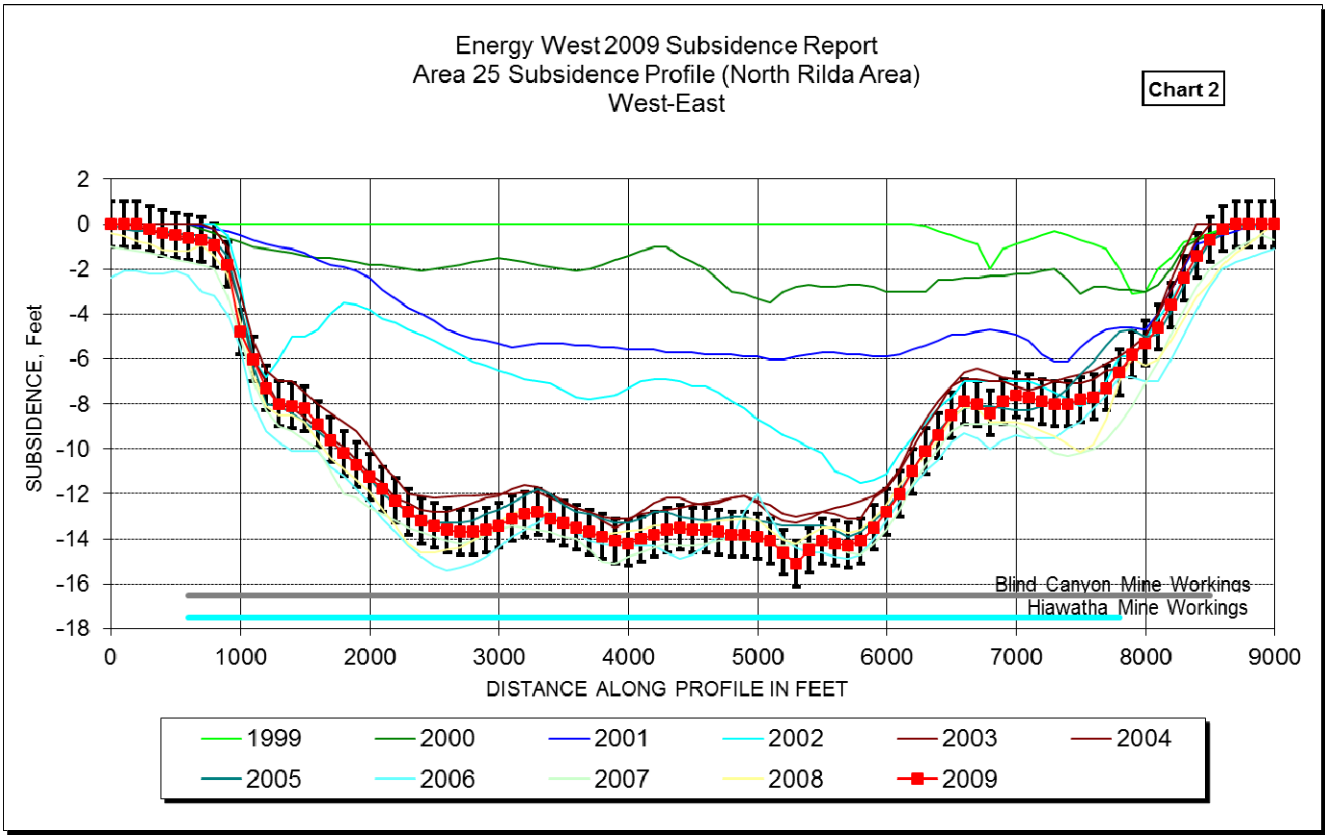
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-2810 Subsidence Data

Subsidence in the lease UTU-2810 area was monitored from 1999 to 2009. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made in the area between 1999 and 2009. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

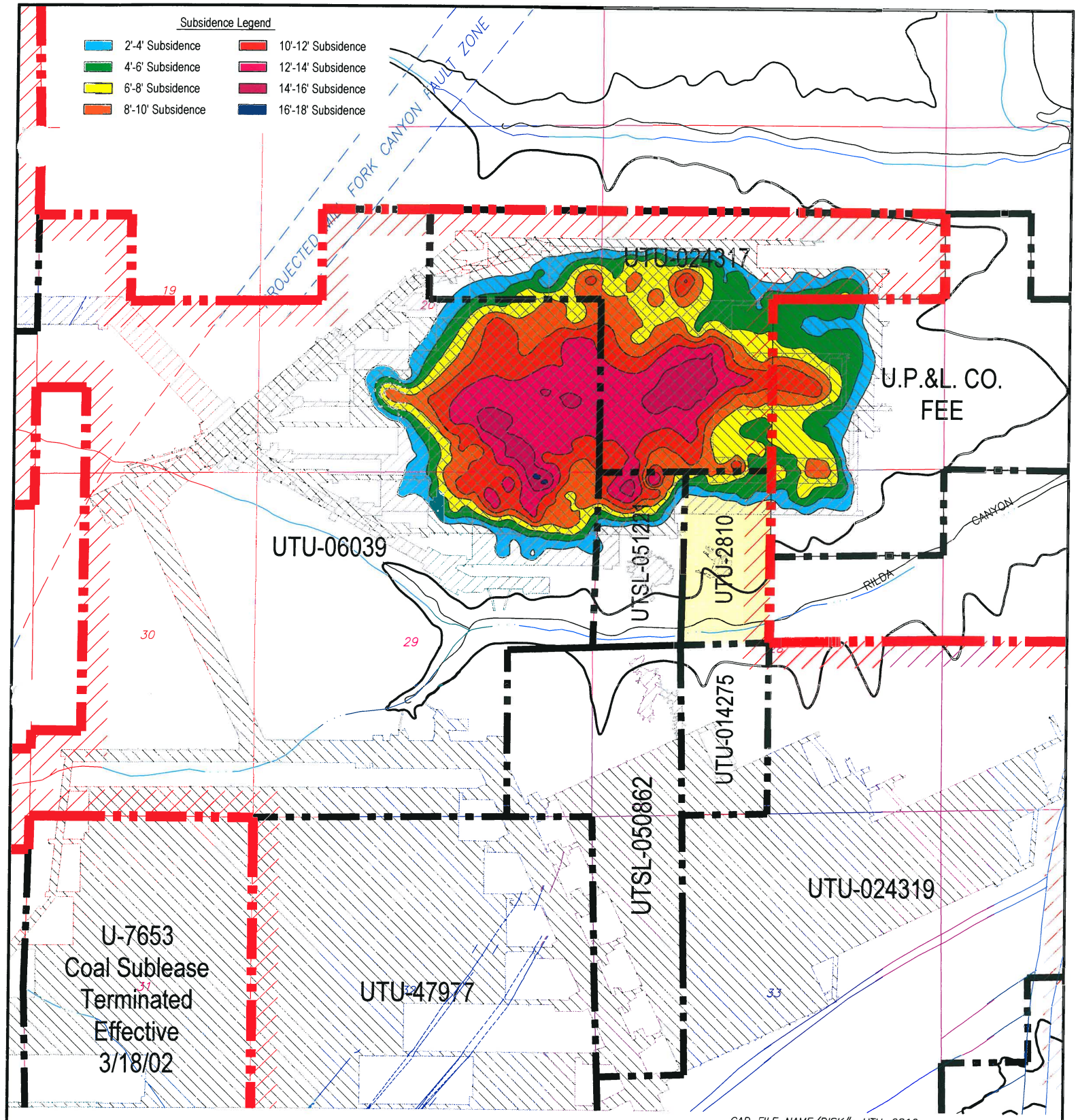
PacifiCorp delineated a series of two profiles covering the main longwall panel districts near Lease UTU-2810, including the dual-seam mining overlay area, are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 14 feet. Some cliff spalling occurred during undermining. Appropriate measures for protection of property and the public were taken during the subsidence of cliffs that were predicted to spall, including warning signs along the Rilda Canyon road to make the public aware of the potential hazards. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-2810. Conventional surveying methods for subsidence were used from 3/99 to 4/07 to measure subsidence in the vicinity cliff escarpments on the south facing slope of North Rilda Ridge. The prism surveys clearly showed the pre-subsidence status of the cliffs, subsidence behavior during double seam undermining, and post-subsidence re-stabilization of the cliffs.

The proposed relinquishment area of Lease UTU-2810 is stable and subsidence is substantially complete.



CAD FILE NAME/DISK#: UTU-2810

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-2810 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

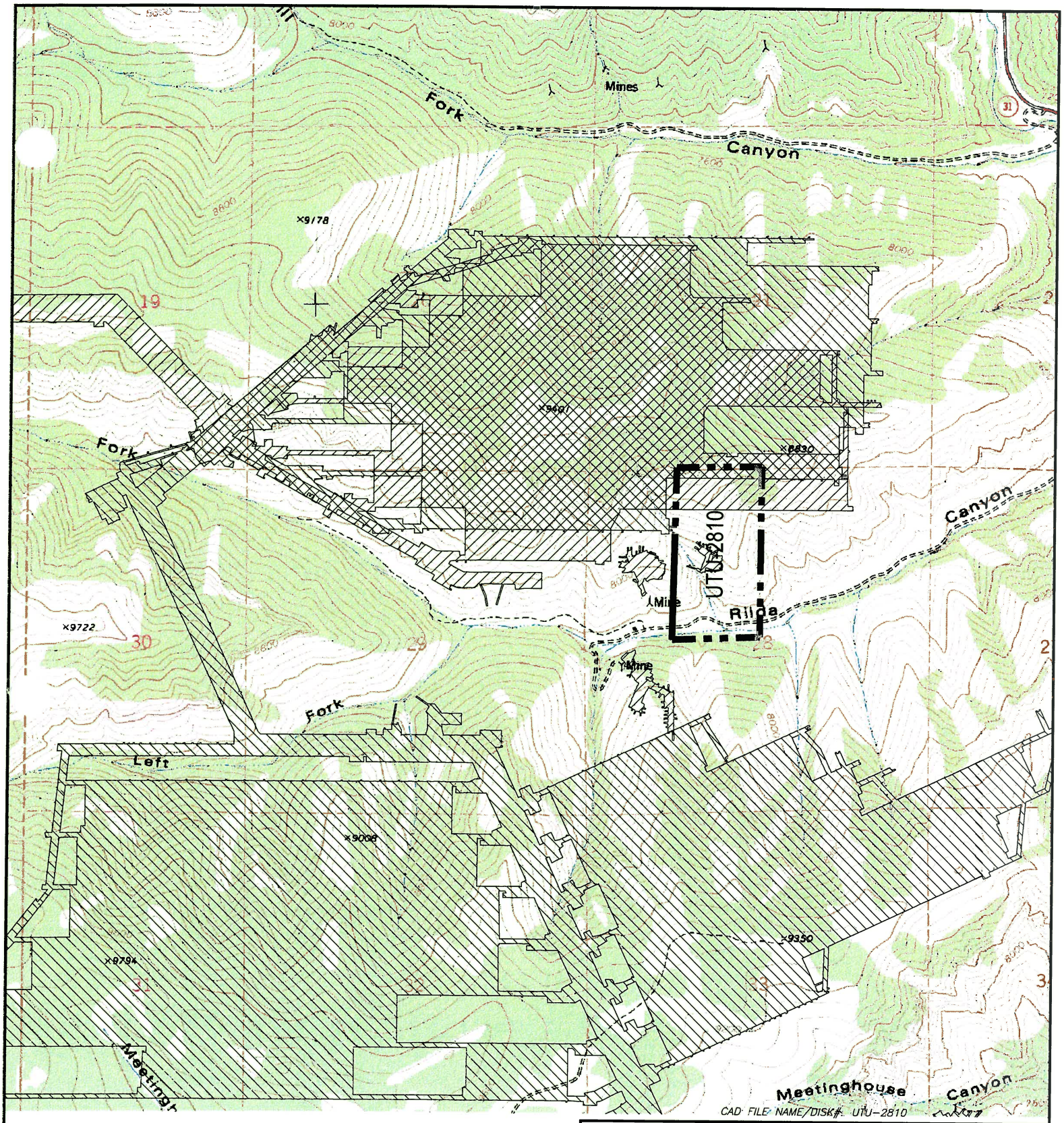
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-2810
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 27, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-2810 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-2810 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-2810. No restoration and/or mitigation efforts are required for Lease UTU-2810. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-2810 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTU-2810

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

FEDERAL LEASE ACREAGE RETAINED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-2810
TOPOGRAPHIC BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX B
SCALE:	1" =2000'	DRAWING #:
DATE:	APRIL 27, 2018	SHEET 1 OF 1 — REV. ___

Deer Creek Mine
Federal Coal Lease UTU-2810 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 40 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTU-2810 and surrounding area (North Rilda Ridge).

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP). Lease UTU-2810 is near to the Mill Fork Lease area and includes within the adjacent ½ mile zone some of the surface sites that are part of the surface hydrology monitoring plan.

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTU-2810.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The North Rilda Ridge 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the North Rilda Ridge 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. 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 PacifiCorp mining area covers portions of East Mountain.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable

calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, and is exposed in the North Rilda Ridge area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the North Rilda Ridge area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 of this 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the North Rilda Ridge area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the East Mountain area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet. There is no Flagstaff Limestone in the North Rilda Ridge area.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone

are limited to a narrow north-south trending ridge located several miles west of the North Rilda Ridge area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the water bearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 the North Rilda Ridge area.

Folding:

Strata in the North Rilda Ridge area are gently folded in two broad structural features. The Flat Canyon Anticline crosses to the west of the lease 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. The strata within Lease UTSL-05221 are located on the southeastern limb of the Flat Canyon Anticline, which is also the northwestern limb of the Straight Canyon Syncline. Strata dip about 2 - 4 degrees to the southeast.

Faulting:

There is no faulting within the UTU-2810 lease area. The nearest known faulting to the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes about 1 mile to the northwest of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates

general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk

Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The δ2H and δ18O compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.
7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years

b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of

surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its CO2(g) in the soil zone where the partial pressure of CO2 greatly exceeds atmospheric levels. This CO2 combines with water to form carbonic acid according to

$$CO2(g) + H2O = H2CO3 \quad (1)$$

Carbonic acid dissociates into H+ and HCO3- as

$$H2CO3 = HCO3^- + H+ \quad (2)$$

The H+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H+ + \underset{\text{(dolomite)}}{CaMg(CO3)2} = Ca2+ + Mg2+ + 2HCO3^-, \text{ and} \quad (3)$$

$$H+ + \underset{\text{(calcite)}}{CaCO3} = Ca2+ + HCO3^- \quad (4)$$

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$\underset{\text{(gypsum)}}{CaSO_4 \cdot 2H_2O} = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute

concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-clay} = 2Na^+ + Ca\text{-clay} \quad (9)$$

$$Mg^{2+} + Na\text{-clay} = 2Na^+ + Mg\text{-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs

discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically

dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} -HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent

with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and $\delta^{18}O$

The δ^2H and $\delta^{18}O$ composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and $\delta^{18}O$ composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Interwest and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork area spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^3H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^3H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^3H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^3H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is

minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir

downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less

than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute

significant groundwater to the discharge from the spring.

Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – NORTH RILDA RIDGE AREA

A. GROUNDWATER

Groundwater within the North Rilda Ridge area was monitored according to the schedules in established in the Deer Creek MRP. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining. There are no surface springs within the lease area of UTU-2810 that is to be relinquished. PacifiCorp has conducted baseline and operational monitoring of spring sources adjacent to the lease area. The nearest springs within ½ mile of the relinquishment boundary are located at the North Emery Water Users Special Service District Rilda Canyon Springs collection system, which taps a series of alluvial springs in the floor of Rilda Canyon.

East Mountain Springs - Mill Fork

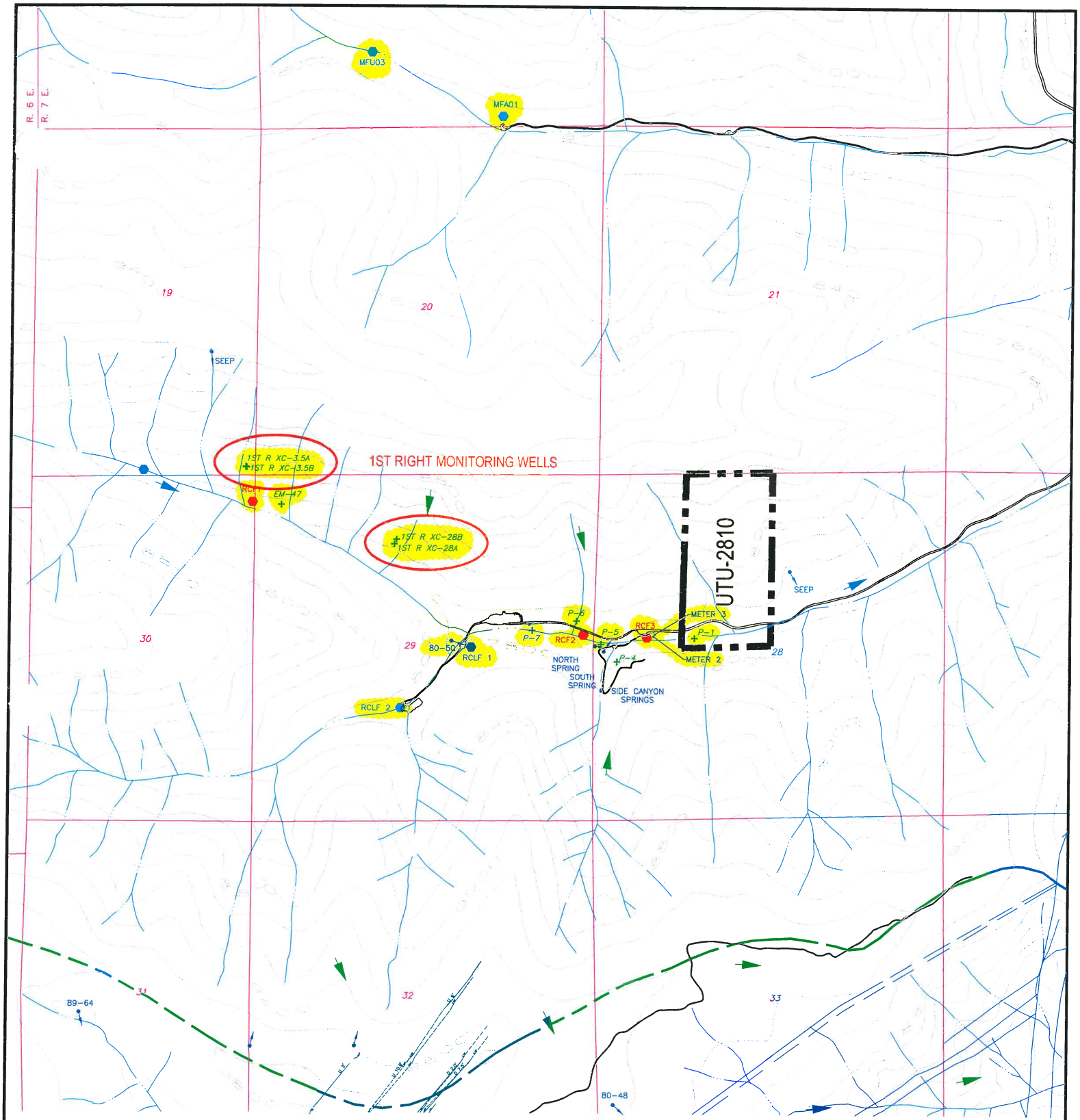
In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the adjacent Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.

There are no monitored groundwater springs within ½ mile of UTU-2810. The spring collection system operated by the North Emery Water Users Special Service District is within ½ mile. Data related to monitoring point RCF3 is included in Appendix C.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTU-2810 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTU-2810 are ephemeral. The majority of the surface flow from the lease area drains to the south into Rilda Canyon which reports to Huntington Creek. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



CAD FILE NAME/DISK#: UTU-2810

LEGEND

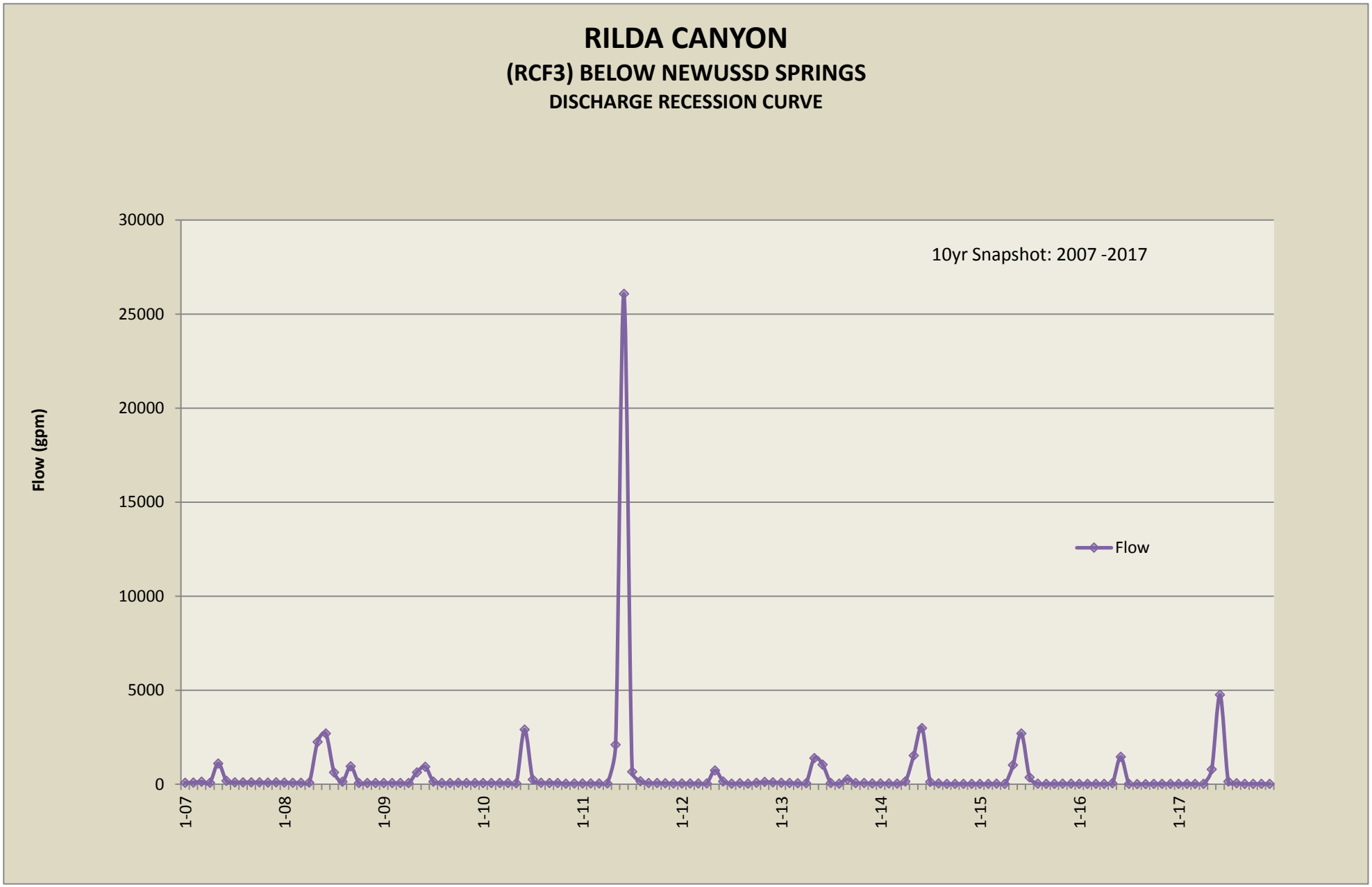
- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-2810
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 27, 2018	SHEET 1 OF 1	REV. ___


RILDA CANYON
(RCF3) BELOW NEWUSSD SPRINGS
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
30000
25000
20000
15000
10000
5000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - BELOW NEWUA SPRINGS

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170313	0.0	354.0	99.2	0.0	32.0	1013.0	8.1	493.0	0.2	0.1	59.6	0.0	0.0	8.1	4.2	28.5	177.0	0.0	611.0
20170608	0.0	222.0	60.7	0.0	2.0	449.0	10.2	239.0	0.5	0.0	21.2	0.0	0.0	8.6	1.0	5.4	15.0	165.0	252.0
20170907	6.0	320.0	82.0	0.0	15.0	885.0	10.4	407.0	0.1	0.0	49.1	0.0	0.0	8.6	3.1	20.9	137.0	0.0	514.0
20171205	0.0	331.0	90.7	0.0	12.0	901.0	13.1	443.0	0.1	0.0	52.6	0.0	0.0	8.0	3.4	21.6	143.0	8.0	575.0
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2017																			
MIN	0	222	61	0	2	449	8	239	0	0	21	0	0	8	1	5	15	0	
MAX	6	354	99	0	32	1013	13	493	1	0	60	0	0	9	4	29	177	165	
MEAN	0.00	306.75	83.14	0.00	15.25	812.00	10.45	395.50	0.23	0.01	45.62	0.01	0.00	8.32	2.91	19.11	118.00	43.25	
2016**																			
MIN	0.0	205.0	55.2	0.0	1.0	381.0	8.7	210.0	0.0	0.0	17.5	0.0	0.0	8.0	0.0	4.4	12.0	0.0	272.0
MAX	6.0	350.0	95.0	0.0	10.0	880.0	9.9	483.0	0.5	0.0	59.6	0.0	0.0	8.1	2.9	23.6	159.0	56.0	589.0
MEAN	1.5	302.8	82.3	0.0	7.8	746.5	9.4	398.5	0.3	0.0	46.8	0.0	0.0	8.1	2.1	18.5	115.0	19.3	493.0
2015**																			
MIN	0	218	52	0	2	419	10	218	0	0	22	0	0	8	1	5	14	0	277
MAX	0	343	87	0	10	895	10	454	3	0	58	0	0	9	3	24	157	221	583
MEAN	0	303	78	0	8	769	10	388	1	0	47	0	0	8	2	19	117	83	506
2014**																			
MIN	0	339	85	0	9	871	0	425	0	0	52	0	0	8	3	25	139	0	550
MAX	6	343	89	0	10	920	0	447	0	0	54	0	0	8	4	55	170	0	586
MEAN	3	341	87	0	10	896	0	436	0	0	53	0	0	8	3	40	155	0	568
2013**																			
MIN	0	205	53	0	1	155	0	221	0	0	20	0	0	8	1	7	17	0	214
MAX	5	339	97	11	10	901	0	486	12	0	59	0	0	9	3	25	154	1092	562
MEAN	3	274	76	3	6	599	0	351	3	0	39	0	0	8	2	16	88	284	386
2012**																			
MIN	0	250	67	0	4	576	8	297	0	0	32	0	0	8	1	12	56	0	334
MAX	30	350	101	0	10	921	8	495	0	0	59	0	0	8	3	26	159	8	556
MEAN	8	312	85	0	8	782	8	413	0	0	48	0	0	8	2	20	113	4	468
2011**																			
MIN	0	212	59.9	0	2.0	423	8.70	228	0.16	0.00	19.14	0.00	0.00	7.95	0.80	4.79	13.0	0.0	258
MAX	5	351	97.0	0	11.0	899	8.70	481	14.79	0.00	58.07	0.03	0.00	8.54	2.82	24.63	152.0	1786.0	573
MEAN	1	287	79.9	0	7.0	702	8.70	373	3.86	0.00	42.22	0.02	0.00	8.19	1.97	16.74	95.0	448.0	436
2010**																			
MIN					2.0	411	6.10	221	0.29		18.45	0.00		7.87	0.81	5.10	13.0	0.0	233
MAX					11.0	922	10.20	510	1.37		62.65	0.04		8.56	3.10	26.36	157.0	100.0	592
MEAN					7.3	765	8.80	419.75	0.65		48.58	0.02		8.14	2.42	19.78	111.3	34.0	488
2009**																			
MIN	0	217	62		2	462	8	251	0		23	0		8	1	7	26	6	288
MAX	15	374	108		10	1005	9	545	1		67	0		8	3	30	183	90	678
MEAN	9	330	91		8	840	8	448	1		53	0		8	3	22	130	31	550
2008**																			
MIN	0	179	61		2	470	9	242	1		22	0		8	1	5	18	8	247
MAX	20	378	115		10	1072	16	577	1		70	0		9	4	29	213	12	742
MEAN	10	322	97		8	911	12	471	1		55	0		8	3	23	147	10	571
2007**																			
MIN		285	77.6		6.0	834	10.09	378	0.20		44.70	0.02		7.54	1.86	15.60	90.0	5.0	438
MAX		400	132.0		12.0	1304	12.48	614	1.17		69.10	0.09		8.04	3.51	30.06	255.0	6.0	746
MEAN		370	111.2		10.2	1128.2	11.26	536.2	0.50		62.75	0.05		7.79	3.14	26.11	196.0	5.5	652.6
2006**																			
MIN		220	62		3.0	487	10.3	252	0.16		23.8	0		7.78	0.98	6.4	25	6	278
MAX		376	112		12.0	1073	12.5	563	0.30		69.0	0		8.18	3.32	26.8	185	18	626
MEAN		328	94		8.8	906	11.7	454	0.25		53.3	0		7.97	2.57	20.9	135	10	517
HISTORICAL 1989-2016																			
MIN	0.0	179.0	50.4	0.0	1.0	155.0	4.4	204.0	0.0	0.0	17.5	0.0	0.0	7.5	0.0	4.4	7.0	0.0	199.0
MAX	38.0	500.0	132.0	30.0	50.0	1304.0	15.5	748.0	14.8	0.4	70.2	0.2	5.0	8.8	5.0	55.0	255.0	1786.0	746.0
MEAN	6.6	344.7	84.5	3.1	8.7	748.0	8.7	403.5	0.7	0.0	45.5	0.0	1.1	8.1	2.3	17.9	107.3	67.5	464.1
COUNT	67	103	103	62	103	104	79	103	101	56	103	75	59	104	100	103	103	79	103

*** Quality parameters are reported as mg/l unless otherwise noted.**
**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTU-2810 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 40 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface vegetation characteristics of the area.

Vegetation of Lease UTU-2810 is diverse, ranging from mountain mahogany, pinyon – juniper to brush. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-2810:

Mountain Mahogany	MM
Pinyon-Juniper	PJ
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires (such as the wildfire of June, 2018 that destroyed more than 60% of the vegetation on this lease), variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

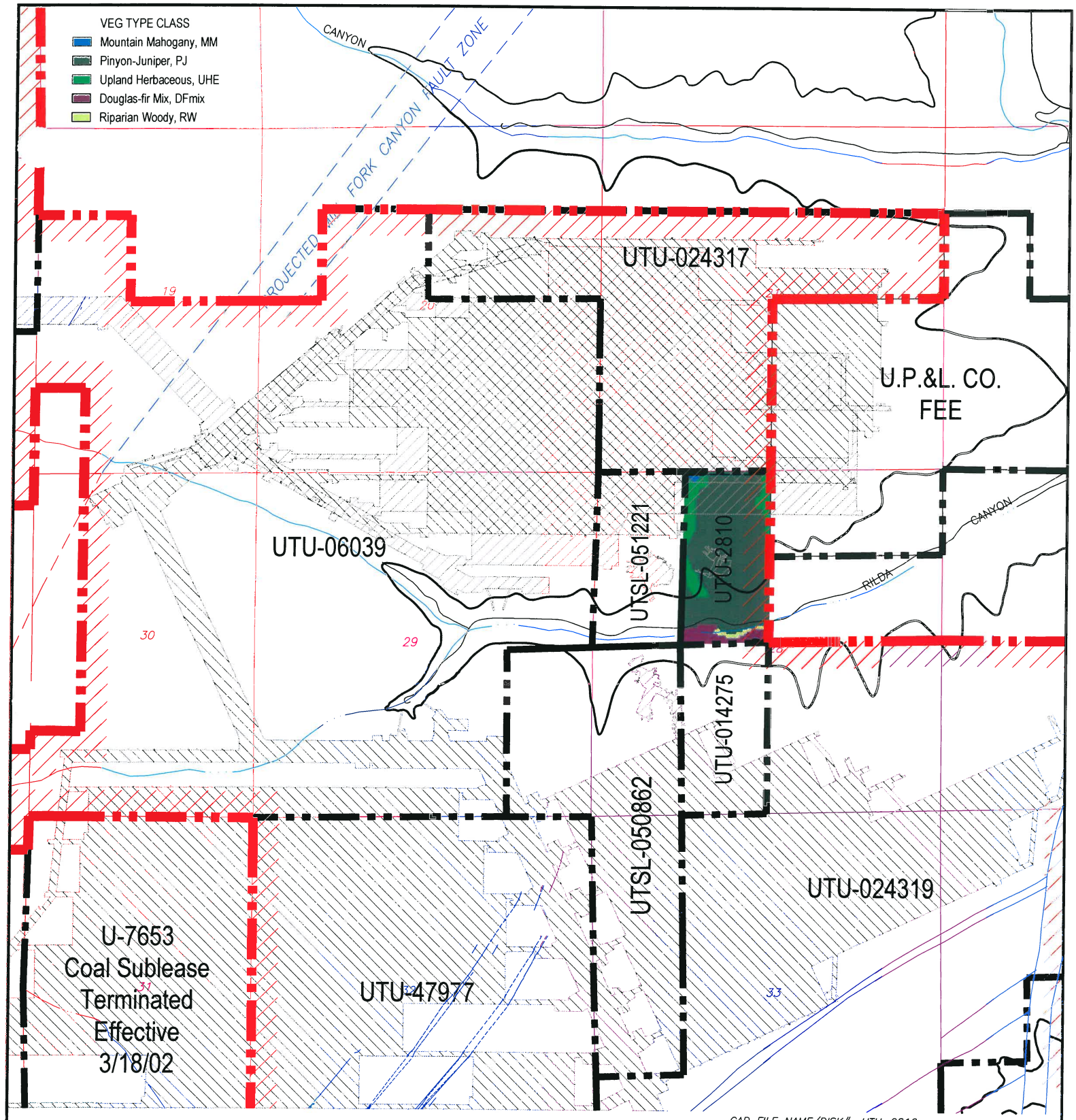
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTSL-051221 area. There were no surface facilities or installations on the relinquished portion of this lease.



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-2810 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

CAD FILE NAME/DISK#: UTU-2810

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-2810
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 27, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-2810 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in the relinquished area of Lease UTU-2810.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-2810 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTU-2810 have taken place in January 2002, December 2002 (Blind Canyon Seam) and December 2004 (Hiawatha Seam). CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-2810 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd Right Section, 9th East Section

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/27/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-2810 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd Right Section, 9th East Section

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-2810 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd Right Section, 9th East Section

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTU-2810 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd Right Section, 9th East Section

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) #UTU-2810 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd Right Section, 9th East Section

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
None			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-2810 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd Right Section, 9th East Section

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 12/00 – 04/15

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-2810
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 3rd Right Section, 9th East Section

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (12/00 - 03/03) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	12/00 - 3/03	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	12/00 - 3/03	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	12/00 - 3/03	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	12/00 - 3/03	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	12/00 - 3/03	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	12/00 - 3/03	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	12/00 - 3/03	Naptha	40 - 50%	64742-94-5	All Sections
	12/00 - 3/03	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	12/00 - 3/03	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	12/00 - 3/03	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	12/00 - 3/03	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	12/00 - 3/03	Propane	14%	74-98-6	All Sections
	12/00 - 3/03	Butane	13%	106-97-8	All Sections
	12/00 - 3/03	Toluene	17%	108-88-3	All Sections
	12/00 - 3/03	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	12/00 - 3/03	Napthalene	0.40%	91-20-3	All Sections
	12/00 - 3/03	Acetone	41%	67-64-1	All Sections
	12/00 - 3/03	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	12/00 - 3/03	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	12/00 - 3/03	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	12/00 - 3/03	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	12/00 - 3/03	Mineral Oil	20 - 25%	8042-47-5	All Sections
	12/00 - 3/03	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	12/00 - 3/03	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	12/00 - 3/03	Methanol	<20%	67-56-1	All Sections
	12/00 - 3/03	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	12/00 - 3/03	Heptane	69 - 79%	142-82-5	All Sections
	12/00 - 3/03	Ethyl Ether	11 - 21%	60-29-7	All Sections
	12/00 - 3/03	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	12/00 - 3/03	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	12/00 - 3/03	Heptane	60 - 70%	142-82-5	All Sections
	12/00 - 3/03	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	12/00 - 3/03	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	12/00 - 3/03	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	12/00 - 3/03	None			All Sections
Cat Transmission and Drive Train Oil	12/00 - 3/03	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	12/00 - 3/03	Monoethanolamine	<10%	141-41-3	All Sections
	12/00 - 3/03	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	12/00 - 3/03	Mineral Oil	70 - 95%	Mixture	All Sections
	12/00 - 3/03	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	12/00 - 3/03	Lubricant base oil	87 - 91%	Various	All Sections
	12/00 - 3/03	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	12/00 - 3/03	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	12/00 - 3/03	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	12/00 - 3/03	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	12/00 - 3/03	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	12/00 - 3/03	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	12/00 - 3/03	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	12/00 - 3/03	Trichloroethylene	95 - 99%	79-01-6	All Sections
	12/00 - 3/03	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	12/00 - 3/03	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	12/00 - 3/03	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	12/00 - 3/03	Deionized Water	1 - 3%	7732-18-5	All Sections
	12/00 - 3/03	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-2810
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 3rd Right Section, 9th East Section

Coal Bed Blind Canyon Seam, Hiawatha Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (12/00 - 3/03) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	12/00 - 3/03	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	12/00 - 3/03	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	12/00 - 3/03	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	12/00 - 3/03	Calcium sulfate	2 - 10%		All Sections
	12/00 - 3/03	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	12/00 - 3/03	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	12/00 - 3/03	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	12/00 - 3/03	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	12/00 - 3/03	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	12/00 - 3/03	Lead	34%	7439-92-1	All Sections
	12/00 - 3/03	Lead Dioxide	31%	1309-60-0	All Sections
	12/00 - 3/03	Lead Sulfate	<1%	7446-14-2	All Sections
	12/00 - 3/03	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	12/00 - 3/03	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	12/00 - 3/03	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	12/00 - 3/03	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	12/00 - 3/03	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	12/00 - 3/03	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	12/00 - 3/03	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	12/00 - 3/03	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	12/00 - 3/03	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	12/00 - 3/03	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	12/00 - 3/03	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	12/00 - 3/03	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	12/00 - 3/03	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	12/00 - 3/03	Portland Cement		65997-15-1	All Sections
	12/00 - 3/03	Crystalline Silicon Dioxide		13397-24-5	All Sections
	12/00 - 3/03	Calcium Hydroxide		001-305-620	All Sections
	12/00 - 3/03	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	12/00 - 3/03	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	12/00 - 3/03	Polyglycols	60 - 100%	Mixture (2)	15 W
	12/00 - 3/03	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	12/00 - 3/03	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	12/00 - 3/03	Polyester Resin	5 - 15%	Not Reported	All Sections
	12/00 - 3/03	Styrene Monomer	3 - 7%	100-42-5	All Sections
	12/00 - 3/03	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	12/00 - 3/03	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	12/00 - 3/03	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	12/00 - 3/03	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	12/00 - 3/03	Isobutane	2 - 10%	75-28-5	All Sections
	12/00 - 3/03	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	12/00 - 3/03	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	12/00 - 3/03	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	12/00 - 3/03			64742-48-9	All Sections
	12/00 - 3/03			64742-88-7	All Sections
	12/00 - 3/03	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	12/00 - 3/03	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	12/00 - 3/03	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	12/00 - 3/03	Lubricant base oil	>99	Various	All Sections
	12/00 - 3/03	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	12/00 - 3/03	Lubricant base oil	87 - 91%	Various	All Sections
	12/00 - 3/03	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	12/00 - 3/03	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	12/00 - 3/03	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-2810
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

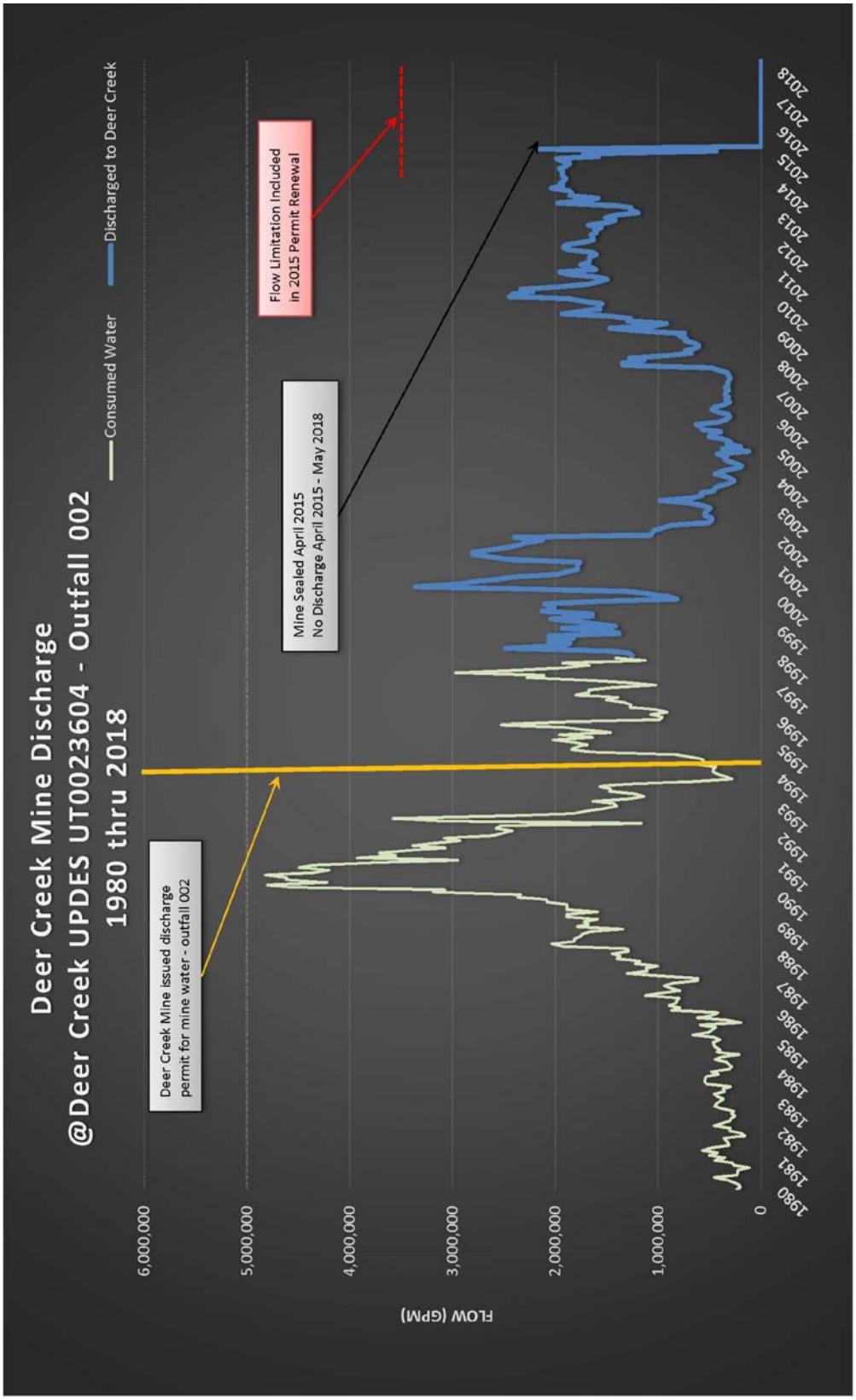
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



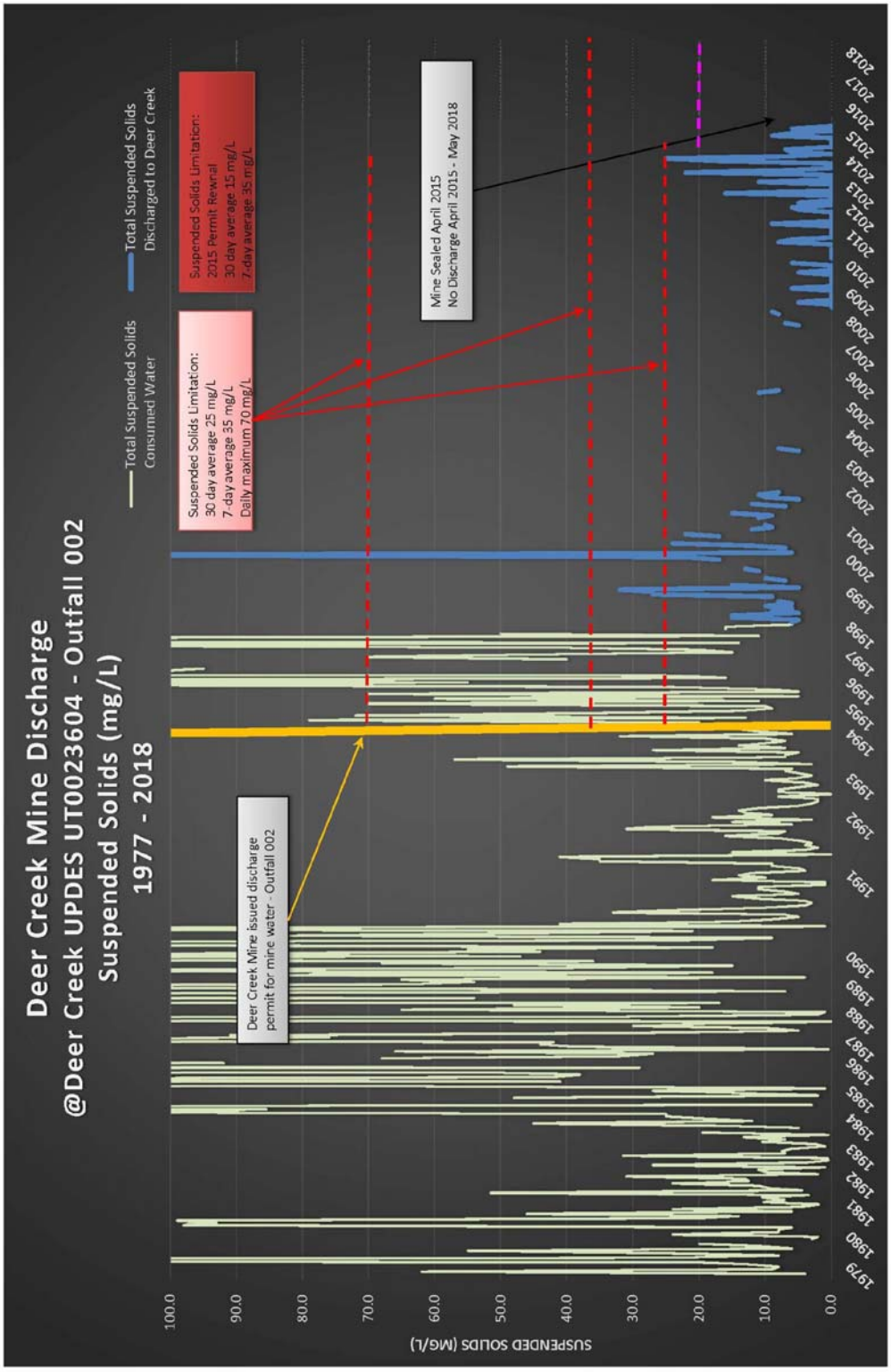
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



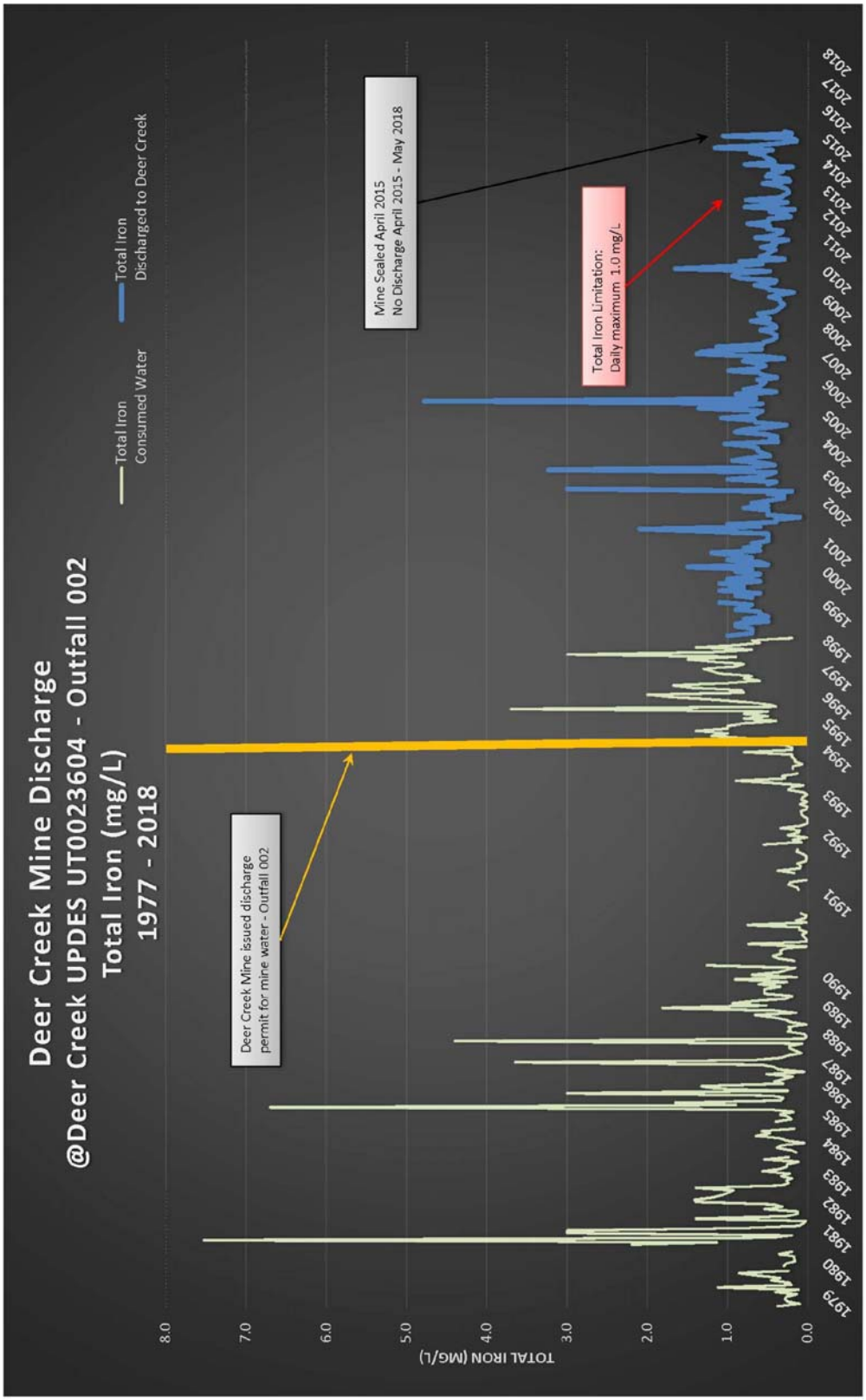
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



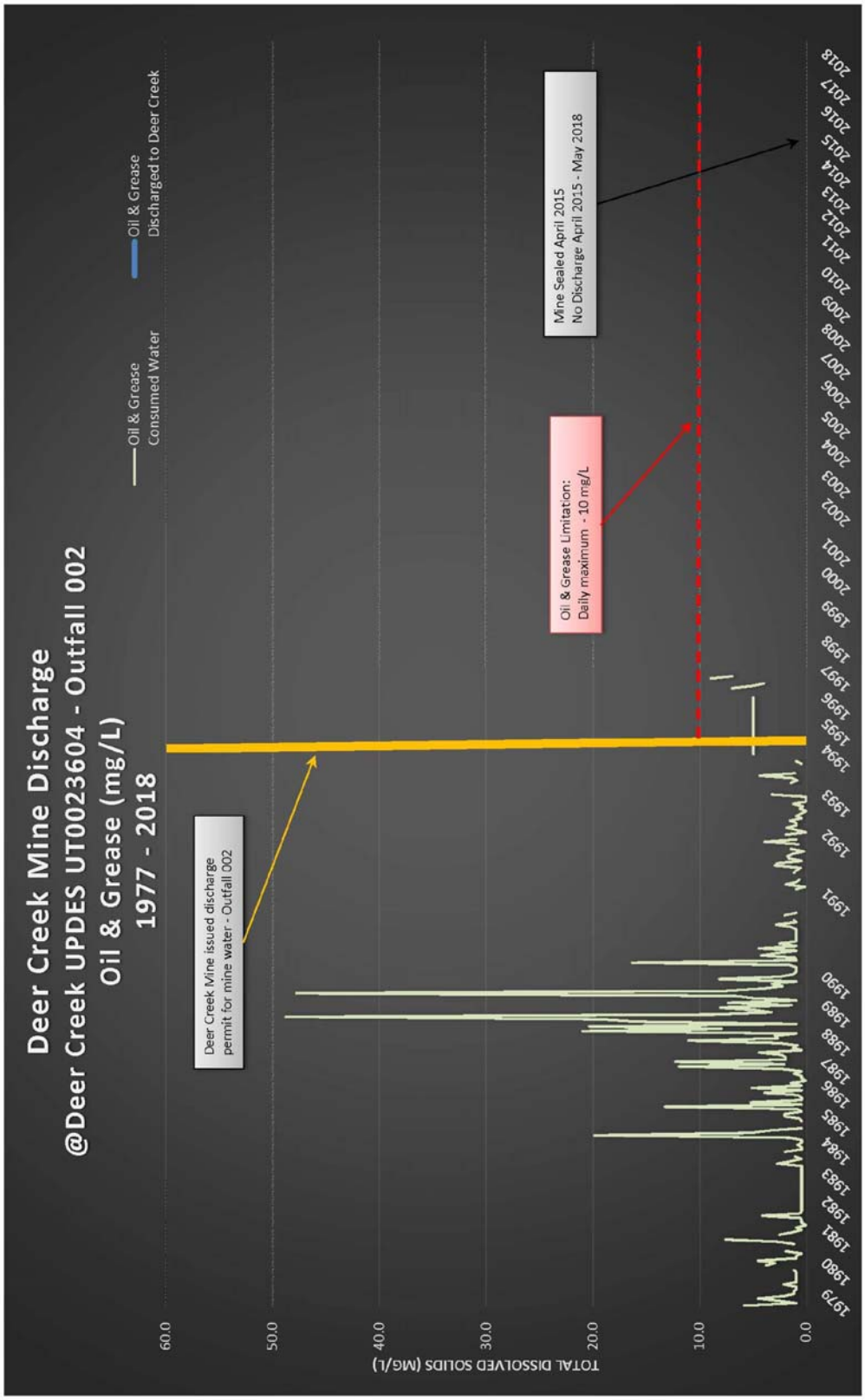
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



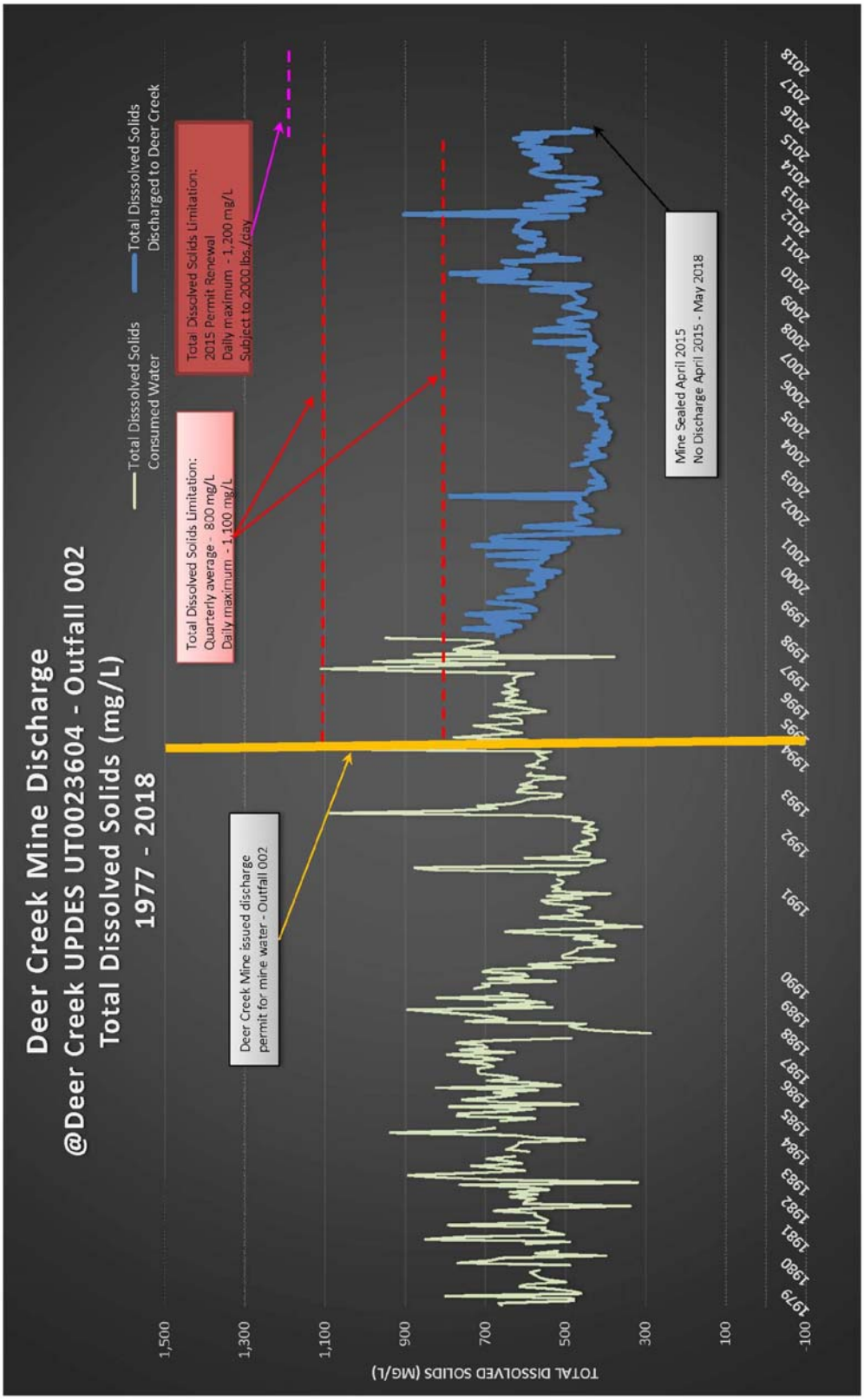
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



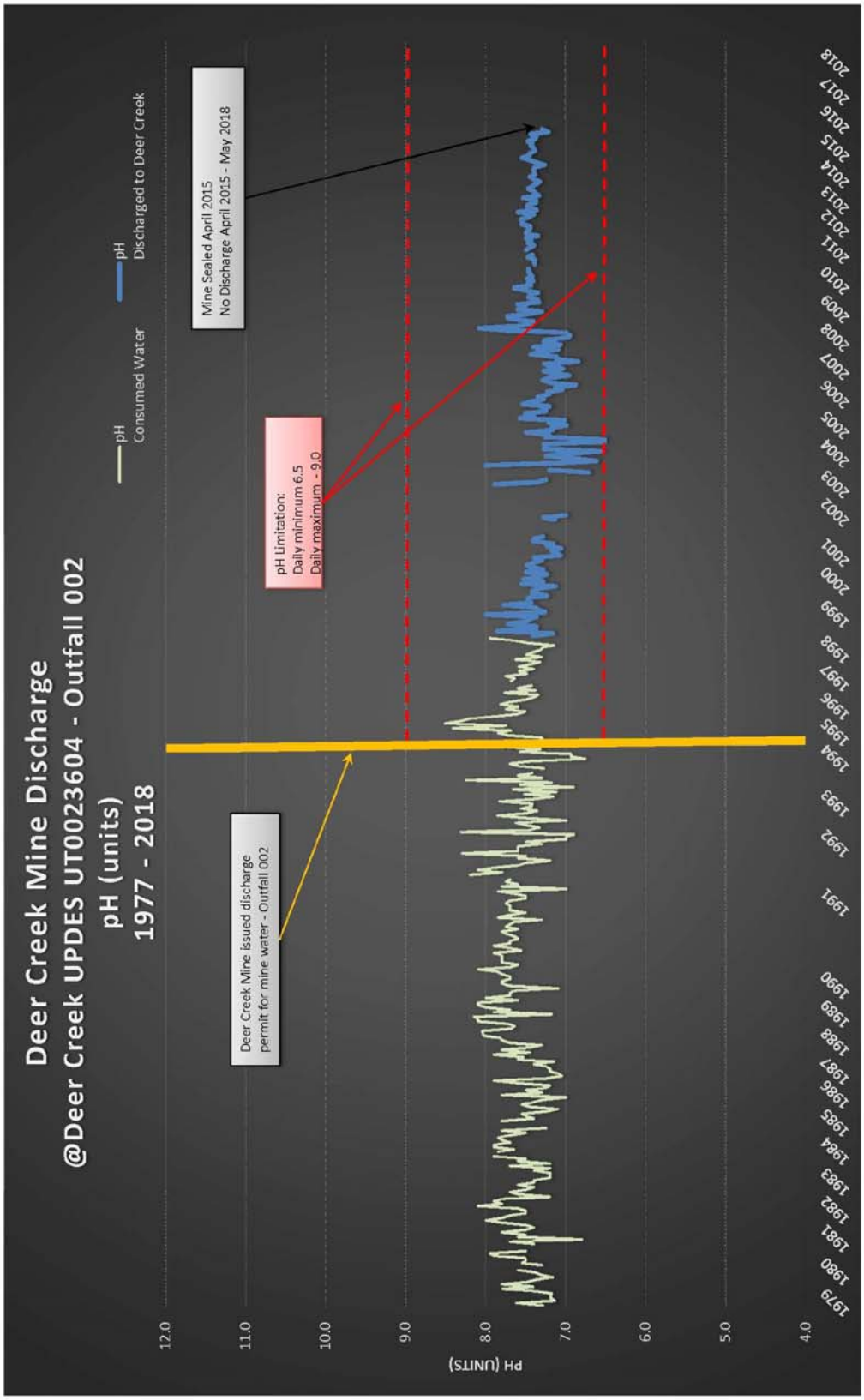
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Partial Relinquishment
Federal Coal Lease
UTSL-050862

November, 2018

Prepared by:

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Partial Relinquishment of Federal Coal Lease UTSL-050862, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's partial relinquishment of acreage under federal coal lease UTSL-050862. The total acreage being surrendered is 270.00 acres. The total acreage being retained for reclamation purposes is 10.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government.

Partial Relinquishment

The legal description for the area of partial relinquishment of UTSL-050862 is described below:

Federal Coal Lease UTSL-050862		
Lease Readjustment Effective Date:		8/5/2017 to 8/5/2027
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**280.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 28:	SW¼SW¼, S½NW¼SW¼, NE¼NW¼SW¼	70.00
Sec 29:	E½SE¼	80.00
Sec 33:	W½NW¼, NW¼SW¼	120.00
	Total Lease Acreage Bering Relinquished:	**270.00**
	Total Lease Acres Remaining:	**10.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec. 28	NW¼NW¼SW¼	**10.00**
	Total Lease Acreage Being Retained:	**10.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43

CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.
This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-050862

LEASE ACTIVITIES

1) Coal Lease Number: UTSL-050862 *(Partial Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 270.00; Entire lease? YES ☐ NO ☒ (See attached map.) Comments: *This is a partial relinquishment. Refer to Exhibit A for the legal descriptions of acreage relinquished and acreage retained. See also Figures 1 and 2 (a map depicting the areas to be relinquihsed and retained). Lease acreage to be retained: 10.00.*

Original Lease Acreage: 280.00 Relinquished to date: 0.00 acres Remaining: 280.00 acres

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)?
YES ☒ NO ☐ (If "YES", describe: *Surface support facilities in Rilda Canyon. All facilities have been removed and all disturbed lands are being reclaimed during 2018-2019 in accordance with DOGM mine permit C/015/0018. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-050862

11) Date of initial mining: December 1992; last mining: February 1996.

12) Number of coal beds mined: 1 coal seam (Blind Canyon)

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to hydrographs*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-050862

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D?
YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
- *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F?
YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
- *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities?
YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐
(If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTSL-050862

Exhibit A

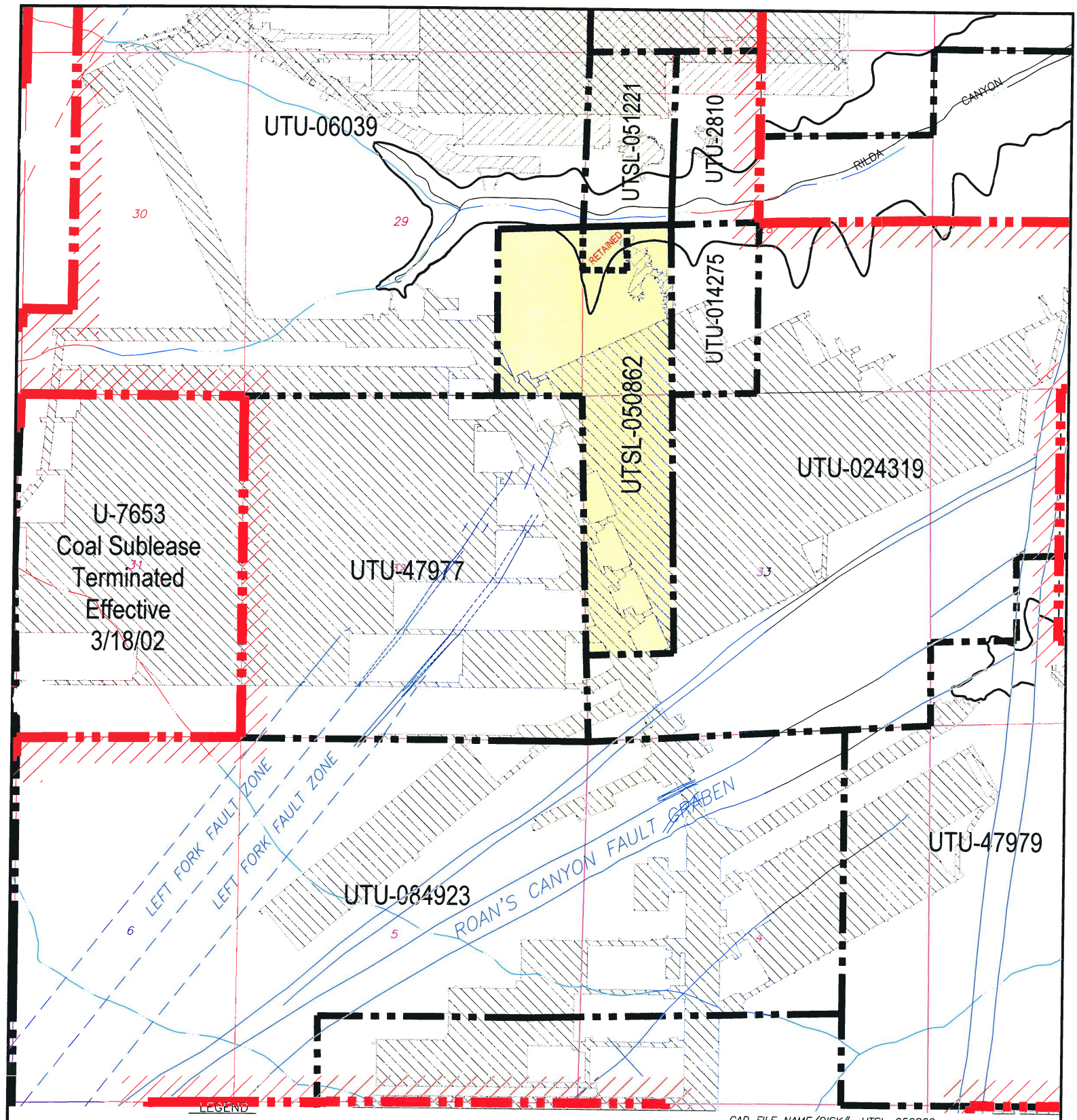
Partial Relinquishment

The legal description for the area of partial relinquishment of UTSL-050862 is described below:

Federal Coal Lease UTSL-050862		
Lease Readjustment Effective Date:		8/5/2017 to 8/5/2027
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**280.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 28:	SW¼SW¼, S½NW¼SW¼, NE¼NW¼SW¼	70.00
Sec 29:	E½SE¼	80.00
Sec 33:	W½NW¼, NW¼SW¼	120.00
	Total Lease Acreage Bering Relinquished:	**270.00**
	Total Lease Acres Remaining:	**10.00**

Lease Acreage Retained (for mine permit legal right-of-entry and surface reclamation purposes)

Description of Lease Acreage Being Retained		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec. 28	NW¼NW¼SW¼	**10.00**
	Total Lease Acreage Being Retained:	**10.00**



LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- SL-050862 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA
- FEDERAL COAL LEASE RETAINMENT AREA

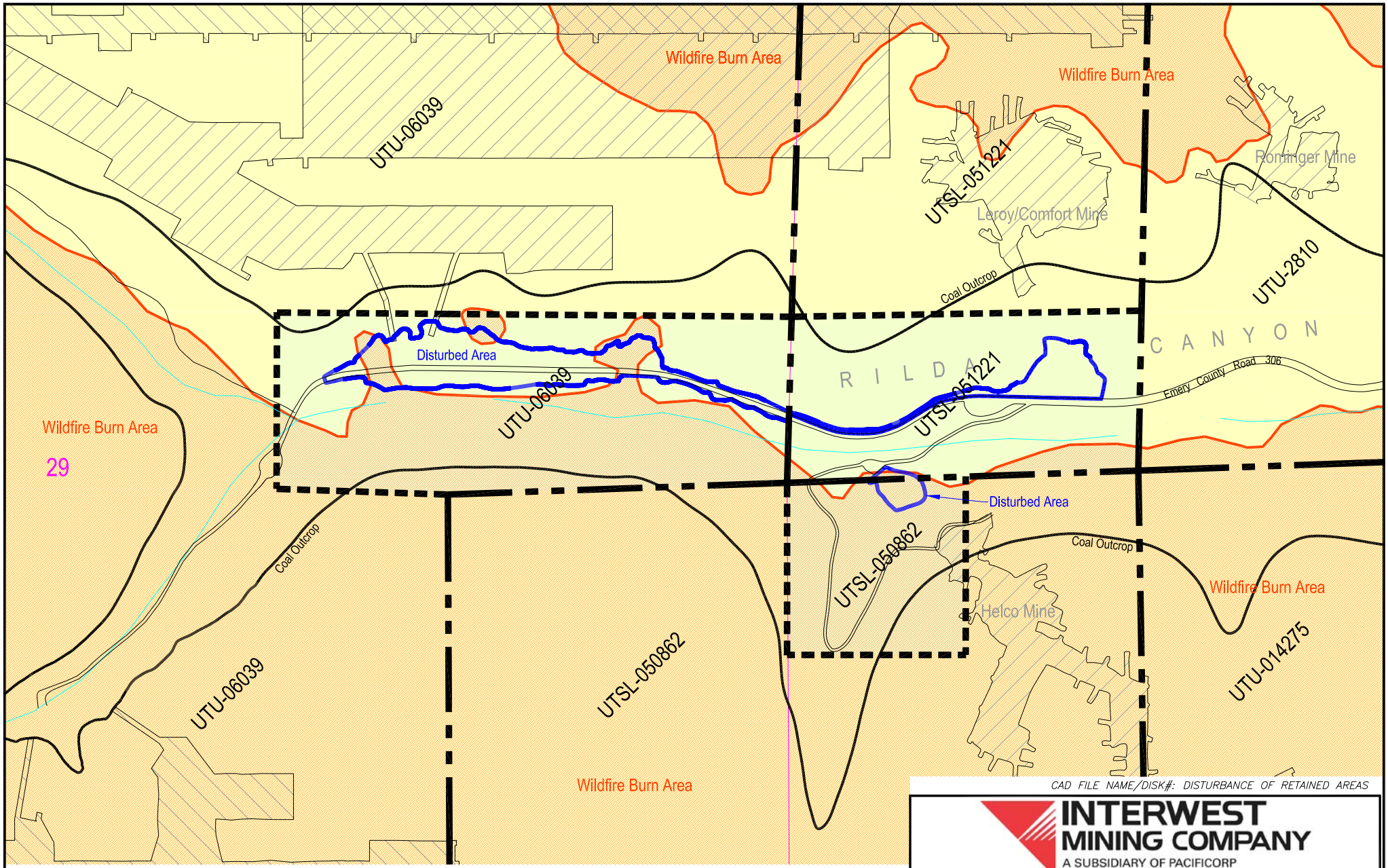
N

CAD FILE NAME/DISK#: UTSL-050862

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-050862

DRAWN BY:	K. LARSEN	FIGURE 1
SCALE:	1" =2000'	DRAWING #:
DATE:	APRIL 30, 2018	SHEET 1 OF 1 REV. ___



LEGEND

	DISTURBED AREA TO BE RECLAIMED
	COAL OUTCROP
	HIAWATHA SEAM MINE WORKINGS
	BLIND CANYON SEAM MINE WORKINGS
UTU-2810	FEDERAL LEASE NUMBER
	FEDERAL LEASE LINE
	FEDERAL COAL LEASE ACREAGE RETAINED
	FEDERAL COAL LEASE ACREAGE RELINQUISHED
	WILDFIRE BURN AREA - JUNE 2018

CAD FILE NAME/DISK#: DISTURBANCE OF RETAINED AREAS

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

DEER CREEK MINE/RILDA CANYON
FEDERAL COAL LEASE ACREAGE RETAINED
WITH DISTURBED AREA

DRAWN BY:	K. LARSEN	FIGURE 2	
SCALE:	1" =500'	DRAWING #:	
DATE:	OCTOBER 1, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTSL-050862
Checklist and Data Documentation for
Federal Coal Partial Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTSL-050862 Partial Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Hiawatha and Blind Canyon seams. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam only took place between 12/1992 and 2/1996. Only a minor amount of previous Hiawatha seam mining was done in the abandoned Helco mine (1938 – 1969) workings beneath 7th East section.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the Trail Mountain Area were collected in 1994. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

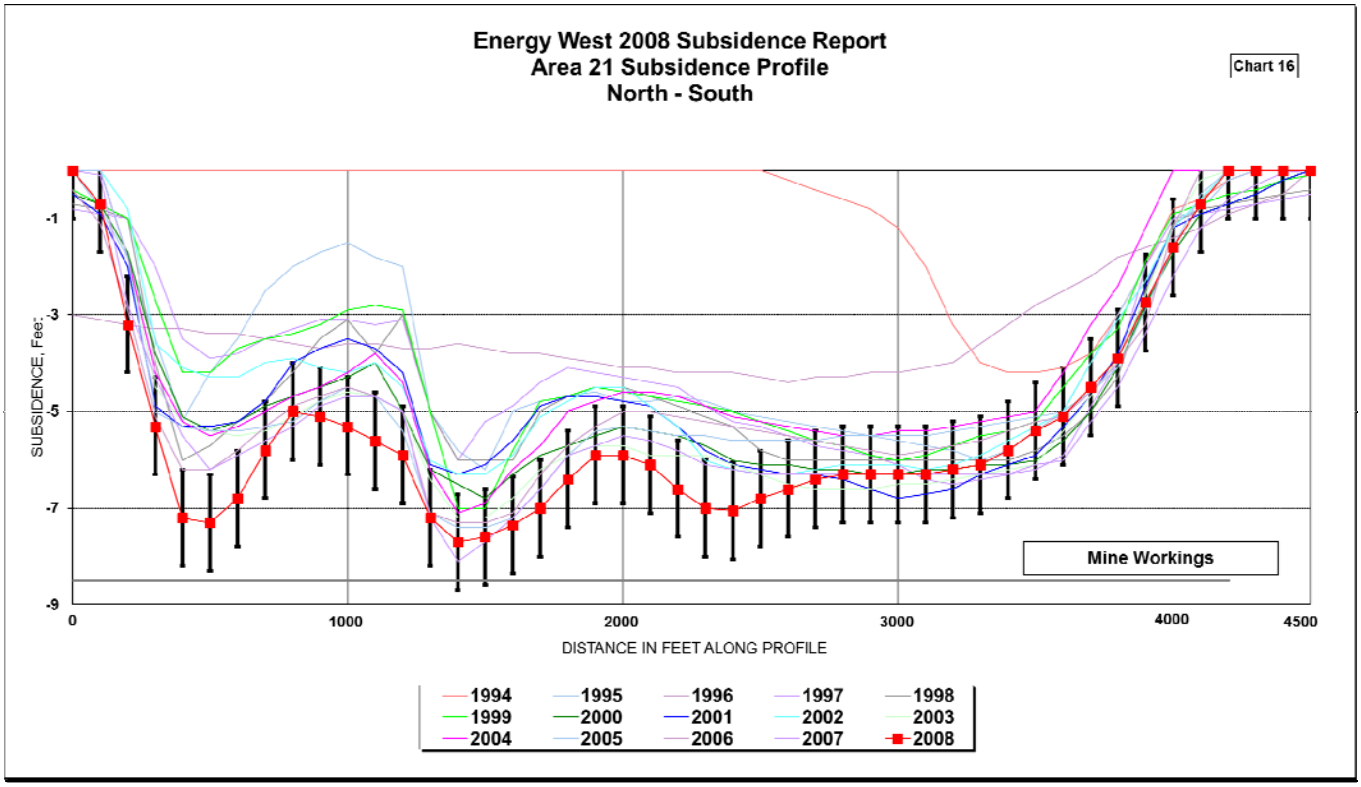
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

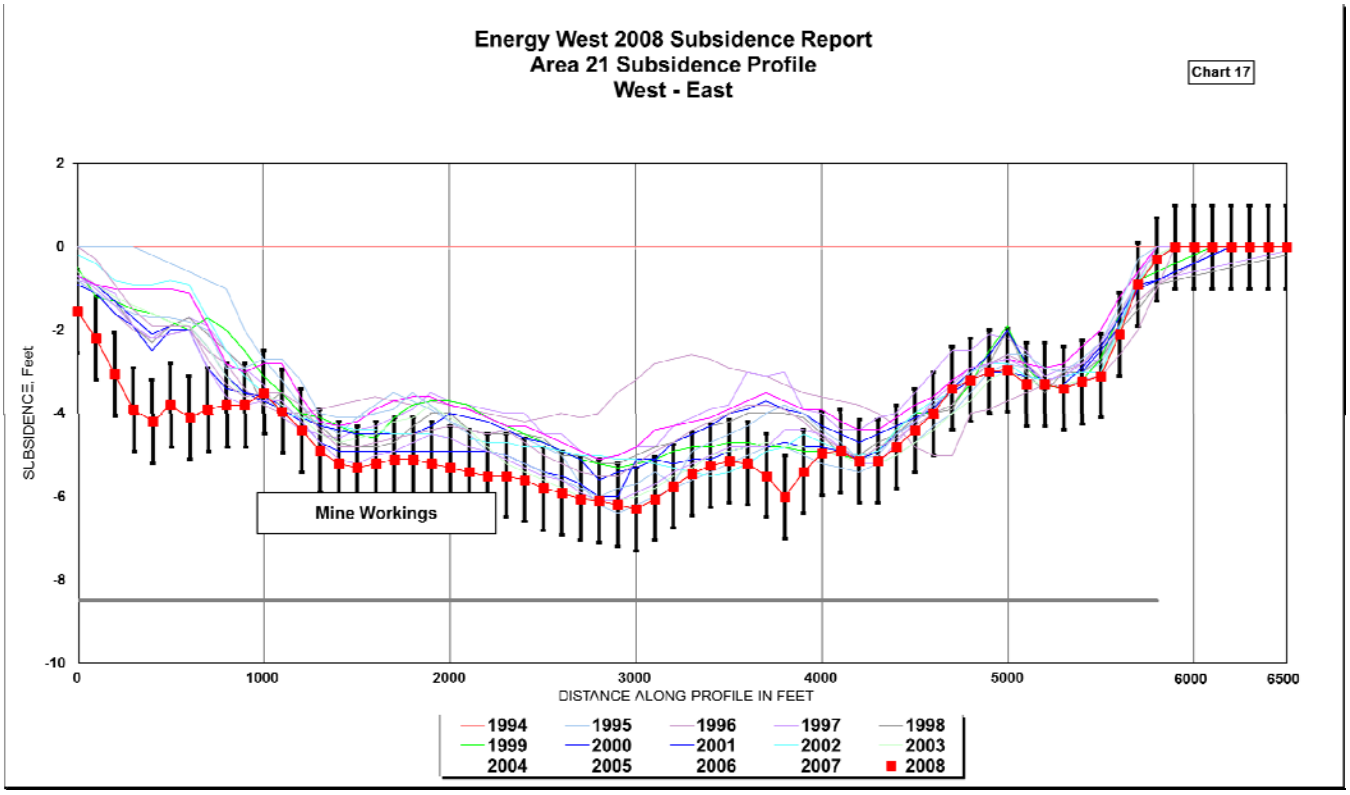
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTSL-050862 Subsidence Data

Subsidence in the lease UTSL-050862 area was monitored from 1994 to 2008. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made in the area between 1994 and 2008. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

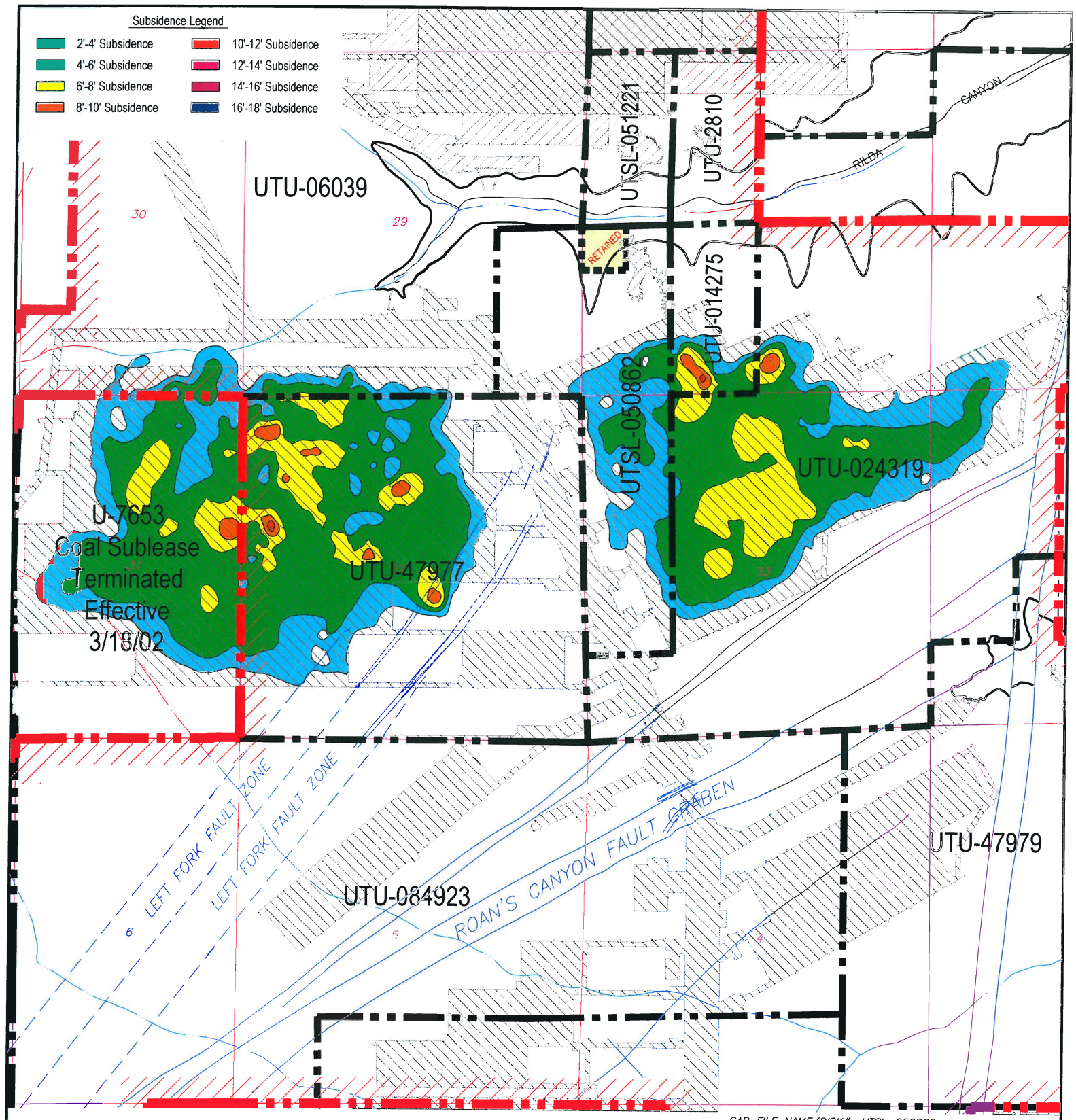
PacifiCorp delineated a series of two profiles near lease UTSL-050862 covering the main longwall panel district east of 3rd North B Mains, are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 8 feet. Some minor surface fracturing (self-healing) and rock rolls occurred on steep slopes. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTSL-050862.

The proposed relinquishment area of Lease UTSL-050862 is stable and subsidence is substantially complete.



CAD FILE NAME/DISK#: UTSL-050862

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- SL-050862 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

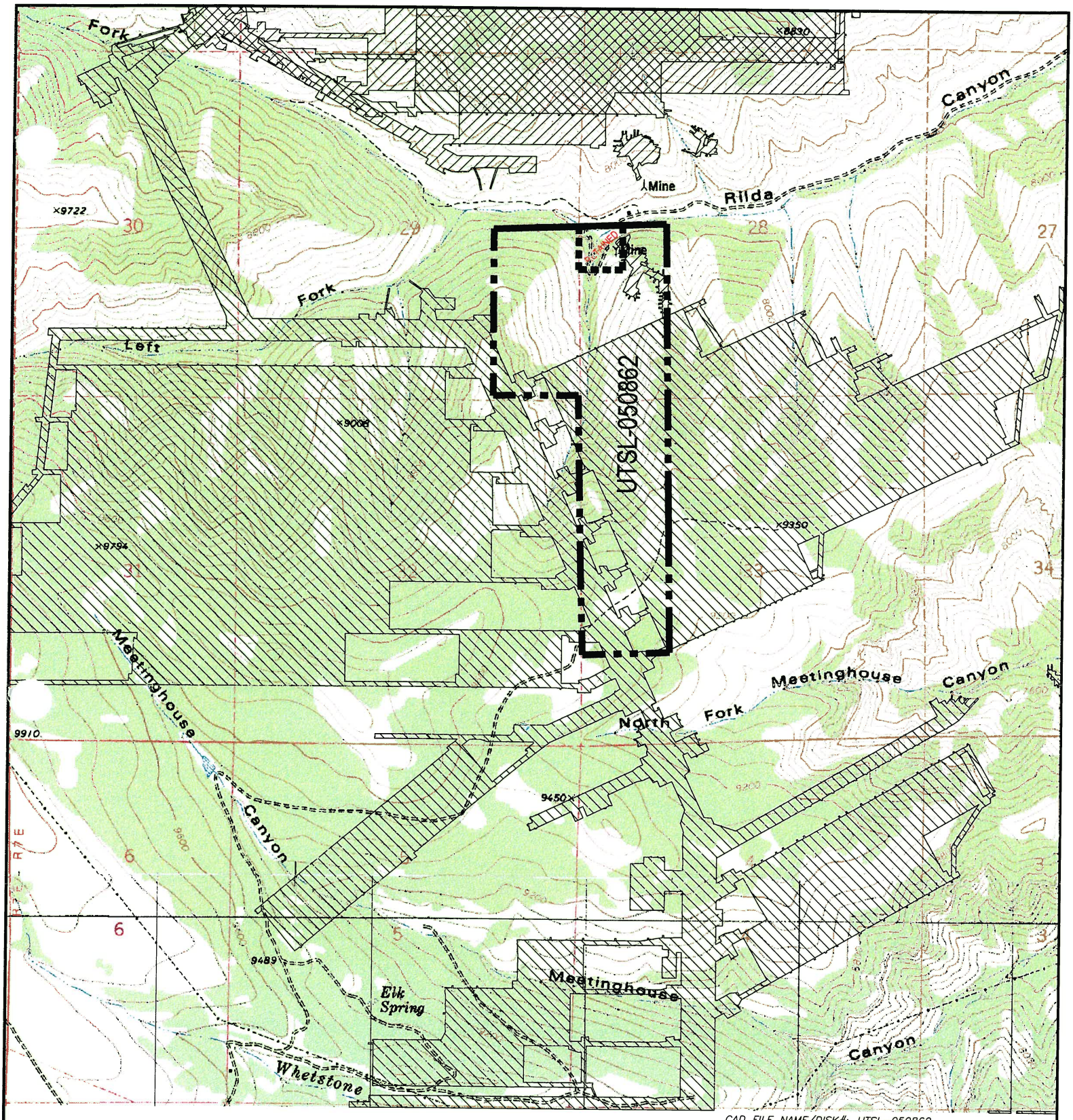
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-050862
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-050862 Partial Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTSL-050862 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTSL-050862. No restoration and/or mitigation efforts are required for Lease UTSL-050862. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTSL-050862 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTSL-050862

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

FEDERAL LEASE ACREAGE RETAINED

N

INTERWEST MINING COMPANY
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EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-050862
TOPOGRAPHIC BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX B
SCALE:	1" =2000'	DRAWING #:
DATE:	APRIL 30, 2018	SHEET 1 OF 1 REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-050862 Partial Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 100 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTSL-050862 and surrounding area (North Rilda Ridge).

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP). Lease UTSL-050862 is near to the Mill Fork Lease area and includes within the adjacent ½ mile zone some of the surface sites that are part of the surface hydrology monitoring plan.

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface

water resources within and adjacent to Federal Lease UTSL-050862.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The North Rilda Ridge 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the North Rilda Ridge 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. 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 PacifiCorp mining area covers portions of East Mountain.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open

marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, and is exposed in the North Rilda Ridge area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the North Rilda Ridge area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 of this 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity

is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the North Rilda Ridge area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the East Mountain area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet. There is no Flagstaff Limestone in the North Rilda Ridge area.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing

abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone are limited to a narrow north-south trending ridge located several miles west of the North Rilda Ridge area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the water bearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk	Ss, f	1,521	14	1.5x10-2	3.7x10-3
Formation	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point	Ss, m	2,466	17	3.1x10-2	1.1x10-2
Sandstone	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 the North Rilda Ridge area.

Folding:

Strata in the North Rilda Ridge area are gently folded in two broad structural features. The Flat Canyon Anticline crosses to the west of the lease 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. The strata within Lease UTSL-05221 are located on the southeastern limb of the Flat Canyon Anticline, which is also the northwestern limb of the Straight Canyon Syncline. Strata dip about 2 - 4 degrees to the southeast.

Faulting:

There is no faulting within the UTSL-05221 lease area. The nearest known faulting to the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes about 1 mile to the northwest of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates

general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk

Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The δ2H and δ18O compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.
7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years

b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of

surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its CO2(g) in the soil zone where the partial pressure of CO2 greatly exceeds atmospheric levels. This CO2 combines with water to form carbonic acid according to

$$CO2(g) + H2O = H2CO3 \quad (1)$$

Carbonic acid dissociates into H+ and HCO3- as

$$H2CO3 = HCO3^- + H+ \quad (2)$$

The H+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H+ + CaMg(CO3)2 = Ca2+ + Mg2+ + 2HCO3^-, \text{ and} \quad (3)$$
(dolomite)

$$H+ + CaCO3 = Ca2+ + HCO3^- \quad (4)$$
(calcite)

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$CaSO_4 \cdot 2H_2O = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$
(gypsum)

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute

concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-clay} = 2Na^+ + Ca\text{-clay} \quad (9)$$

$$Mg^{2+} + Na\text{-clay} = 2Na^+ + Mg\text{-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs

discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically

dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} -HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent

with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and $\delta^{18}O$

The δ^2H and $\delta^{18}O$ composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and $\delta^{18}O$ composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Interwest and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork area spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^3H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^3H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^3H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^3H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is

minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir

downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less

than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute

significant groundwater to the discharge from the spring.

Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – NORTH RILDA RIDGE AREA

A. GROUNDWATER

Groundwater within the North Rilda Ridge area was monitored according to the schedules in established in the Deer Creek MRP. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining. There are no surface springs within the lease area of UTSL-05221 that is to be relinquished. PacifiCorp has conducted baseline and operational monitoring of spring sources adjacent to the lease area. The nearest springs within ½ mile of the relinquishment boundary are located at the North Emery Water Users Special Service District Rilda Canyon Springs collection system, which taps a series of alluvial springs in the floor of Rilda Canyon.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the adjacent Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.

The ground water monitoring plan in Appendix C includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights

- Measurable flow based on historical surveys
- Reliable measuring point(s)

The following table outlines the rationale for springs selected for long term monitoring. Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency. The spring collection system operated by the North Emery Water Users Special Service District is within ½ mile. Data related to monitoring point RCF3 is included in Appendix C.

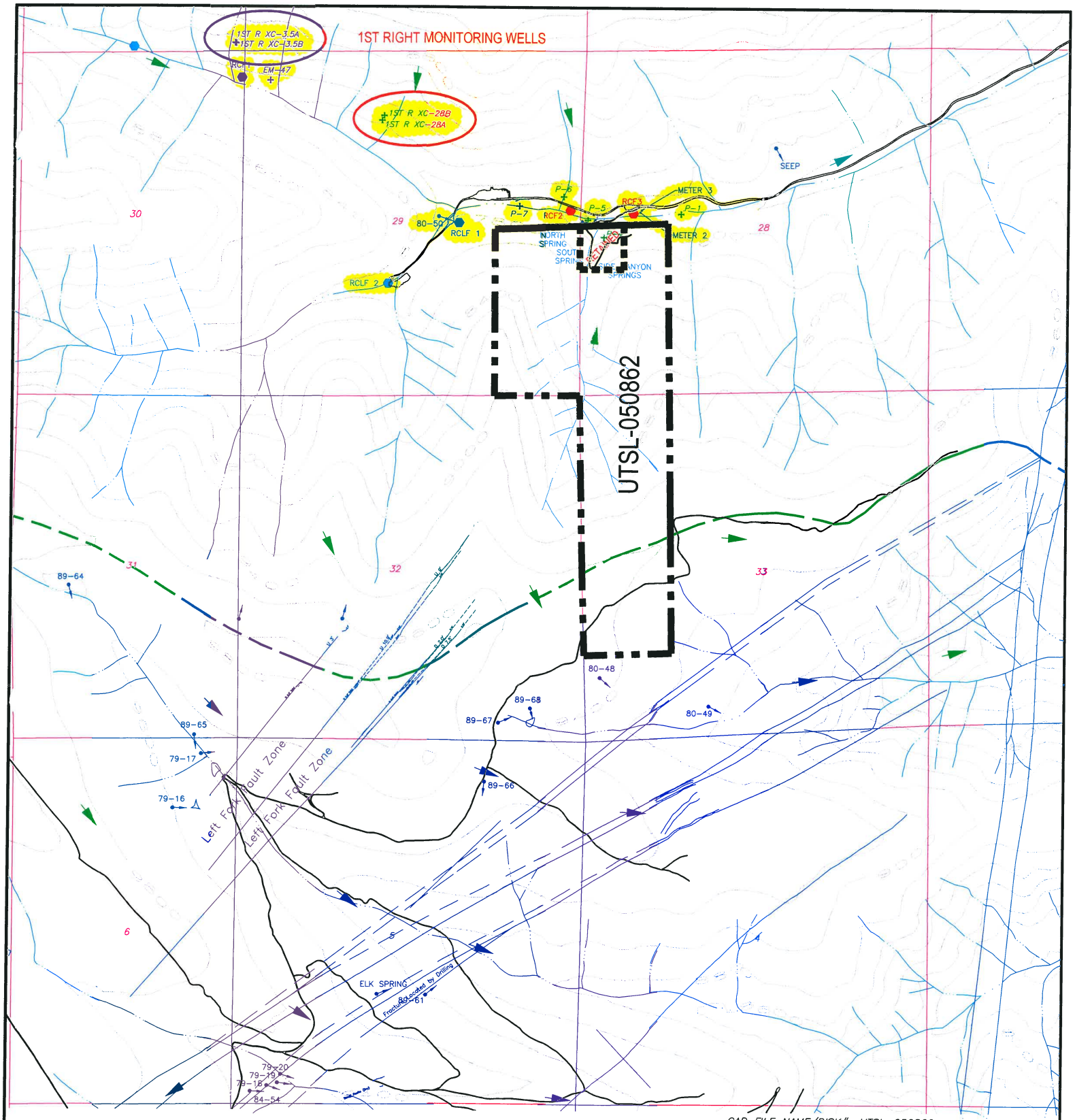
GROUNDWATER MONITORING PLAN - SPRINGS							
Spring	Stratigraphic Position	Projected Subsidence Zone	Regional Location	Water Rights	Historical Measurable Flow	Reliable Measuring Point	Comment
80-50	✓		✓		✓	✓	

Water samples were collected and analyzed during the months of July and October. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTSL-050862 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTSL-050862 are ephemeral. The majority of the surface flow from the lease area drains to the south into Rilda Canyon which reports to Huntington Creek. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



CAD FILE NAME/DISK#: UTSL-050862

LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-050862
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Location: Section 29, Township 16 South, Range 7 East, SLB&M. This site is located within the Deer Creek mine permit boundary and within the Federal Coal lease UTU-06039.

Lease Association: Spring 80-50 is located within Federal Coal lease UTU-06039. The lease was originally issued effective May 1, 1953. Both the Hiawatha and Blind Canyon seams have been mined in this lease. Room and pillar mining began in the Blind Canyon Seam in November 1993 with the first longwall retreat in August 1999. Hiawatha seam development began in October 2000 with the first longwall retreat in April 2002. . No mining occurred in vicinity of 80-50.

Subsidence: No subsidence has been detected near 80-50. The 2008 Annual Subsidence Report reported that the subsidence west of the spring has been stable since at least 2005. 80-50 is outside of the subsided area.

For additional data related to subsidence refer to the 2008 Annual Subsidence Report.

Hydrologic Data (Quality and Quantity):

- Quality
  - Historic pre/post mining water quality data is included for spring 80-50. Date of database query for pre/post mining determination for each spring is based on the date of the nearest mining. Data show no abnormalities in the water quality parameters for this area of East Mountain.
- Quantity
  - Historic flow data has been collected from 2001 and has continued through 2017. This information is found on the following page where July spring flow is plotted against precipitation data collected from the East Mountain weather station, as well as the Palmer Drought Index for regions 4, and 5. The East Mountain weather station is located on the southern tip of East Mountain.
  - 80-50 is located on east facing hillside which is densely populated with spruce trees above the Rilda Canyon road (Emery County Road #306) turn around. Flow from spring 80-50 generally ranges from 0gpm/seep to a maximum of 3.5 gpm.

Geologic Mode of Occurrence for spring 80-50:

- Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.
- Geologic Formation: Blackhawk Formation (refer to Geologic Occurrence sheet).
- Stratigraphic Position: 100' above base.

Justification for removal from monitoring: 80-50 has been monitored by PacifiCorp from 1980 through 1986 and from 1996 through 2018. There have been no reported occurrences in which mining has impacted this site. Historic quality and quantity data have not indicated such impacts to the site.

All mining activities in Lease UTU-88554 and adjacent Federal Lease UTU-84285 (west and north of UTU-06039) ceased as of January 7, 2015. Deer Creek Mine portals were sealed April 17, 2015 as a facet of the Deer Creek mine closure process. All mining equipment including the mine dewatering system was removed from the mine prior to sealing. Withdrawal of all mining equipment inby the parallel plug locations commenced upon completion of mining PacifiCorp coordinated removal of the mining equipment, including conducting environmental inspections, with the subsurface management agency and State of Utah regulators. A double redundant French drain system (two separate well screen intake setups installed in two separate portals) was installed in the two lowest elevation portals at the Deer Creek Mine site to allow for a permanent post mine gravity discharge of groundwater from the southern portion of the mine. The remaining Rilda Canyon portion was left open while implementing mitigation measures to handle anticipated intercepted groundwater. Final sealing of the Rilda Canyon 1st Right portals consisted of first constructing a water drainage system including an in-mine collection gallery together with the construction and permanent placement of a water pipeline from Rilda Canyon 1st Right to the Huntington Power Plant raw water pond. The pipeline project was completed in November 2017. The final Rilda Canyon 1st Right portal sealing consisted of two 25-foot thick concrete portal plugs with water drains, one each in the 1st Right facility fan and roadway portals, that were constructed on November 8 and 10, 2017, and high strength panel seals, one each in the Left Fork facility fan and roadway portals completed on December 18 and December 20, 2017. The portal seals were constructed to meet or exceed regulatory requirements of 30CFR 75.1711. With the completion of the Rilda Canyon Left Fork Portals seals, final abandonment and closure of the Deer Creek Mine has been concluded. PacifiCorp will commence with final reclamation activities of the entire Deer Creek Mine complex per the approved reclamation plan.

With the completion of three years of hydrologic monitoring after the last date of mining, PacifiCorp formally requests that site 80-50 be removed from the monitoring program.

EAST MOUNTAIN

EAST MOUNTAIN & SEEP SURVEY

GEOLOGIC OCCURRENCE

Spring Name/Number: **80-50**

Location		From Section Corner	Section	Township	Range	Elevation (above mean sea level)
Feet	Feet					
2850’ S.	2230' W.	NW	29	16S	7E	7810

Geologic Formation	*Development*	*Water Right*	*Stratigraphic Position*
Blackhawk	None	None	100' above bottom

Location Comments: Spring located on east facing hillside which is densely populated with spruce trees.

Probable Recharge Area: Areas of higher elevations which are located to the west.

Relationship to Adjacent Springs: Spring not associated with any other springs.

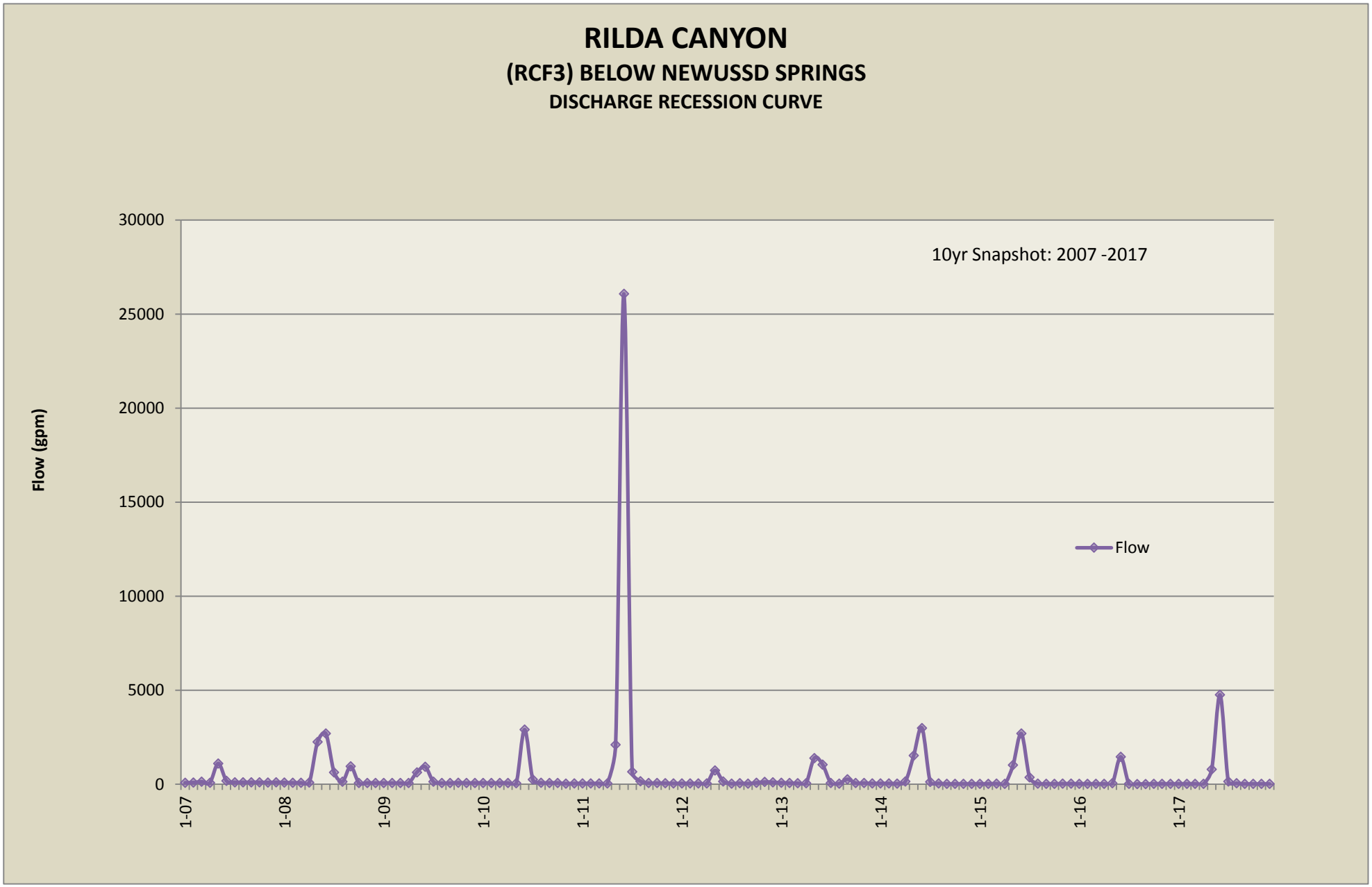
Geologic Occurrence of Spring:

Water flowing along fractures in the Blackhawk Formation intersects the land surface forming a spring.

Spring 80-50, May 22, 2018

East Mountain Spring: 80-50
Water Quality Data: Operational
Mine Association: Deer Creek Mine - East Mountain
Date of Development: Not undermined
Date of Second Mining: Not undermined
Location of Nearest Mining: 1890'
Date of Nearest Mining: May-05

	Pre-Mining Data: 19770101 THROUGH 20031001				Post-Mining Data: 20031030 THROUGH 20171231				
PARAMETER	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	MAXIMUM	MINIMUM	AVERAGE	# ANALYSIS	
BICARBONATE	574	456	504.375	16	421	343	387.23	13	BICARBONATE
CALCIUM	150	44	59.8625	16	70.84	48.5	57.9692	13	CALCIUM
CARBONATE	0				0	0	0	9	CARBONATE
CHLORIDE	28	9	18.025	16	24	8	14.4615	13	CHLORIDE
CONDUCTIVITY	1298	872	1073.06	16	1249	800	991.538	13	CONDUCTIVITY
DISSOLVED OXYGEN	10.2	6.3	8.25	2	0				DISSOLVED OXYGEN
FLOW	3	0.38	1.436875	16	2.36	0.18	1.11538	13	FLOW
HARDNESS	670	452	566.214	14	679	420	525.384	13	HARDNESS
TOTAL IRON	0.8	0.063	0.4315	2	3.06	0	0.37363	11	TOTAL IRON
DISSOLVED IRON	0.4	0.33	0.365	2	0	0	0	9	DISSOLVED IRON
MAGNESIUM	133	27	98.63125	16	132	65.31	92.4038	13	MAGNESIUM
DISSOLVED MANGANESE	0				0.141	0	1.82222	9	DISSOLVED MANGANESE
MANGANESE	0				0.009	0	0.0009	10	MANGANESE
OIL AND GREASE	0				0				OIL AND GREASE
PH	8.14	7.04	7.748125	16	8.23	7.12	7.97692	13	PH
POTASSIUM	12	3	4.3125	16	3.58	2.53	3.03461	13	POTASSIUM
SET SOLIDS	0				0				SET SOLIDS
SODIUM	46	18	26.3125	16	25.5	19.18	21.943	13	SODIUM
SULFATE	252	114	184.525	16	256	89	154	13	SULFATE
SUSPENDED SOLIDS	79	1.5	40.25	2	0				SUSPENDED SOLIDS
TEMPERATURE	8.3	6.3	7.51875	16	11.4	7.6	9.15384	13	TEMPERATURE
TOTAL DISSOLVED SOLIDS	810	494	651.625	16	721	470	588.153	13	TOTAL DISSOLVED SOLIDS


RILDA CANYON
(RCF3) BELOW NEWUSSD SPRINGS
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
30000
25000
20000
15000
10000
5000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - BELOW NEWUA SPRINGS

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170313	0.0	354.0	99.2	0.0	32.0	1013.0	8.1	493.0	0.2	0.1	59.6	0.0	0.0	8.1	4.2	28.5	177.0	0.0	611.0
20170608	0.0	222.0	60.7	0.0	2.0	449.0	10.2	239.0	0.5	0.0	21.2	0.0	0.0	8.6	1.0	5.4	15.0	165.0	252.0
20170907	6.0	320.0	82.0	0.0	15.0	885.0	10.4	407.0	0.1	0.0	49.1	0.0	0.0	8.6	3.1	20.9	137.0	0.0	514.0
20171205	0.0	331.0	90.7	0.0	12.0	901.0	13.1	443.0	0.1	0.0	52.6	0.0	0.0	8.0	3.4	21.6	143.0	8.0	575.0
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2017																			
MIN	0	222	61	0	2	449	8	239	0	0	21	0	0	8	1	5	15	0	
MAX	6	354	99	0	32	1013	13	493	1	0	60	0	0	9	4	29	177	165	
MEAN	0.00	306.75	83.14	0.00	15.25	812.00	10.45	395.50	0.23	0.01	45.62	0.01	0.00	8.32	2.91	19.11	118.00	43.25	
2016**																			
MIN	0.0	205.0	55.2	0.0	1.0	381.0	8.7	210.0	0.0	0.0	17.5	0.0	0.0	8.0	0.0	4.4	12.0	0.0	272.0
MAX	6.0	350.0	95.0	0.0	10.0	880.0	9.9	483.0	0.5	0.0	59.6	0.0	0.0	8.1	2.9	23.6	159.0	56.0	589.0
MEAN	1.5	302.8	82.3	0.0	7.8	746.5	9.4	398.5	0.3	0.0	46.8	0.0	0.0	8.1	2.1	18.5	115.0	19.3	493.0
2015**																			
MIN	0	218	52	0	2	419	10	218	0	0	22	0	0	8	1	5	14	0	277
MAX	0	343	87	0	10	895	10	454	3	0	58	0	0	9	3	24	157	221	583
MEAN	0	303	78	0	8	769	10	388	1	0	47	0	0	8	2	19	117	83	506
2014**																			
MIN	0	339	85	0	9	871	0	425	0	0	52	0	0	8	3	25	139	0	550
MAX	6	343	89	0	10	920	0	447	0	0	54	0	0	8	4	55	170	0	586
MEAN	3	341	87	0	10	896	0	436	0	0	53	0	0	8	3	40	155	0	568
2013**																			
MIN	0	205	53	0	1	155	0	221	0	0	20	0	0	8	1	7	17	0	214
MAX	5	339	97	11	10	901	0	486	12	0	59	0	0	9	3	25	154	1092	562
MEAN	3	274	76	3	6	599	0	351	3	0	39	0	0	8	2	16	88	284	386
2012**																			
MIN	0	250	67	0	4	576	8	297	0	0	32	0	0	8	1	12	56	0	334
MAX	30	350	101	0	10	921	8	495	0	0	59	0	0	8	3	26	159	8	556
MEAN	8	312	85	0	8	782	8	413	0	0	48	0	0	8	2	20	113	4	468
2011**																			
MIN	0	212	59.9	0	2.0	423	8.70	228	0.16	0.00	19.14	0.00	0.00	7.95	0.80	4.79	13.0	0.0	258
MAX	5	351	97.0	0	11.0	899	8.70	481	14.79	0.00	58.07	0.03	0.00	8.54	2.82	24.63	152.0	1786.0	573
MEAN	1	287	79.9	0	7.0	702	8.70	373	3.86	0.00	42.22	0.02	0.00	8.19	1.97	16.74	95.0	448.0	436
2010**																			
MIN					2.0	411	6.10	221	0.29		18.45	0.00		7.87	0.81	5.10	13.0	0.0	233
MAX					11.0	922	10.20	510	1.37		62.65	0.04		8.56	3.10	26.36	157.0	100.0	592
MEAN					7.3	765	8.80	419.75	0.65		48.58	0.02		8.14	2.42	19.78	111.3	34.0	488
2009**																			
MIN	0	217	62		2	462	8	251	0		23	0		8	1	7	26	6	288
MAX	15	374	108		10	1005	9	545	1		67	0		8	3	30	183	90	678
MEAN	9	330	91		8	840	8	448	1		53	0		8	3	22	130	31	550
2008**																			
MIN	0	179	61		2	470	9	242	1		22	0		8	1	5	18	8	247
MAX	20	378	115		10	1072	16	577	1		70	0		9	4	29	213	12	742
MEAN	10	322	97		8	911	12	471	1		55	0		8	3	23	147	10	571
2007**																			
MIN		285	77.6		6.0	834	10.09	378	0.20		44.70	0.02		7.54	1.86	15.60	90.0	5.0	438
MAX		400	132.0		12.0	1304	12.48	614	1.17		69.10	0.09		8.04	3.51	30.06	255.0	6.0	746
MEAN		370	111.2		10.2	1128.2	11.26	536.2	0.50		62.75	0.05		7.79	3.14	26.11	196.0	5.5	652.6
2006**																			
MIN		220	62		3.0	487	10.3	252	0.16		23.8	0		7.78	0.98	6.4	25	6	278
MAX		376	112		12.0	1073	12.5	563	0.30		69.0	0		8.18	3.32	26.8	185	18	626
MEAN		328	94		8.8	906	11.7	454	0.25		53.3	0		7.97	2.57	20.9	135	10	517
HISTORICAL 1989-2016																			
MIN	0.0	179.0	50.4	0.0	1.0	155.0	4.4	204.0	0.0	0.0	17.5	0.0	0.0	7.5	0.0	4.4	7.0	0.0	199.0
MAX	38.0	500.0	132.0	30.0	50.0	1304.0	15.5	748.0	14.8	0.4	70.2	0.2	5.0	8.8	5.0	55.0	255.0	1786.0	746.0
MEAN	6.6	344.7	84.5	3.1	8.7	748.0	8.7	403.5	0.7	0.0	45.5	0.0	1.1	8.1	2.3	17.9	107.3	67.5	464.1
COUNT	67	103	103	62	103	104	79	103	101	56	103	75	59	104	100	103	103	79	103

*** Quality parameters are reported as mg/l unless otherwise noted.**
**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTSL-050862 Partial Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 100 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface vegetation characteristics of the area.

Vegetation of Lease UTSL-050862 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTSL-050862:

Mountain Mahogany	MM
Pinyon-Juniper	PJ
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

Stat. of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

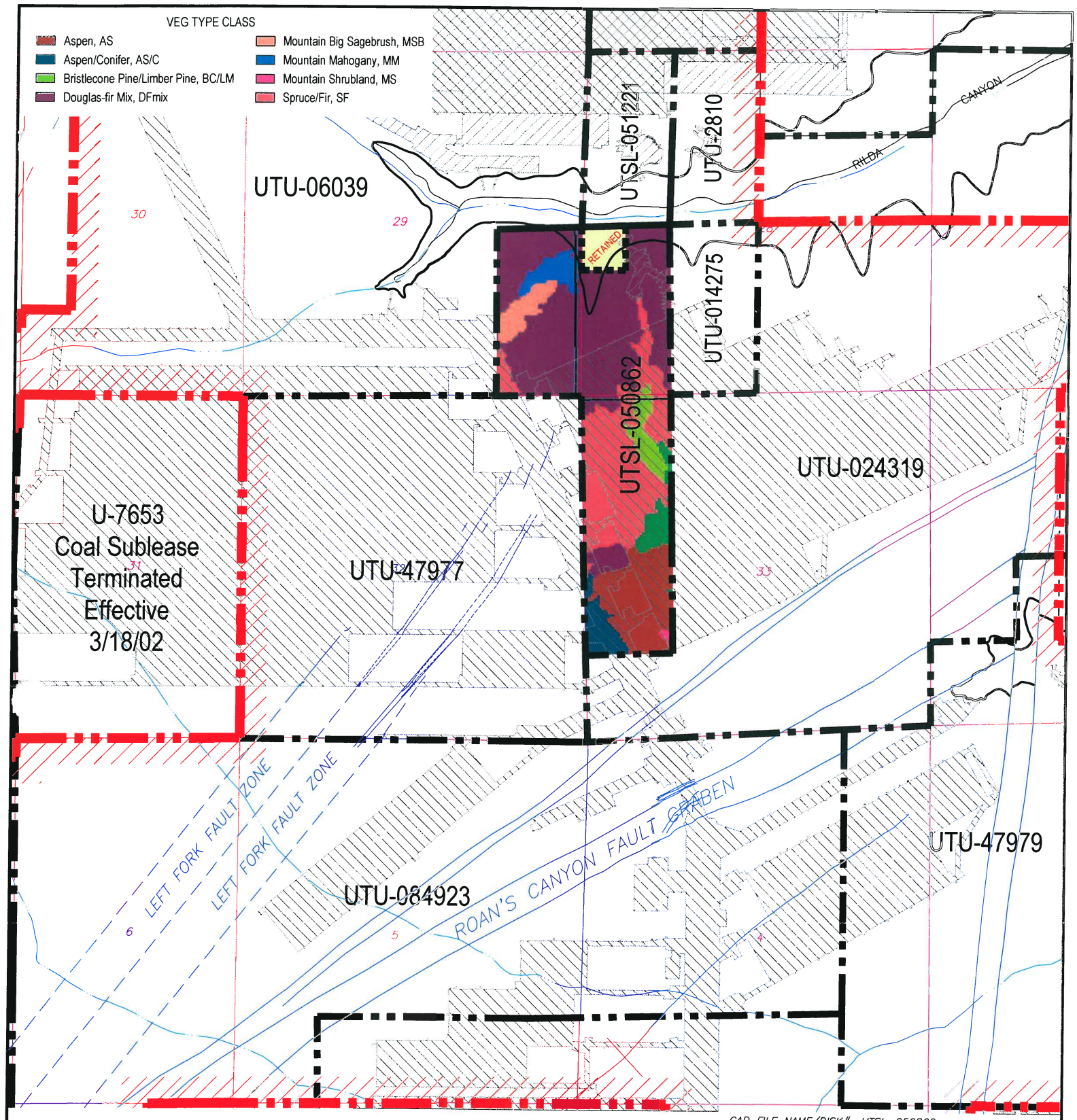
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTSL-050862 area. There were no surface facilities or installations on this lease.



CAD FILE NAME/DISK#: UTSL-050862

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- SL-050862 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTSL-050862
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTSL-050862 Partial Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in Lease UTSL-050862.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTSL-050862 lease have been submitted when those districts were sealed. Previous CERCLA inspections within UTSL-050862 have taken place in January 2002, December 2002 (Blind Canyon Seam) and December 2004 (Hiawatha Seam). CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-050862 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North B Mains, 1st through 7th East Sections, 4th West Section and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTSL-050862 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North B Mains, 1st through 7th East Sections, 4th West Section and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTSL-050862 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North B Mains, 1st through 7th East Sections, 4th West Section and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTSL-050862 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North B Mains, 1st through 7th East Sections, 4th West Section and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: Nov. 7, 2018

Lease(s) # UTSL-050862 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North B Mains, 1st through 7th East Sections, 4th West Section and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
D-Box	**March 19, 2015**	**None**	**3rd North B Mains XC-131 Ent. 5**

SUMMARY WATER ANALYSIS REPORT

Lease(s) #UTSL-050862 Partial Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 3rd North B Mains, 1st through 7th East Sections, 4th West Section and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 02/92 – 12/17

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTSL-050862
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 3rd North B Mains, 1st through 7th East Sections, 4th West Section and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (12/92 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	12/92 - 4/15	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	12/92 - 4/15	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	12/92 - 4/15	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	12/92 - 4/15	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	12/92 - 4/15	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	12/92 - 4/15	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	12/92 - 4/15	Naptha	40 - 50%	64742-94-5	All Sections
	12/92 - 4/15	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	12/92 - 4/15	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	12/92 - 4/15	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	12/92 - 4/15	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	12/92 - 4/15	Propane	14%	74-98-6	All Sections
	12/92 - 4/15	Butane	13%	106-97-8	All Sections
	12/92 - 4/15	Toluene	17%	108-88-3	All Sections
	12/92 - 4/15	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	12/92 - 4/15	Napthalene	0.40%	91-20-3	All Sections
	12/92 - 4/15	Acetone	41%	67-64-1	All Sections
	12/92 - 4/15	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	12/92 - 4/15	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	12/92 - 4/15	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	12/92 - 4/15	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	12/92 - 4/15	Mineral Oil	20 - 25%	8042-47-5	All Sections
	12/92 - 4/15	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	12/92 - 4/15	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	12/92 - 4/15	Methanol	<20%	67-56-1	All Sections
	12/92 - 4/15	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	12/92 - 4/15	Heptane	69 - 79%	142-82-5	All Sections
	12/92 - 4/15	Ethyl Ether	11 - 21%	60-29-7	All Sections
	12/92 - 4/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	12/92 - 4/15	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	12/92 - 4/15	Heptane	60 - 70%	142-82-5	All Sections
	12/92 - 4/15	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	12/92 - 4/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	12/92 - 4/15	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	12/92 - 4/15	None			All Sections
Cat Transmission and Drive Train Oil	12/92 - 4/15	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	12/92 - 4/15	Monoethanolamine	<10%	141-41-3	All Sections
	12/92 - 4/15	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	12/92 - 4/15	Mineral Oil	70 - 95%	Mixture	All Sections
	12/92 - 4/15	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	12/92 - 4/15	Lubricant base oil	87 - 91%	Various	All Sections
	12/92 - 4/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	12/92 - 4/15	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	12/92 - 4/15	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	12/92 - 4/15	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	12/92 - 4/15	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	12/92 - 4/15	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	12/92 - 4/15	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	12/92 - 4/15	Trichloroethylene	95 - 99%	79-01-6	All Sections
	12/92 - 4/15	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	12/92 - 4/15	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	12/92 - 4/15	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	12/92 - 4/15	Deionized Water	1 - 3%	7732-18-5	All Sections
	12/92 - 4/15	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTSL-050862
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 3rd North B Mains, 1st through 7th East Sections, 4th West Section and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (12/92 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	12/92 - 4/15	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	12/92 - 4/15	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	12/92 - 4/15	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	12/92 - 4/15	Calcium sulfate	2 - 10%		All Sections
	12/92 - 4/15	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	12/92 - 4/15	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	12/92 - 4/15	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	12/92 - 4/15	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	12/92 - 4/15	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	12/92 - 4/15	Lead	34%	7439-92-1	All Sections
	12/92 - 4/15	Lead Dioxide	31%	1309-60-0	All Sections
	12/92 - 4/15	Lead Sulfate	<1%	7446-14-2	All Sections
	12/92 - 4/15	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	12/92 - 4/15	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	12/92 - 4/15	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	12/92 - 4/15	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	12/92 - 4/15	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	12/92 - 4/15	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	12/92 - 4/15	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	12/92 - 4/15	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	12/92 - 4/15	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	12/92 - 4/15	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	12/92 - 4/15	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	12/92 - 4/15	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	12/92 - 4/15	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	12/92 - 4/15	Portland Cement		65997-15-1	All Sections
	12/92 - 4/15	Crystalline Silicon Dioxide		13397-24-5	All Sections
	12/92 - 4/15	Calcium Hydroxide		001-305-620	All Sections
	12/92 - 4/15	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	12/92 - 4/15	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	12/92 - 4/15	Polyglycols	60 - 100%	Mixture (2)	15 W
	12/92 - 4/15	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	12/92 - 4/15	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	12/92 - 4/15	Polyester Resin	5 - 15%	Not Reported	All Sections
	12/92 - 4/15	Styrene Monomer	3 - 7%	100-42-5	All Sections
	12/92 - 4/15	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	12/92 - 4/15	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	12/92 - 4/15	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	12/92 - 4/15	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	12/92 - 4/15	Isobutane	2 - 10%	75-28-5	All Sections
	12/92 - 4/15	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	12/92 - 4/15	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	12/92 - 4/15	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	12/92 - 4/15			64742-48-9	All Sections
	12/92 - 4/15			64742-88-7	All Sections
	12/92 - 4/15	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	12/92 - 4/15	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	12/92 - 4/15	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	12/92 - 4/15	Lubricant base oil	>99	Various	All Sections
	12/92 - 4/15	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	12/92 - 4/15	Lubricant base oil	87 - 91%	Various	All Sections
	12/92 - 4/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	12/92 - 4/15	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	12/92 - 4/15	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTSL-050862
Partial Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
- **Quantity - Historical Data**
- **Quality - Historical Data (UPDES Parameters)**
  - **Total Suspended Solids**
  - **Iron (Total & Dissolved)**
  - **Oil & Grease**
  - **Total Dissolved Solids**
  - **Ph**

UPDES Permit Data:

Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

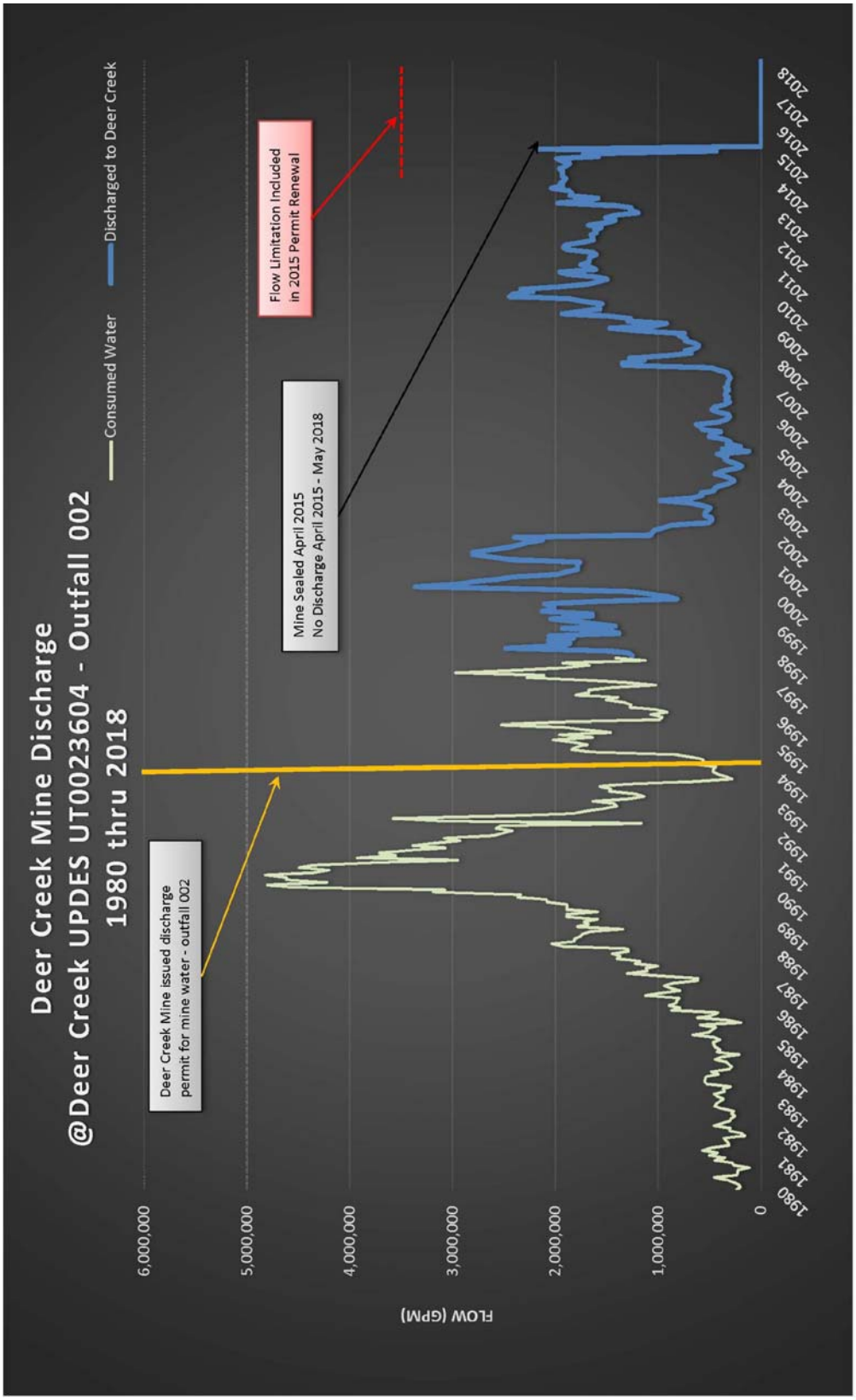
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



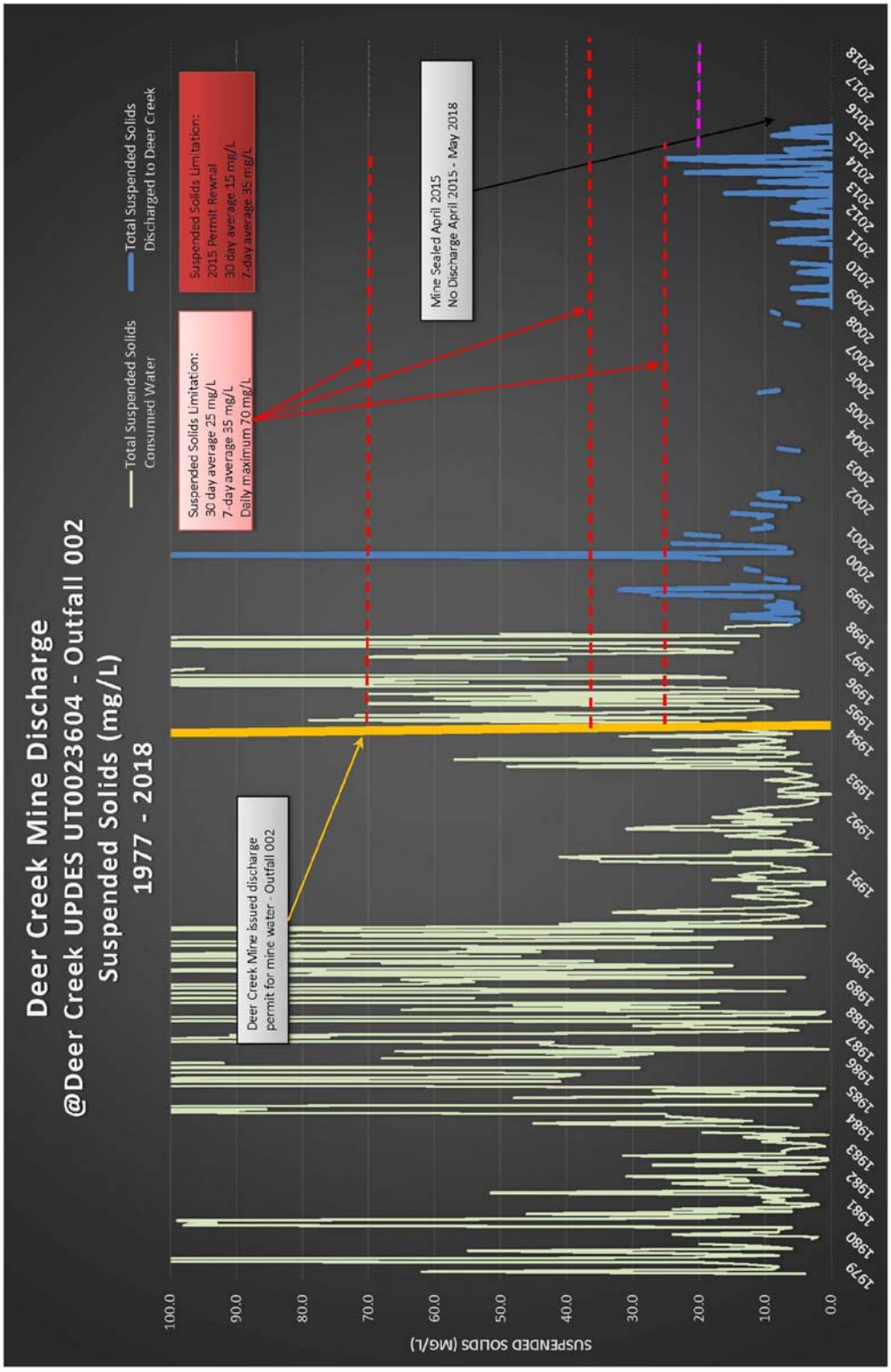
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



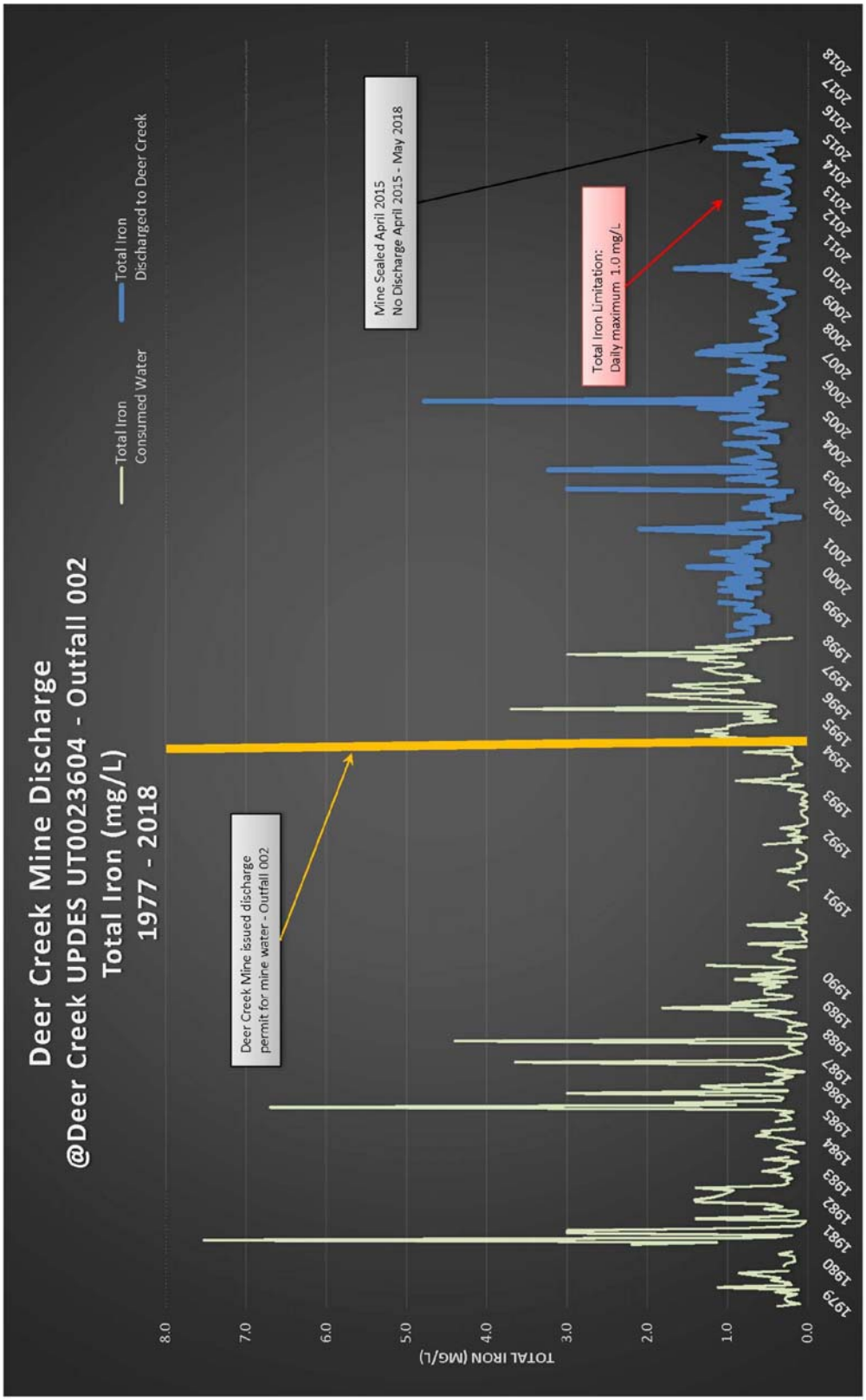
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



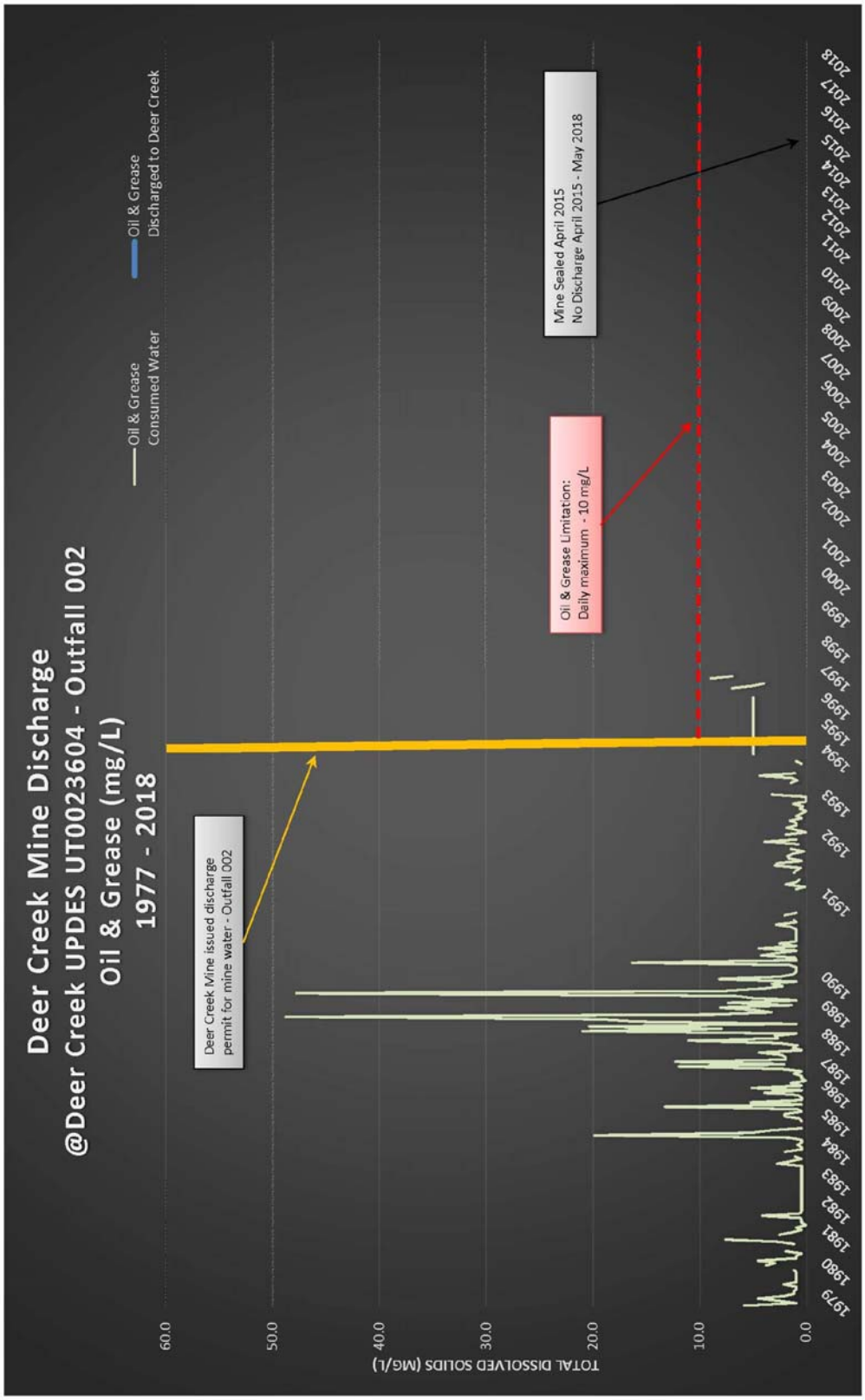
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



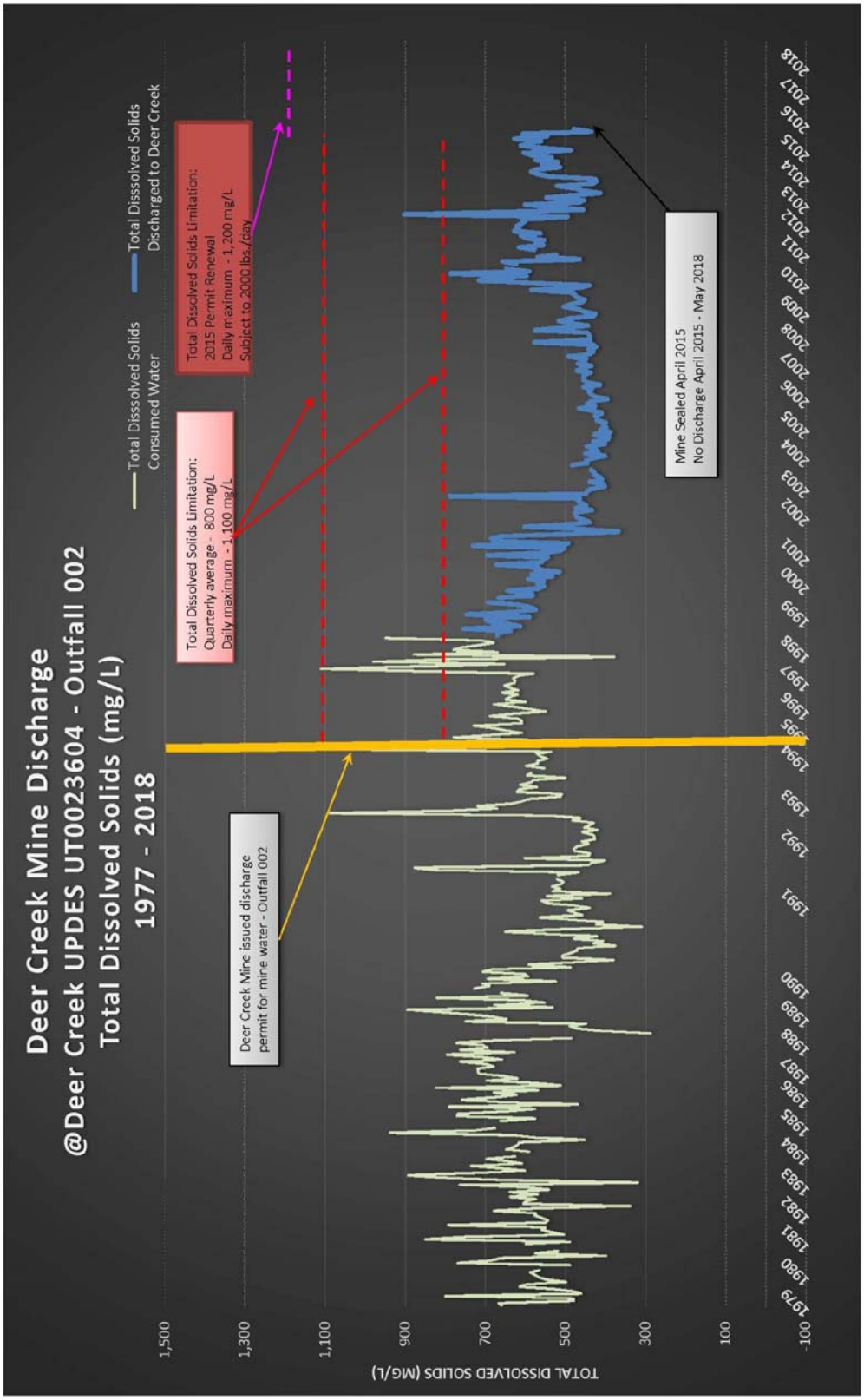
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



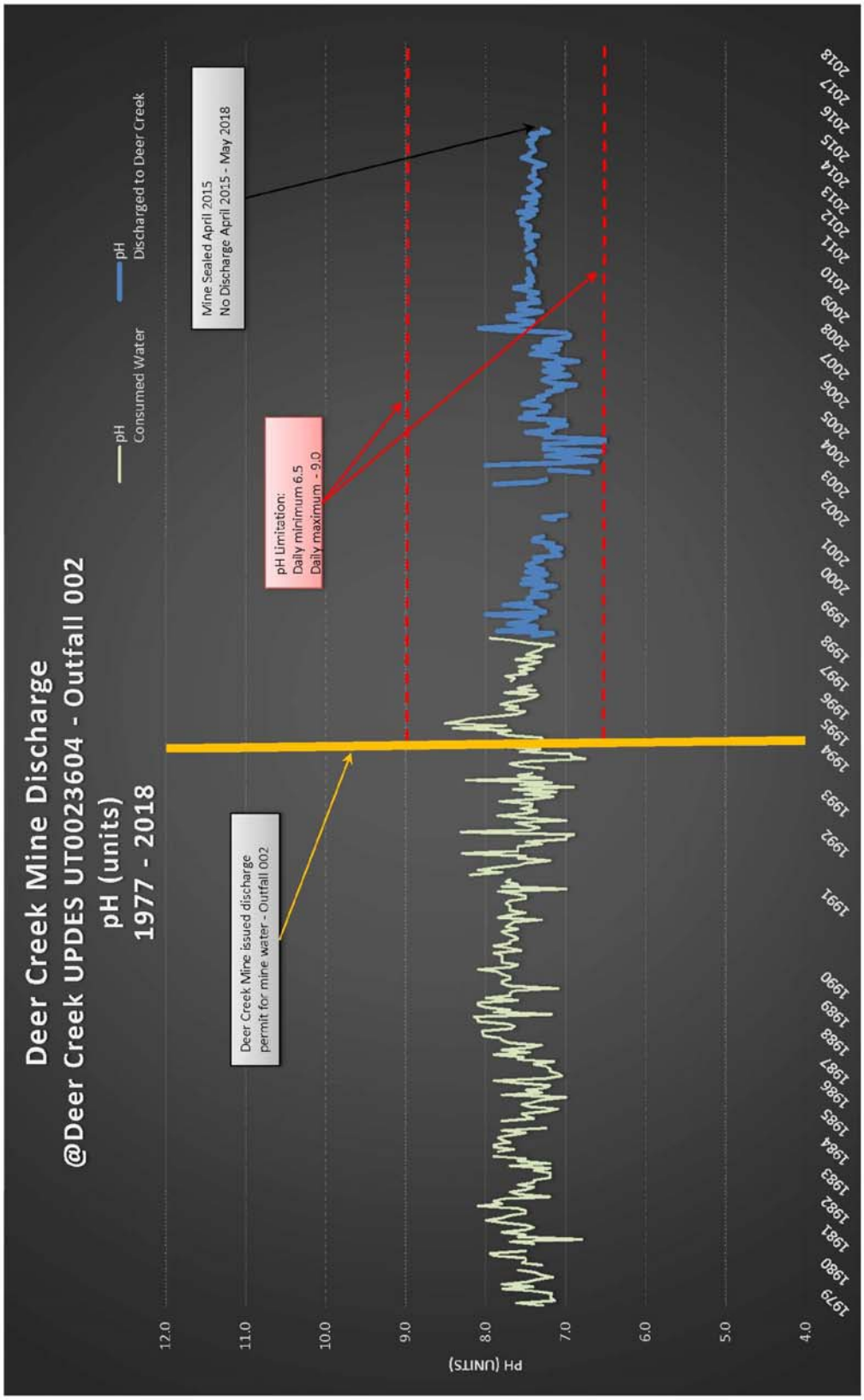
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTU-014275

November, 2018

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Prepared by:

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-014275, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-014275 The total acreage being surrendered is 80.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTU-014275 is described below:

Federal Coal Lease UTU-014275		
Lease Readjustment Effective Date:		10/1/2015 to 10/1/2025
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**80.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 28:	E½SW¼	80.00
	Total Lease Acres for Full Relinquishment:	**80.00**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7th of Nov., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

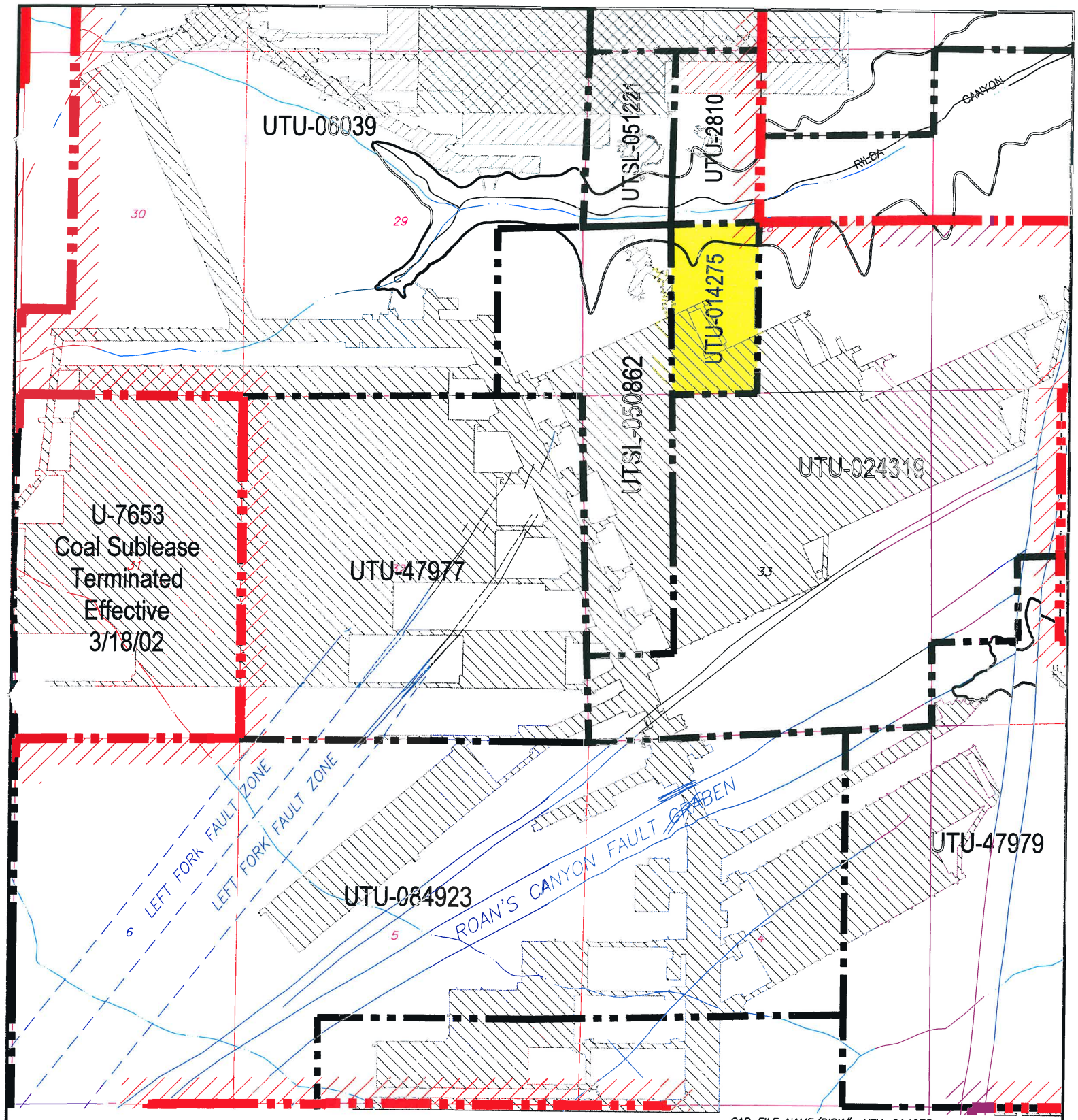
SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.



CAD FILE NAME/DISK#: UTU-014275

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-014275 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE RELINQUISHMENT AREA

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-014275

DRAWN BY: K. LARSEN	FIGURE 1	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

FEDERAL COAL LEASE UTU-014275
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-014275 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Blind Canyon seam. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam took place between 9/1994 and 12/1995.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In

steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the East Mountain Area were collected in 1980. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

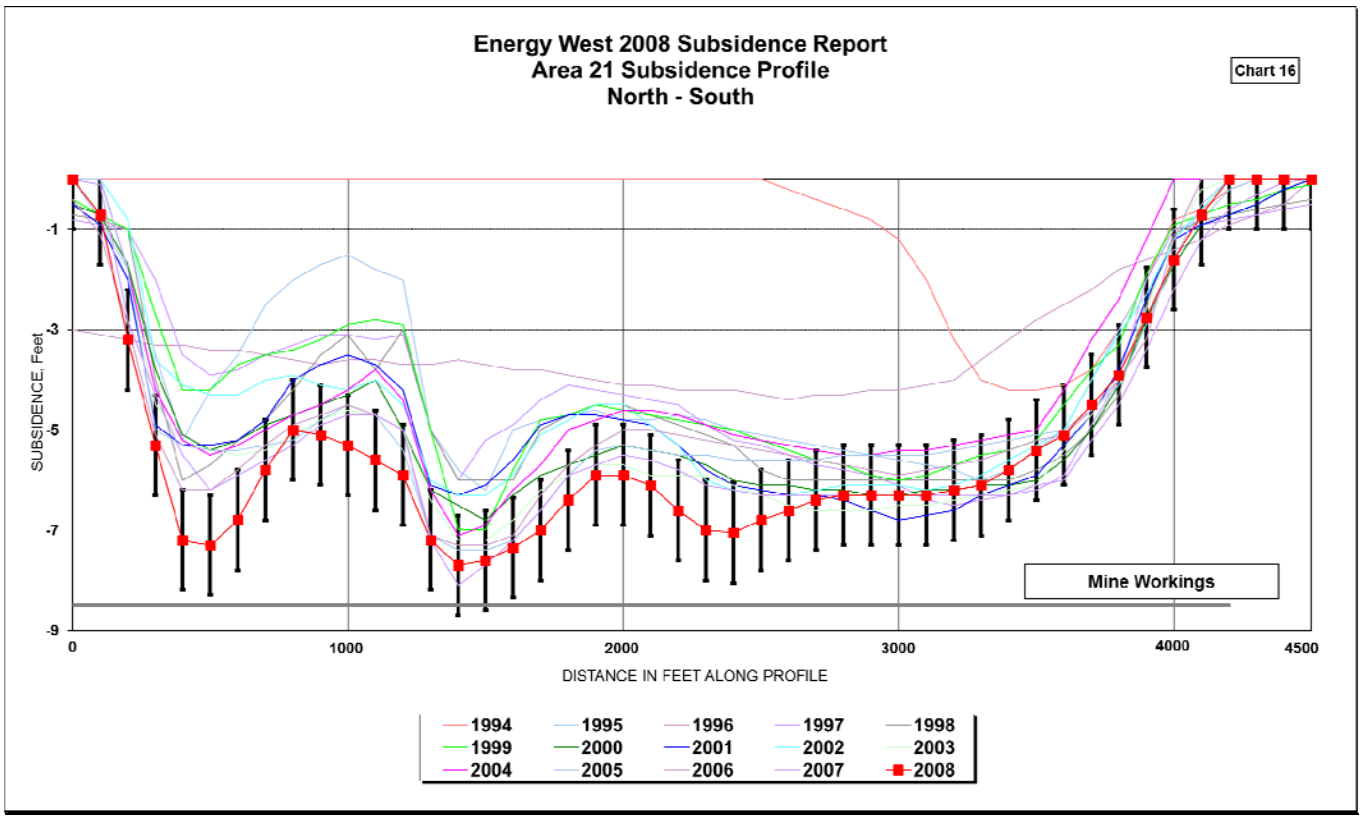
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

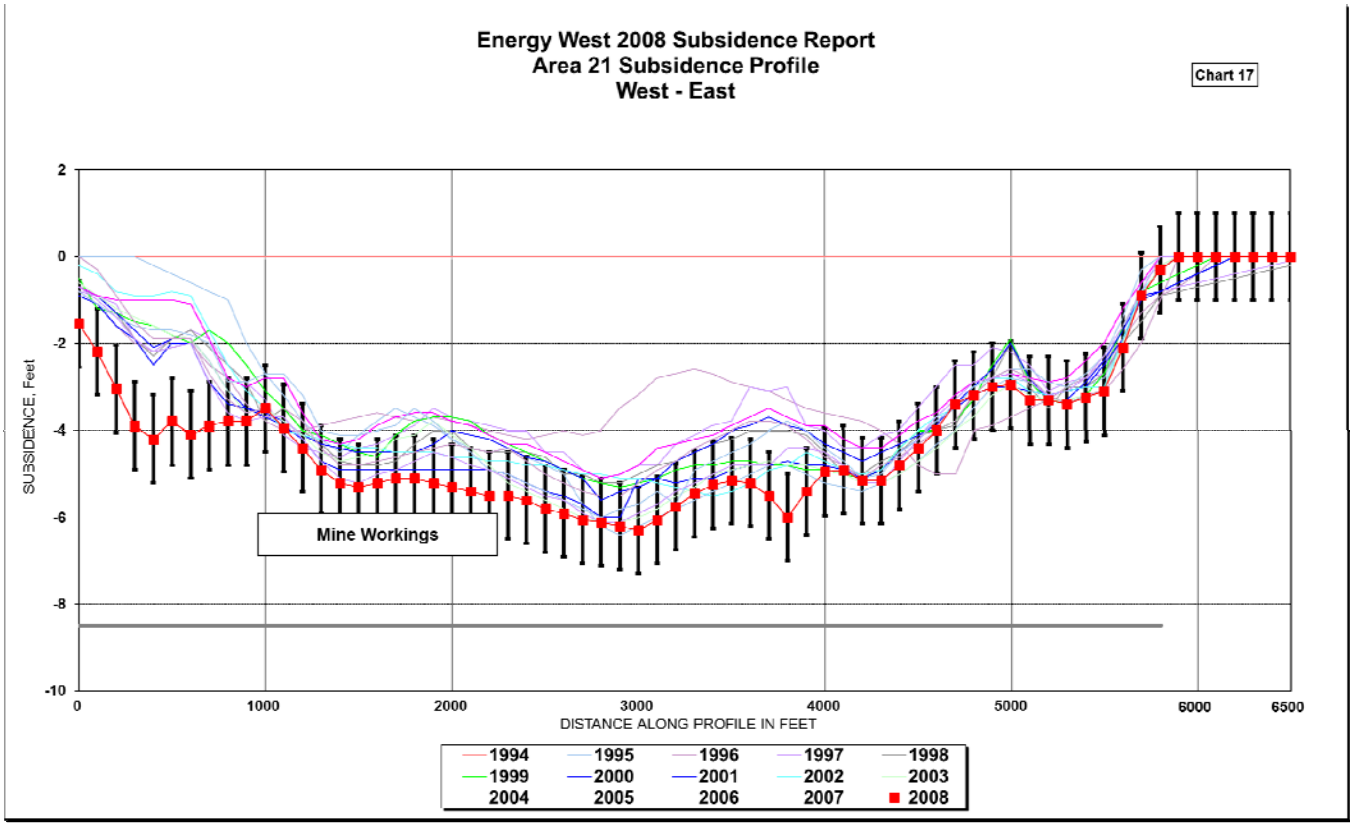
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-014275 Subsidence Data

Subsidence in the lease UTU-014275 area was monitored from 1994 to 2008. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1994 and 2008. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

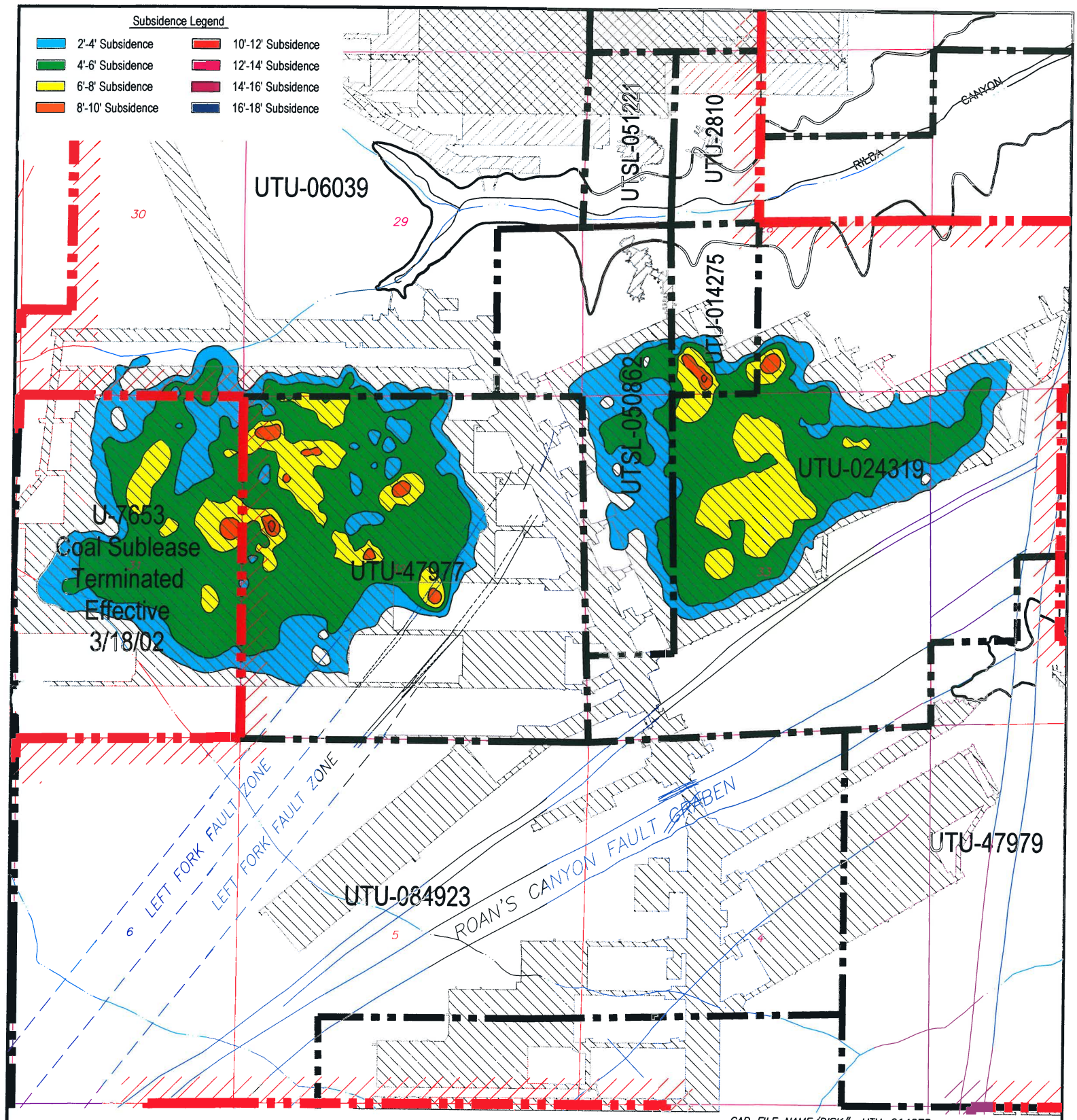
PacifiCorp delineated a series of two profiles (Area 21) covering the main longwall panels on and near Lease UTU-014275 that are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 10 feet. Some cliff spalling occurred during undermining. Minor ground cracking did occur, but was not considered hazardous and was allowed to heal naturally. No change in subsidence has occurred since 2008, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-014275.

The proposed relinquishment area of Lease UTU-014275 is stable and subsidence is substantially complete.



CAD FILE NAME/DISK#: UTU-014275

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-014275 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

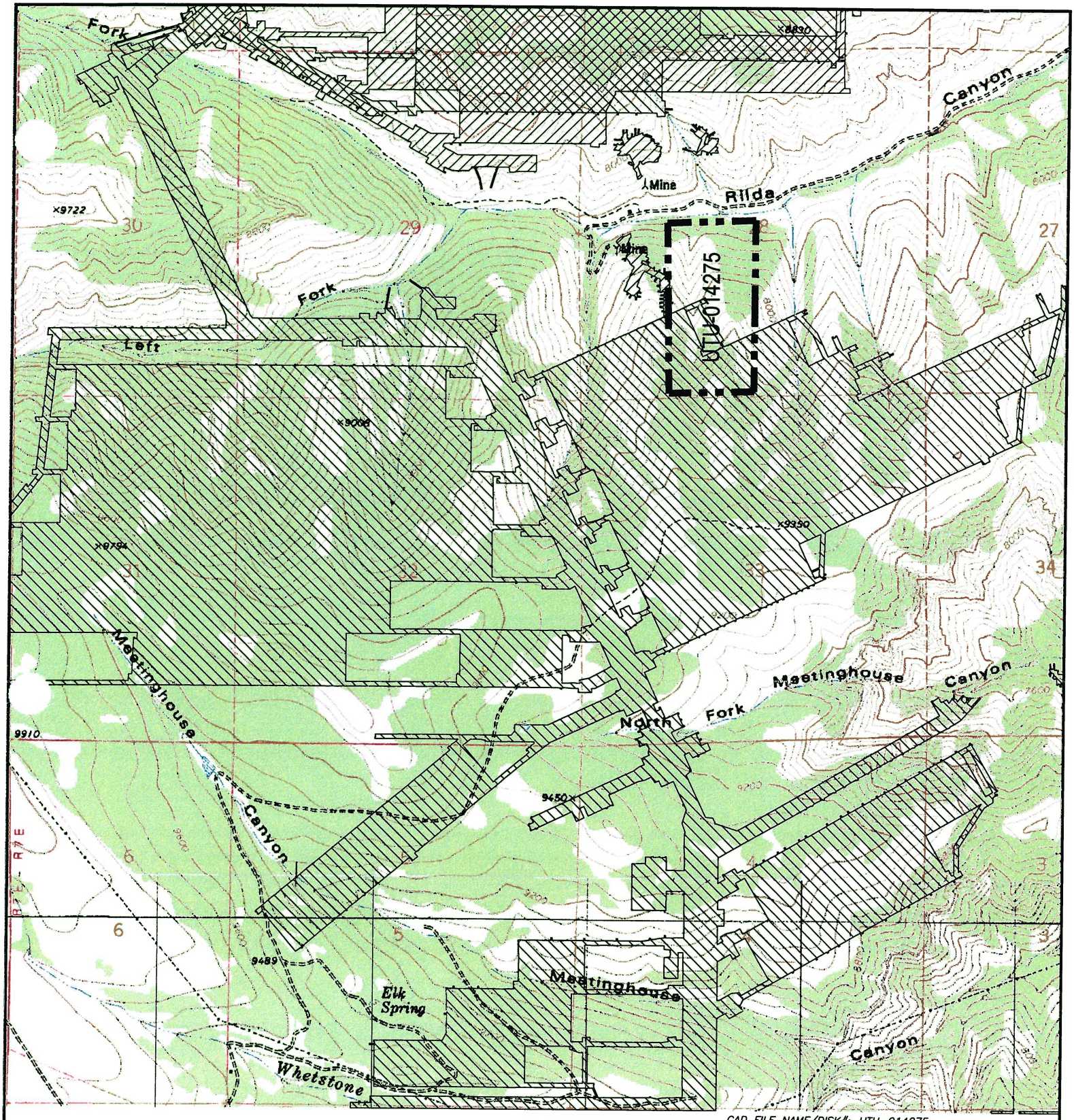
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-014275
SUBSIDENCE BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX A	
SCALE:	1" =2000'	DRAWING #:	
DATE:	APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-014275 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-014275 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-014275. No restoration and/or mitigation efforts are required for Lease UTU-014275. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-014275 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTU-014275

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

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INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-014275
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-014275 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 100 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTU-014275 and surrounding area (North Rilda Ridge).

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP). Lease UTU-014275 is near to the Mill Fork Lease area and includes within the adjacent ½ mile zone some of the surface sites that are part of the surface hydrology monitoring plan.

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTU-014275.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The North Rilda Ridge 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the North Rilda Ridge 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. 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 PacifiCorp mining area covers portions of East Mountain.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable

calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, and is exposed in the North Rilda Ridge area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the North Rilda Ridge area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 of this 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the North Rilda Ridge area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the East Mountain area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet. There is no Flagstaff Limestone in the North Rilda Ridge area.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone

are limited to a narrow north-south trending ridge located several miles west of the North Rilda Ridge area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the water bearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 the North Rilda Ridge area.

Folding:

Strata in the North Rilda Ridge area are gently folded in two broad structural features. The Flat Canyon Anticline crosses to the west of the lease 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. The strata within Lease UTU-014275 are located on the southeastern limb of the Flat Canyon Anticline, which is also the northwestern limb of the Straight Canyon Syncline. Strata dip about 2 - 4 degrees to the southeast.

Faulting:

There is no faulting within the UTU-014275 lease area. The nearest known faulting to the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes about 1 mile to the northwest of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates

general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk

Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The δ2H and δ18O compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.
7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years

b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of

surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its CO2(g) in the soil zone where the partial pressure of CO2 greatly exceeds atmospheric levels. This CO2 combines with water to form carbonic acid according to

$$CO2(g) + H2O = H2CO3 \quad (1)$$

Carbonic acid dissociates into H+ and HCO3- as

$$H2CO3 = HCO3^- + H+ \quad (2)$$

The H+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H+ + \underset{\text{(dolomite)}}{CaMg(CO3)2} = Ca2+ + Mg2+ + 2HCO3^-, \text{ and} \quad (3)$$

$$H+ + \underset{\text{(calcite)}}{CaCO3} = Ca2+ + HCO3^- \quad (4)$$

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$\underset{\text{(gypsum)}}{CaSO_4 \cdot 2H_2O} = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute

concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-clay} = 2Na^+ + Ca\text{-clay} \quad (9)$$

$$Mg^{2+} + Na\text{-clay} = 2Na^+ + Mg\text{-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs

discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically

dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} -HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent

with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and $\delta^{18}O$

The δ^2H and $\delta^{18}O$ composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and $\delta^{18}O$ composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Interwest and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork area spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^3H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^3H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^3H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^3H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is

minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir

downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less

than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute

significant groundwater to the discharge from the spring.

Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – NORTH RILDA RIDGE AREA

A. GROUNDWATER

Groundwater within the North Rilda Ridge area was monitored according to the schedules in established in the Deer Creek MRP. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining. There are no surface springs within the lease area of UTU-014275 that is to be relinquished. PacifiCorp has conducted baseline and operational monitoring of spring sources adjacent to the lease area. The nearest springs within ½ mile of the relinquishment boundary are located at the North Emery Water Users Special Service District Rilda Canyon Springs collection system, which taps a series of alluvial springs in the floor of Rilda Canyon.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the adjacent Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.

The ground water monitoring plan in Appendix C includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence
- Aerial distribution
- Established water rights

- Measurable flow based on historical surveys
- Reliable measuring point(s)

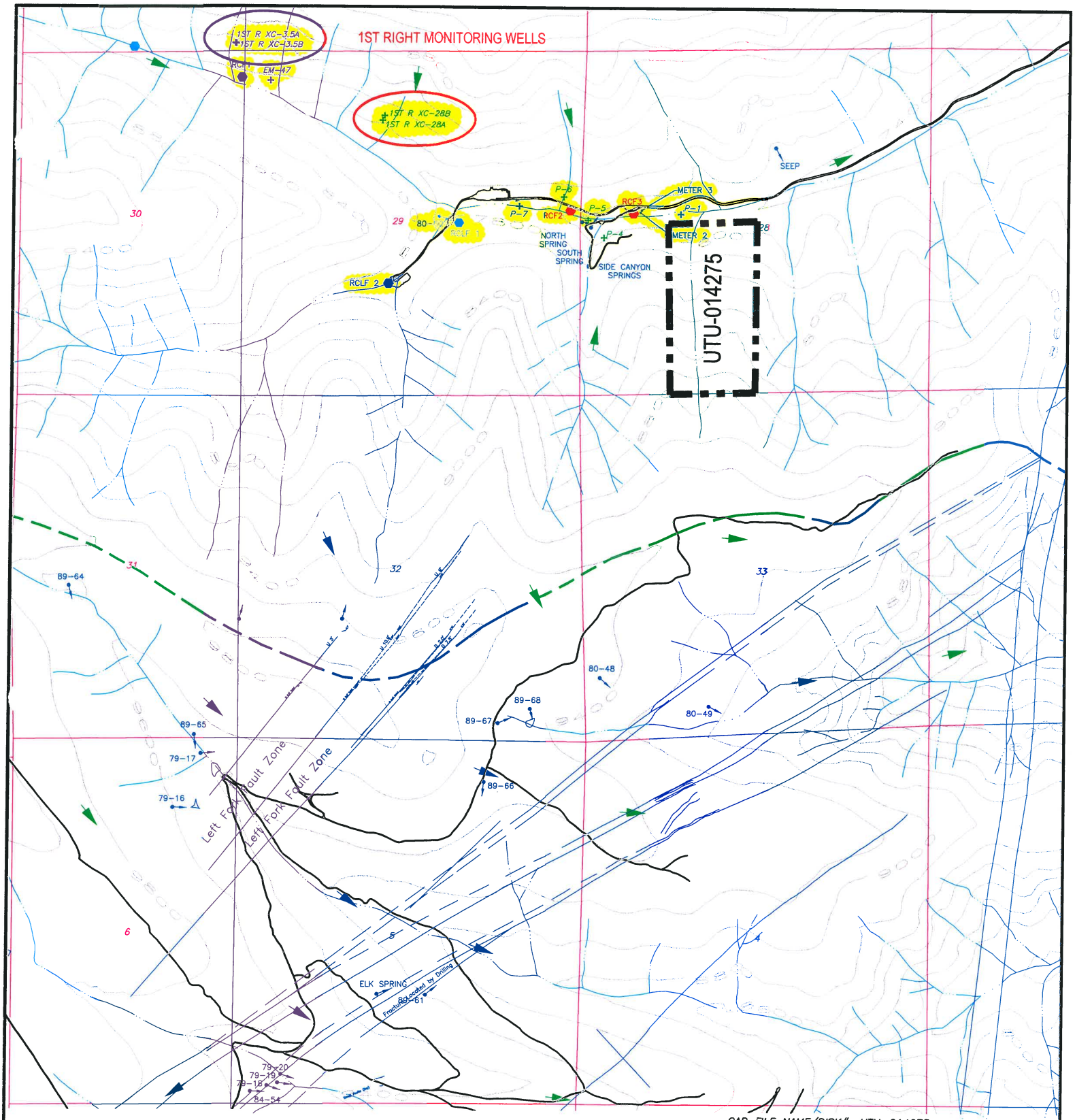
The following table outlines the rationale for springs selected for long term monitoring. Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency. There are no monitored surface springs within ½ mile of the lease. The spring collection system operated by the North Emery Water Users Special Service District is within ½ mile. Data related to monitoring point RCF3 is included in Appendix C.

Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTU-014275 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTU-014275 are ephemeral. The majority of the surface flow from the lease area drains to the north into Rilda Canyon which reports to Huntington Creek. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



CAD FILE NAME/DISK#: UTU-014275

LEGEND

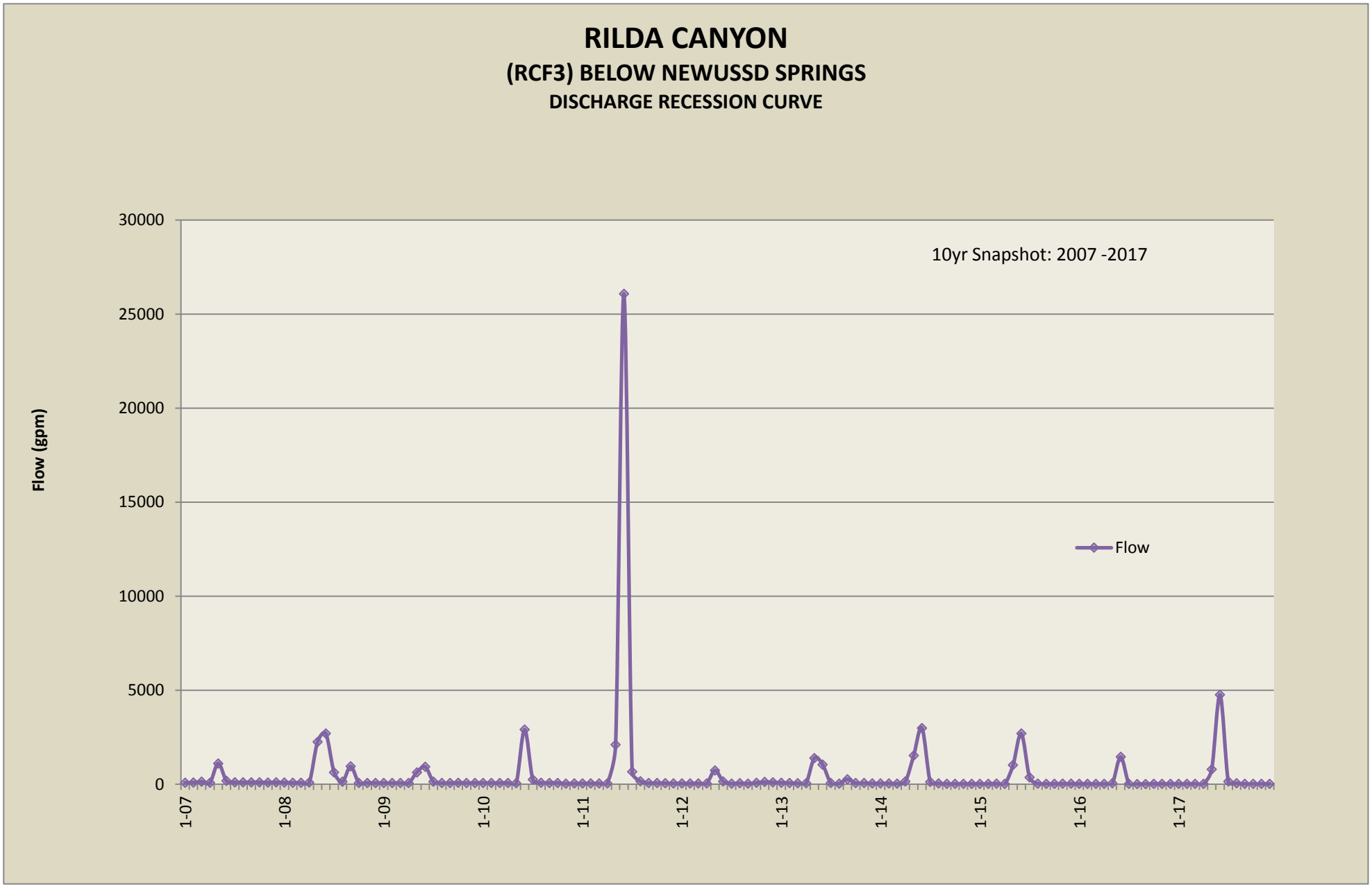
- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-014275
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___


RILDA CANYON
(RCF3) BELOW NEWUSSD SPRINGS
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
30000
25000
20000
15000
10000
5000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - BELOW NEWUA SPRINGS

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170313	0.0	354.0	99.2	0.0	32.0	1013.0	8.1	493.0	0.2	0.1	59.6	0.0	0.0	8.1	4.2	28.5	177.0	0.0	611.0
20170608	0.0	222.0	60.7	0.0	2.0	449.0	10.2	239.0	0.5	0.0	21.2	0.0	0.0	8.6	1.0	5.4	15.0	165.0	252.0
20170907	6.0	320.0	82.0	0.0	15.0	885.0	10.4	407.0	0.1	0.0	49.1	0.0	0.0	8.6	3.1	20.9	137.0	0.0	514.0
20171205	0.0	331.0	90.7	0.0	12.0	901.0	13.1	443.0	0.1	0.0	52.6	0.0	0.0	8.0	3.4	21.6	143.0	8.0	575.0
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2017																			
MIN	0	222	61	0	2	449	8	239	0	0	21	0	0	8	1	5	15	0	
MAX	6	354	99	0	32	1013	13	493	1	0	60	0	0	9	4	29	177	165	
MEAN	0.00	306.75	83.14	0.00	15.25	812.00	10.45	395.50	0.23	0.01	45.62	0.01	0.00	8.32	2.91	19.11	118.00	43.25	
2016**																			
MIN	0.0	205.0	55.2	0.0	1.0	381.0	8.7	210.0	0.0	0.0	17.5	0.0	0.0	8.0	0.0	4.4	12.0	0.0	272.0
MAX	6.0	350.0	95.0	0.0	10.0	880.0	9.9	483.0	0.5	0.0	59.6	0.0	0.0	8.1	2.9	23.6	159.0	56.0	589.0
MEAN	1.5	302.8	82.3	0.0	7.8	746.5	9.4	398.5	0.3	0.0	46.8	0.0	0.0	8.1	2.1	18.5	115.0	19.3	493.0
2015**																			
MIN	0	218	52	0	2	419	10	218	0	0	22	0	0	8	1	5	14	0	277
MAX	0	343	87	0	10	895	10	454	3	0	58	0	0	9	3	24	157	221	583
MEAN	0	303	78	0	8	769	10	388	1	0	47	0	0	8	2	19	117	83	506
2014**																			
MIN	0	339	85	0	9	871	0	425	0	0	52	0	0	8	3	25	139	0	550
MAX	6	343	89	0	10	920	0	447	0	0	54	0	0	8	4	55	170	0	586
MEAN	3	341	87	0	10	896	0	436	0	0	53	0	0	8	3	40	155	0	568
2013**																			
MIN	0	205	53	0	1	155	0	221	0	0	20	0	0	8	1	7	17	0	214
MAX	5	339	97	11	10	901	0	486	12	0	59	0	0	9	3	25	154	1092	562
MEAN	3	274	76	3	6	599	0	351	3	0	39	0	0	8	2	16	88	284	386
2012**																			
MIN	0	250	67	0	4	576	8	297	0	0	32	0	0	8	1	12	56	0	334
MAX	30	350	101	0	10	921	8	495	0	0	59	0	0	8	3	26	159	8	556
MEAN	8	312	85	0	8	782	8	413	0	0	48	0	0	8	2	20	113	4	468
2011**																			
MIN	0	212	59.9	0	2.0	423	8.70	228	0.16	0.00	19.14	0.00	0.00	7.95	0.80	4.79	13.0	0.0	258
MAX	5	351	97.0	0	11.0	899	8.70	481	14.79	0.00	58.07	0.03	0.00	8.54	2.82	24.63	152.0	1786.0	573
MEAN	1	287	79.9	0	7.0	702	8.70	373	3.86	0.00	42.22	0.02	0.00	8.19	1.97	16.74	95.0	448.0	436
2010**																			
MIN					2.0	411	6.10	221	0.29		18.45	0.00		7.87	0.81	5.10	13.0	0.0	233
MAX					11.0	922	10.20	510	1.37		62.65	0.04		8.56	3.10	26.36	157.0	100.0	592
MEAN					7.3	765	8.80	419.75	0.65		48.58	0.02		8.14	2.42	19.78	111.3	34.0	488
2009**																			
MIN	0	217	62		2	462	8	251	0		23	0		8	1	7	26	6	288
MAX	15	374	108		10	1005	9	545	1		67	0		8	3	30	183	90	678
MEAN	9	330	91		8	840	8	448	1		53	0		8	3	22	130	31	550
2008**																			
MIN	0	179	61		2	470	9	242	1		22	0		8	1	5	18	8	247
MAX	20	378	115		10	1072	16	577	1		70	0		9	4	29	213	12	742
MEAN	10	322	97		8	911	12	471	1		55	0		8	3	23	147	10	571
2007**																			
MIN		285	77.6		6.0	834	10.09	378	0.20		44.70	0.02		7.54	1.86	15.60	90.0	5.0	438
MAX		400	132.0		12.0	1304	12.48	614	1.17		69.10	0.09		8.04	3.51	30.06	255.0	6.0	746
MEAN		370	111.2		10.2	1128.2	11.26	536.2	0.50		62.75	0.05		7.79	3.14	26.11	196.0	5.5	652.6
2006**																			
MIN		220	62		3.0	487	10.3	252	0.16		23.8	0		7.78	0.98	6.4	25	6	278
MAX		376	112		12.0	1073	12.5	563	0.30		69.0	0		8.18	3.32	26.8	185	18	626
MEAN		328	94		8.8	906	11.7	454	0.25		53.3	0		7.97	2.57	20.9	135	10	517
HISTORICAL 1989-2016																			
MIN	0.0	179.0	50.4	0.0	1.0	155.0	4.4	204.0	0.0	0.0	17.5	0.0	0.0	7.5	0.0	4.4	7.0	0.0	199.0
MAX	38.0	500.0	132.0	30.0	50.0	1304.0	15.5	748.0	14.8	0.4	70.2	0.2	5.0	8.8	5.0	55.0	255.0	1786.0	746.0
MEAN	6.6	344.7	84.5	3.1	8.7	748.0	8.7	403.5	0.7	0.0	45.5	0.0	1.1	8.1	2.3	17.9	107.3	67.5	464.1
COUNT	67	103	103	62	103	104	79	103	101	56	103	75	59	104	100	103	103	79	103

*** Quality parameters are reported as mg/l unless otherwise noted.**
**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTU-014275 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 100 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to vegetation caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the vegetation impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface vegetation characteristics of the area.

Vegetation of Lease UTU-014275 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-014275:

Douglas-fir Mix,	DFmix
Mountain Shrubland	MS
Spruce/Fir	SF

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Uinta Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114 -5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR
OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

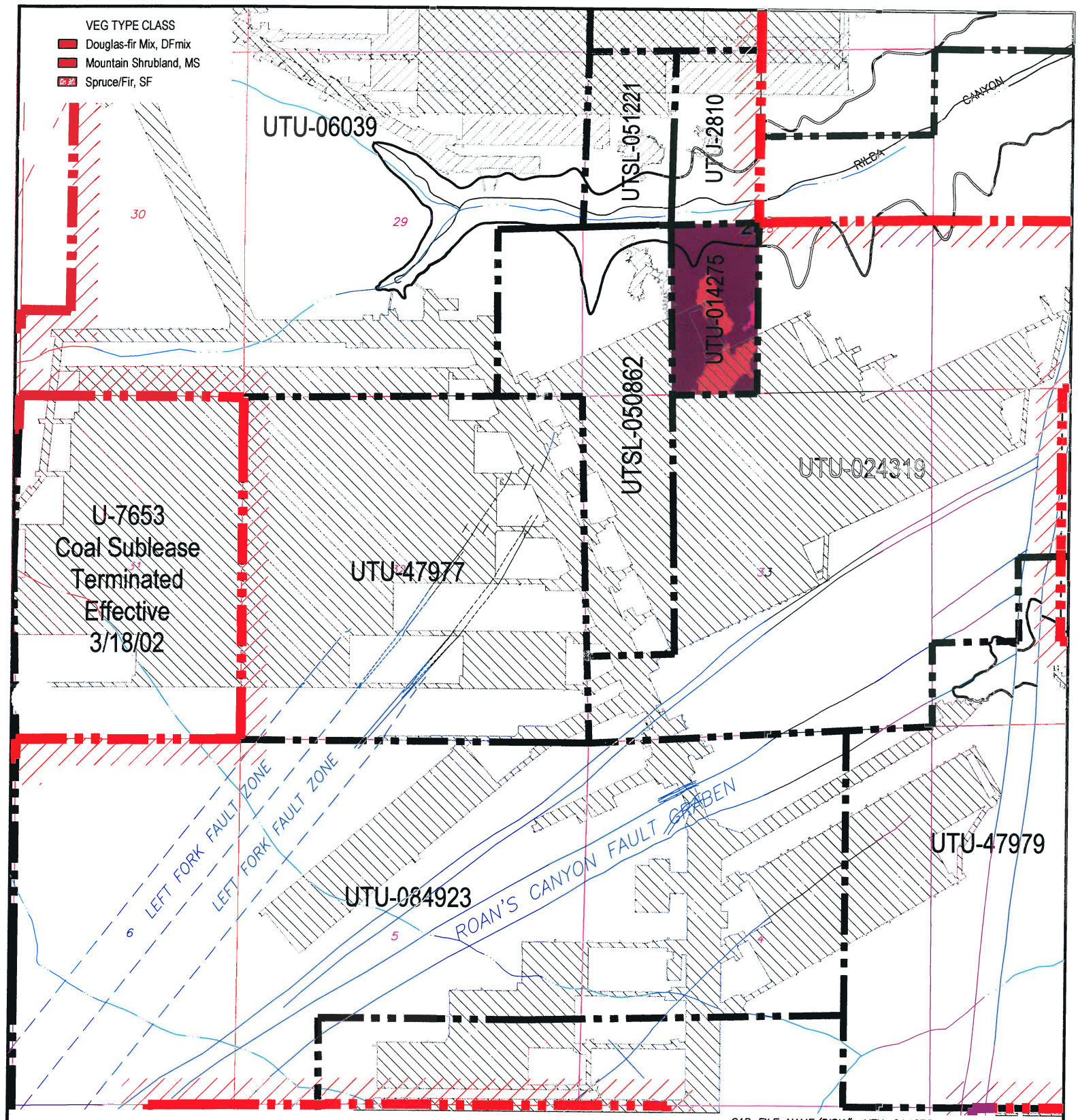
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-014275 area. There were no surface facilities or installations on this lease.



CAD FILE NAME/DISK#: UTU-014275

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-014275 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-014275
VEGETATION BASE MAP

DRAWN BY:	K. LARSEN	APPENDIX D	
SCALE:	1" =2000'	DRAWING #:	
DATE:	APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-014275 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in Lease UTU-014275.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-014275 lease have been submitted when those districts were sealed. The original CERCLA inspection within UTU-014275 to seal the 3rd North B East side panel district took place in February 1996, and BLM approved the sealing plan in February, 1996. CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-014275 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th East, 7th East, 6th East Longwall, 7th East Longwall, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

HAZARDOUS SUBSTANCE REPORT

Submittal Date: Nov. 7, 2018

Lease(s) # UTU-014275 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th East, 7th East, 6th East Longwall, 7th East Longwall, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-014275 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th East, 7th East, 6th East Longwall, 7th East Longwall, and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date Nov. 7, 2018

Lease(s) # UTU-014275 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th East, 7th East, 6th East Longwall, 7th East Longwall, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-014275 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th East, 7th East, 6th East Longwall, 7th East Longwall, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-014275 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 6th East, 7th East, 6th East Longwall, 7th East Longwall, and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 09/94 – 07/18

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-014275
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 6th East, 7th East, 6th East Longwall, 7th East Longwall, and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (09/94 - 12/95) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	09/94 - 12/95	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	09/94 - 12/95	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	09/94 - 12/95	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	09/94 - 12/95	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	09/94 - 12/95	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	09/94 - 12/95	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	09/94 - 12/95	Naptha	40 - 50%	64742-94-5	All Sections
	09/94 - 12/95	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	09/94 - 12/95	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	09/94 - 12/95	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	09/94 - 12/95	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	09/94 - 12/95	Propane	14%	74-98-6	All Sections
	09/94 - 12/95	Butane	13%	106-97-8	All Sections
	09/94 - 12/95	Toluene	17%	108-88-3	All Sections
	09/94 - 12/95	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	09/94 - 12/95	Napthalene	0.40%	91-20-3	All Sections
	09/94 - 12/95	Acetone	41%	67-64-1	All Sections
	09/94 - 12/95	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	09/94 - 12/95	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	09/94 - 12/95	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	09/94 - 12/95	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	09/94 - 12/95	Mineral Oil	20 - 25%	8042-47-5	All Sections
	09/94 - 12/95	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	09/94 - 12/95	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	09/94 - 12/95	Methanol	<20%	67-56-1	All Sections
	09/94 - 12/95	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	09/94 - 12/95	Heptane	69 - 79%	142-82-5	All Sections
	09/94 - 12/95	Ethyl Ether	11 - 21%	60-29-7	All Sections
	09/94 - 12/95	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	09/94 - 12/95	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	09/94 - 12/95	Heptane	60 - 70%	142-82-5	All Sections
	09/94 - 12/95	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	09/94 - 12/95	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	09/94 - 12/95	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	09/94 - 12/95	None			All Sections
Cat Transmission and Drive Train Oil	09/94 - 12/95	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	09/94 - 12/95	Monoethanolamine	<10%	141-41-3	All Sections
	09/94 - 12/95	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	09/94 - 12/95	Mineral Oil	70 - 95%	Mixture	All Sections
	09/94 - 12/95	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	09/94 - 12/95	Lubricant base oil	87 - 91%	Various	All Sections
	09/94 - 12/95	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	09/94 - 12/95	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	09/94 - 12/95	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	09/94 - 12/95	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	09/94 - 12/95	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	09/94 - 12/95	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	09/94 - 12/95	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	09/94 - 12/95	Trichloroethylene	95 - 99%	79-01-6	All Sections
	09/94 - 12/95	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	09/94 - 12/95	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	09/94 - 12/95	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	09/94 - 12/95	Deionized Water	1 - 3%	7732-18-5	All Sections
	09/94 - 12/95	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-014275
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 6th East, 7th East, 6th East Longwall, 7th East Longwall, and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (09/94 - 12/95) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	09/94 - 12/95	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	09/94 - 12/95	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	09/94 - 12/95	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	09/94 - 12/95	Calcium sulfate	2 - 10%		All Sections
	09/94 - 12/95	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	09/94 - 12/95	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	09/94 - 12/95	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	09/94 - 12/95	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	09/94 - 12/95	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	09/94 - 12/95	Lead	34%	7439-92-1	All Sections
	09/94 - 12/95	Lead Dioxide	31%	1309-60-0	All Sections
	09/94 - 12/95	Lead Sulfate	<1%	7446-14-2	All Sections
	09/94 - 12/95	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	09/94 - 12/95	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	09/94 - 12/95	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	09/94 - 12/95	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	09/94 - 12/95	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	09/94 - 12/95	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	09/94 - 12/95	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	09/94 - 12/95	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	09/94 - 12/95	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	09/94 - 12/95	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	09/94 - 12/95	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	09/94 - 12/95	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	09/94 - 12/95	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	09/94 - 12/95	Portland Cement		65997-15-1	All Sections
	09/94 - 12/95	Crystalline Silicon Dioxide		13397-24-5	All Sections
	09/94 - 12/95	Calcium Hydroxide		001-305-620	All Sections
	09/94 - 12/95	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	09/94 - 12/95	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	09/94 - 12/95	Polyglycols	60 - 100%	Mixture (2)	15 W
	09/94 - 12/95	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	09/94 - 12/95	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	09/94 - 12/95	Polyester Resin	5 - 15%	Not Reported	All Sections
	09/94 - 12/95	Styrene Monomer	3 - 7%	100-42-5	All Sections
	09/94 - 12/95	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	09/94 - 12/95	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	09/94 - 12/95	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	09/94 - 12/95	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	09/94 - 12/95	Isobutane	2 - 10%	75-28-5	All Sections
	09/94 - 12/95	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	09/94 - 12/95	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	09/94 - 12/95	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	09/94 - 12/95			64742-48-9	All Sections
	09/94 - 12/95			64742-88-7	All Sections
	09/94 - 12/95	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	09/94 - 12/95	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	09/94 - 12/95	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	09/94 - 12/95	Lubricant base oil	>99	Various	All Sections
	09/94 - 12/95	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	09/94 - 12/95	Lubricant base oil	87 - 91%	Various	All Sections
	09/94 - 12/95	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	09/94 - 12/95	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	09/94 - 12/95	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-014725
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
- **Quantity - Historical Data**
- **Quality - Historical Data (UPDES Parameters)**
  - **Total Suspended Solids**
  - **Iron (Total & Dissolved)**
  - **Oil & Grease**
  - **Total Dissolved Solids**
  - **Ph**

UPDES Permit Data:

Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

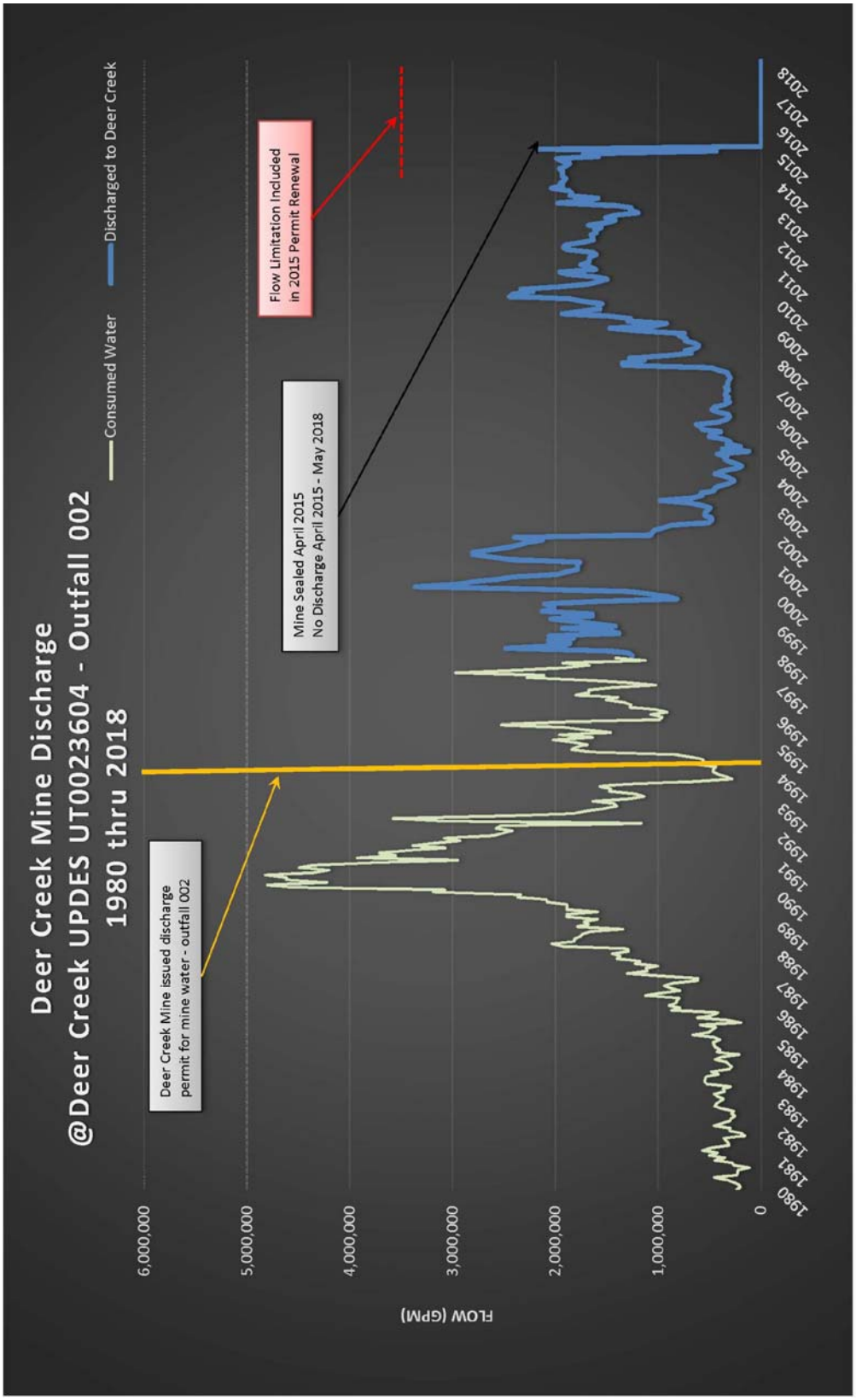
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



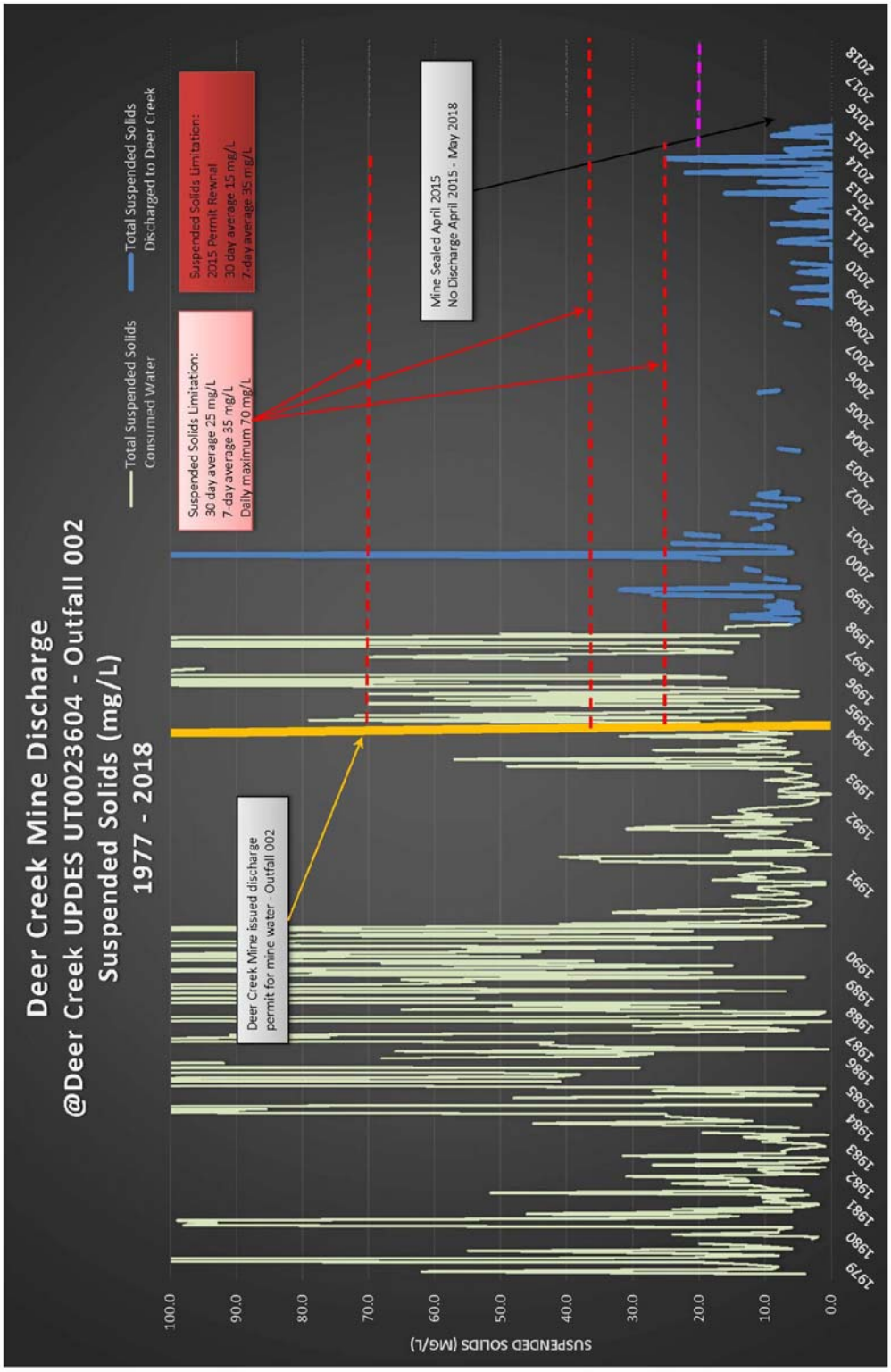
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



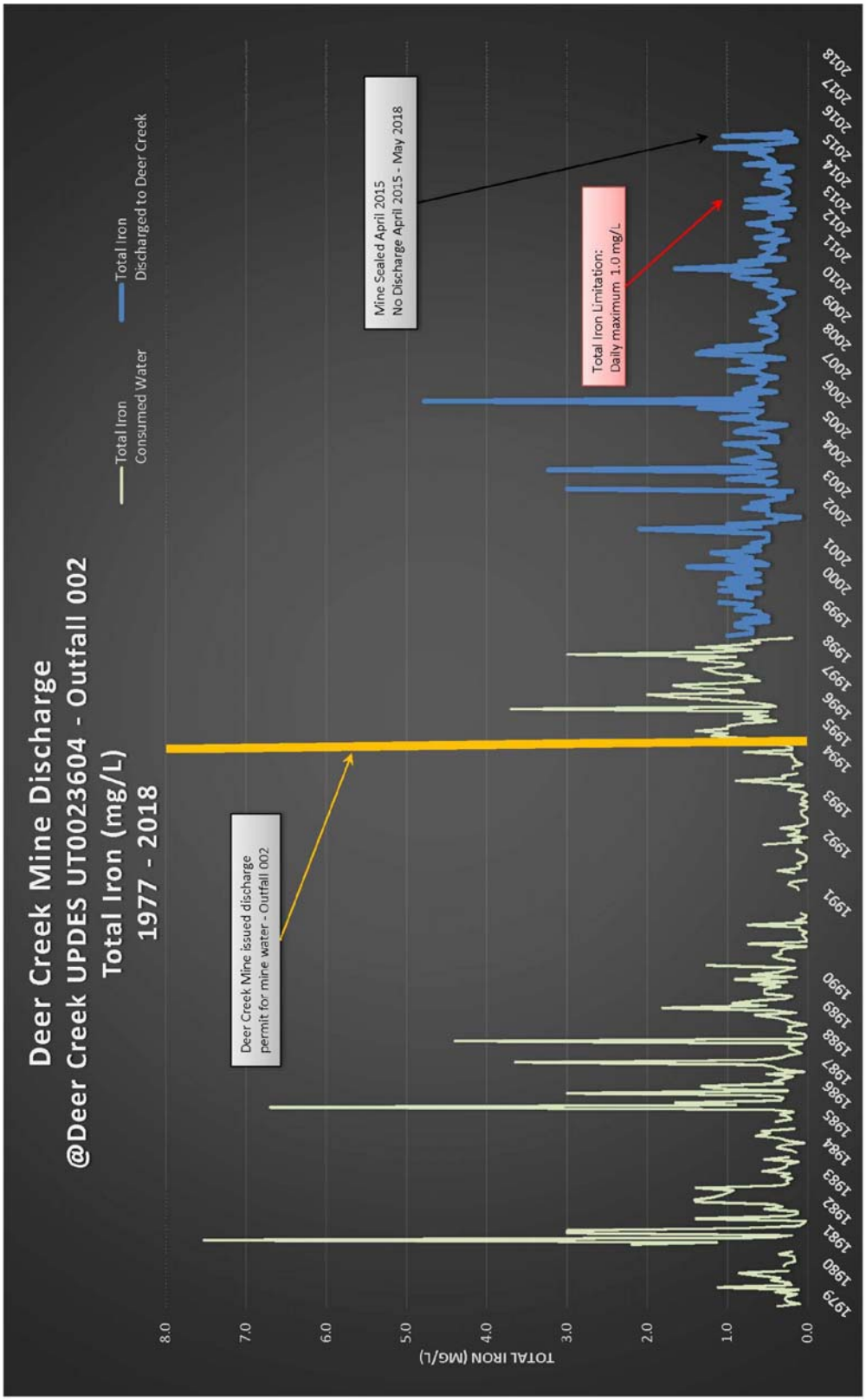
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



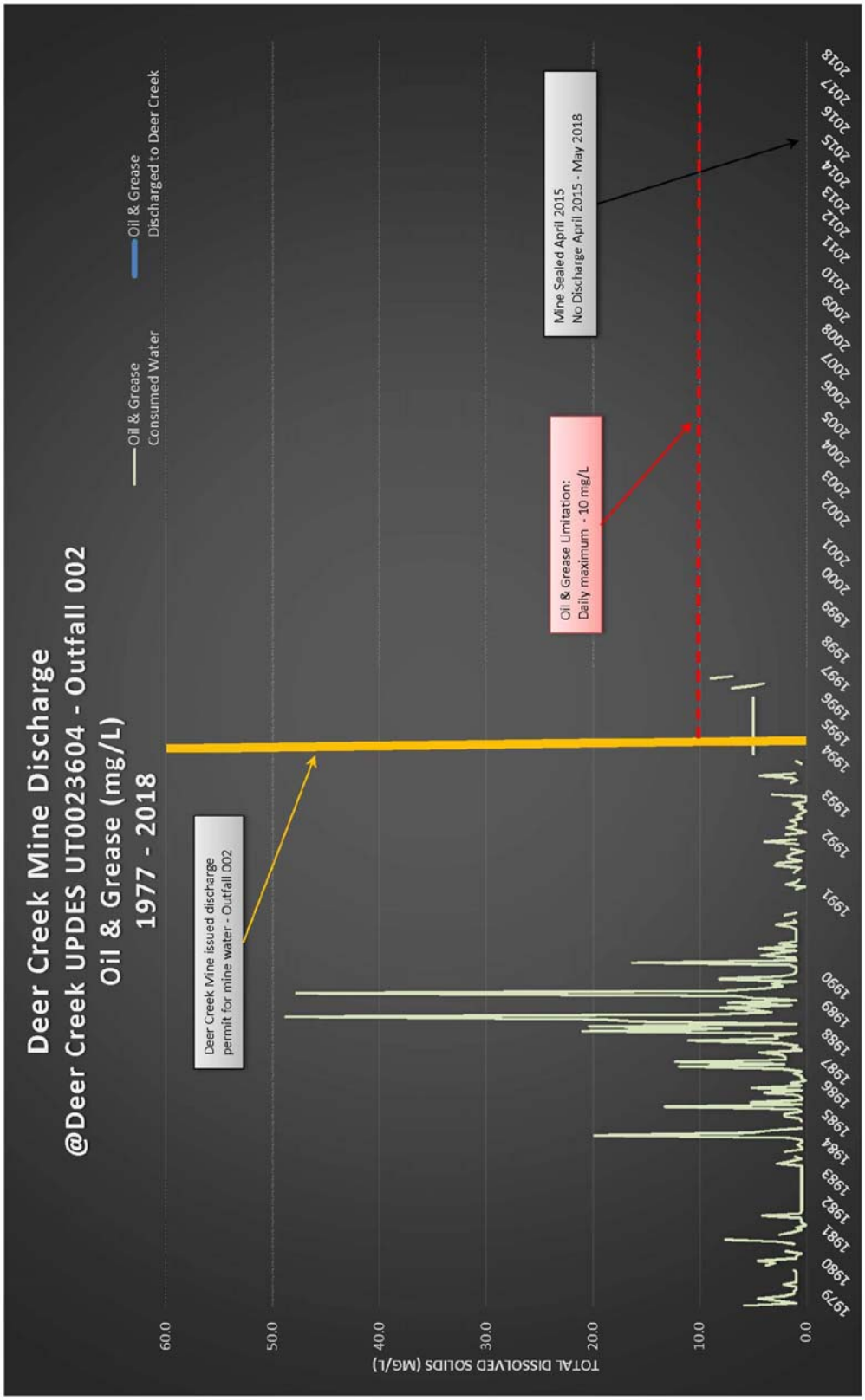
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



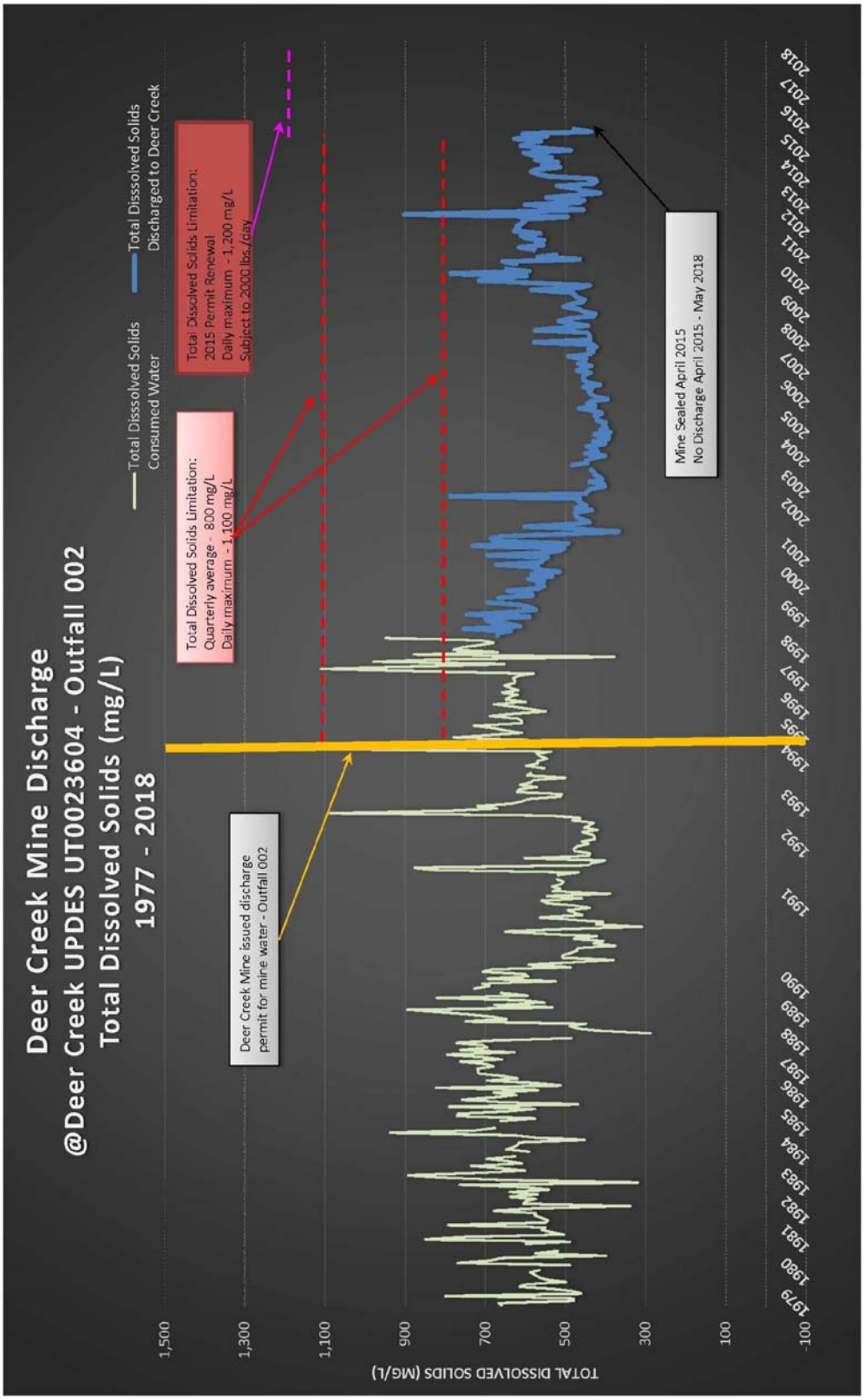
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Dissolved Solids



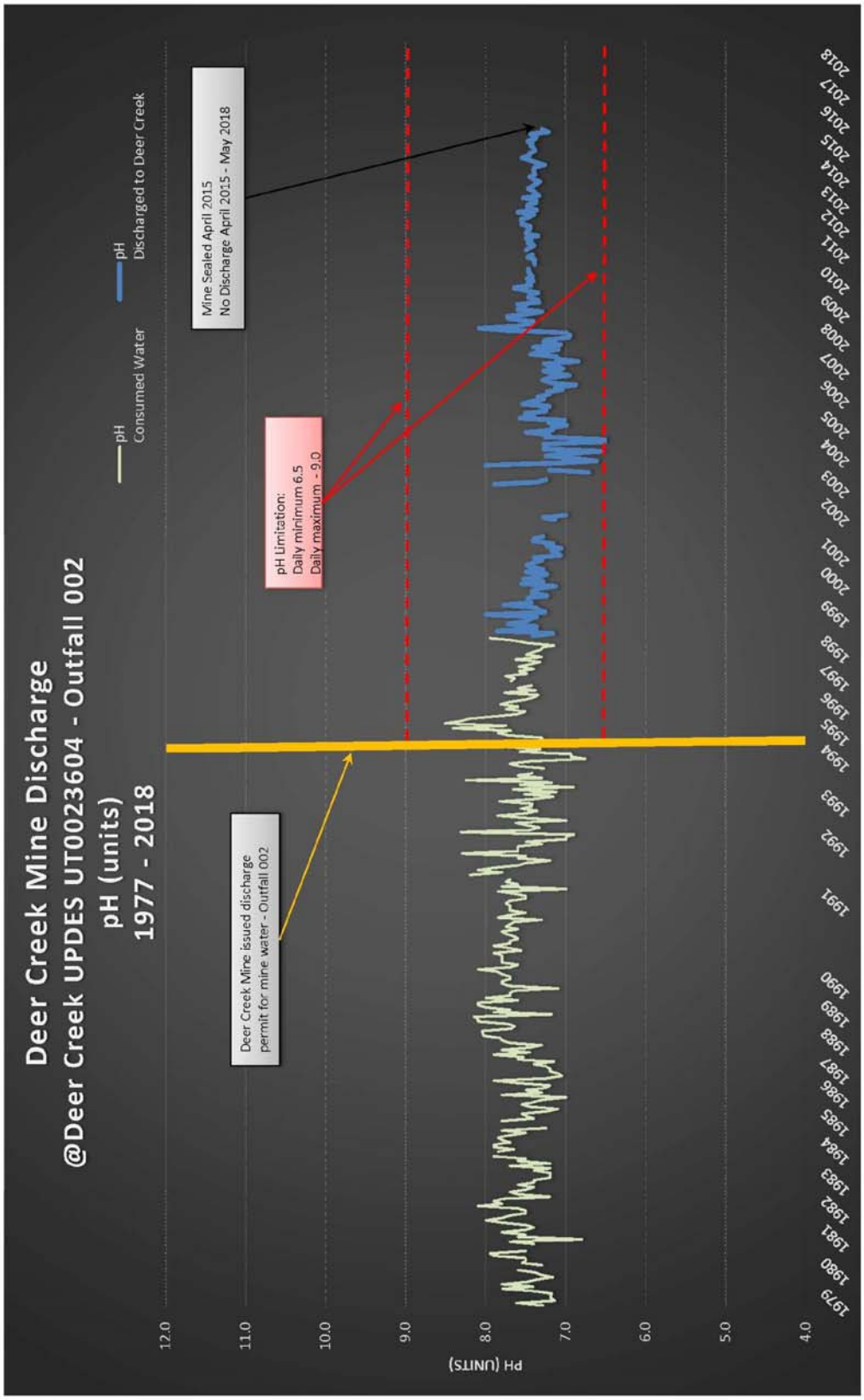
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH



Full Relinquishment
Federal Coal Lease
UTU-024319

November, 2018

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Prepared by:

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Managing Agent
1407 West North Temple, Suite 110
Salt Lake City, UT 84116

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

1407 W. North Temple, Suite 110
Salt Lake City, UT 84116

HAND DELIVERED

November 7, 2018

Kent Hoffman
Deputy State Director
United States Department of the Interior
Bureau of Land Management
Utah State Office
440 West 200 South, Suite 500
Salt lake City, Utah 84101-1345

RE: Notification of Full Relinquishment of Federal Coal Lease UTU-024319, East Mountain LMU, Deer Creek Mine, Emery County, Utah

Dear Mr. Hoffman:

In accordance with 43 CFR § 3452.1 (2017) and the terms of the referenced federal coal lease, submitted herewith in triplicate is documentation in support of PacifiCorp's full relinquishment of acreage under federal coal lease UTU-024319 The total acreage being surrendered is 1,000.00 acres. Refer to Map 1 for lease location within the East Mountain Logical Mining Unit UTU-73336.

The attachments to this letter contain lease specific information compiled using the Bureau of Land Management (BLM) relinquishment checklist developed by your staff. To assist the reviewer in the process, we've completed the checklist with the best available information known to us given the history of this lease. The supporting information is located in the accompanying appendices.

Background and Purpose of Relinquishment

With PacifiCorp's decision and announcement on December 15, 2014, to close the Deer Creek Mine and end production from the LMU, this brought an end to 40+ years of coal production for this LMU. All coal production ceased on January 7, 2015. PacifiCorp has made steadfast efforts to complete all mine closure activities including the construction of permanent portal seals for the entire Deer Creek Mine complex and LMU.

All economically recoverable coal reserves within the entire LMU inclusive of this federal coal lease has been mined out or has been determined uneconomical to mine as acknowledged by BLM's letter dated March 23, 2016 (copy enclosed). Having fully complied with the federal coal lease terms and their associated federal regulations, PacifiCorp has no intentions to re-open this mine. Therefore, the purpose of this relinquishment is to surrender this federal coal lease acreage back to the federal government and bring final closure to this matter.

Full Relinquishment

The legal description for full relinquishment of UTU-024319 is described below:

Federal Coal Lease UTU-024319		
Lease Readjustment Effective Date:		5/1/2010 to 5/1/2020
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,000.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 27:	SW¼	160.00
Sec 28:	SE¼	160.00
Sec 33:	E½, E½W½, SW¼SW¼	520.00
Sec 34:	W½NW¼, W½E½NW¼, NW¼SW¼	160.00
	Total Lease Acres for Full Relinquishment:	**1,000.00**
	Total Lease Acres Remaining:	**0.00**

Conclusion

To the best of its information and belief, PacifiCorp is in compliance with the terms and conditions of this federal coal lease, inclusive of having made all payment obligations relative to rentals and royalties. Furthermore, PacifiCorp represents that the federal lease acres relinquished will not impair the public interest as all obligations under regulation 43 CFR § 3452.1 and all of the lease terms have been met including having demonstrated substantial completeness per BLM subsidence guidelines.

This relinquishment notification was prepared on behalf of PacifiCorp and is acknowledged as set forth below.

We respectfully seek your attention to this matter and ask that this relinquishment be accepted in a timely manner. Should you have any questions, need additional information or wish to discuss this matter with us, please feel free to contact me at 801-220-4612 or by email Scott.Child@PacifiCorp.com.

Sincerely,

Scott M. Child
Manager, Lands & Regulatory Affairs

Acknowledged and agreed to this 7TH of NOV., 2018 by PacifiCorp, the lessee of record:

Dana M. Ralston
Senior Vice President
Thermal Generation & Mining
Rock Mountain Power (a division of PacifiCorp)

Enclosures

cc: B. Morgan, J. Potter, C. Semborski, K. Fleck, D. Oakley

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Green River District
Price Field Office
125 South 600 West
Price, UT 84501
http://www.blm.gov/ut/st/en/fo/price.html

MAR 2 3 2016

MAR 2016
Received
Interwest Mining
Company

In Reply Refer To:
3482 (UTG023)
LMU UTU-73336 Mine Closure, UTU-88554, UTU-84285, UTU-06039
SL-070645/U-02292, U-084923, U-084924, U-083066, U-040151
U-044025, U-1358, SL-064607/064621, U-024317, U-024319
U-014275, SL-051221, U-47977, U-47978, U-47979, SL-050862
U-2810, LDS Fee Land, ML-48258/UTU-88554

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
7014-2120-0004-6185-8850

Mr. Scott M. Child
Manager, Lands and Regulatory Affairs
Interwest Mining Company
1407 W. North Temple, Suite 310
Salt Lake City, Utah 84116

Re: Final Resource Recovery and Protection Plan (R2P2) Amendment and Final Disposition of the East Mountain Logical Mining Unit (LMU), Deer Creek Mine and Interwest Mining Company, as Managing Agent

Dear Mr. Child:

On September 25, 2015, the Bureau of Land Management (BLM) received a final R2P2 amendment from Interwest Mining Company for closing the subject mine and sealing the mine openings. This request follows the "Approved – Portal Sealing and Abandonment Plan – Final Closure of the Deer Creek Mine" letter from the BLM to Interwest dated April 10, 2015. In that letter the BLM approved the sealing of the mine. The received information from Interwest fulfills the requirements described in 43 CFR 3482.1(b) and (c).

Affected Leases and Logical Mining Unit (LMU): The idling of the mine affects the LMU UTU-73336, which includes all the leases and properties in the LMU.

✓ **Proposed Plan and Justification:** Interwest has extracted all equipment out of the mine except those components required for dewatering the mine prior to final implementation of a ground water containment and distribution system. Upon final construction of the underground water management system, all openings to access the coal will be sealed with block walls containing

water drainage P-traps and will be back filled with noncombustible material for at least 30 feet outby. Unauthorized access into the mine and federal coal resources would be secured and the mine workings protected from long term degradation. Justification for the mine closure was PacifiCorp's decision to close the Deer Creek Mine based upon maximum economic recovery. PacifiCorp provided proprietary and confidential information demonstrating that production costs at the mine exceeded market costs and thus provided the decision to close the mine.

Inspection: As equipment has been withdrawn from the mine, the BLM has inspected all areas that have been abandoned before they became inaccessible. The BLM will continue to inspect accessible areas until final sealing has occurred.

Approval and Conditions: The BLM agrees with Interwest's proposal for sealing and securing the mine. The BLM accepts the final R2P2 and the update to the coal reserve as shown in the two-volume "Final Amendment (Per Mine Closure) September 2015 East Mountain LMU UTU-73336 Resource Recovery and Protection Plan for the Deer Creek and Cottonwood/Wilberg Coal Mines".

✓ **Maximum Economic Recovery (MER):** MER has been determined to be achieved due to the mining costs encountered in this mine when compared with coal secured in the open market.

National Environmental Policy Act (NEPA): This approval of a minor modification to an approved R2P2 of an existing underground coal mine is categorically excluded from NEPA analysis, as explained in the Department Manual (5 DM Part 516 11.5 (F) (8)).

The BLM has determined that this R2P2 modification complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, and the lease terms and conditions. Interwest is authorized to secure the Deer Creek Mine indefinitely. If you have any questions, please contact Steve Rigby at the Price Field Office (435-636-3604) or Jeff McKenzie at the BLM State Office (801-539-4038).

Sincerely,

Ahmed Mohsen
Field Manager

cc: Roger Bankert, BLM State Office (UT-920)

Office of Natural Resource Revenue
Attn: John Hovanec
DFC, 6th & Kipling, Bldg.85
P.O. Box 25165, MS 63010C
Denver, Colorado 80225-0165

Utah Division of Oil, Gas, and Mining
Daron Haddock
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

Mine Safety and Health Administration
Cord Cristando
45 East 1375 South
Price, Utah 84501

LEGEND

- LMU BOUNDARY 20,175.11 ACRES
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- U-47977 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE
- FEDERAL COAL LEASE ACREAGE RETAINED
- FEDERAL COAL LEASE ACREAGE RELINQUISHED
- WILDFIRE BURN AREA – JUNE 2018 (SOURCE: INCIWEB.NWCG.GOV)

Lease #	% of Relinquished Area Burned	% of Retained Area Burned
UTU-84285	0%	-
UTU-88554	55%	-
UTU-06039	91%	45%
UTU-024317	98%	-
UTU-024319	97%	-
UTSL-051221	58%	7%
UTU-2810	40%	-
UTSL-050862	100%	99%
UTU-014275	100%	-
UTU-47977	100%	-
UTU-47979	95%	-
UTU-084923	58%	-
UTU-084924	13%	-
UTSL-064607-064621	86%	17%
UTSL-070645-02292	21%	-
UTU-083066	0%	-
UTU-040151	0%	0%
UTU-1358	0%	-
UTSL-064900	0%	0%
UTU-47978	0%	-
UTU-044025	-	0%

Mine Workings Updated To: January 7, 2015

CAD FILE NAME/DISK#: LEASE RELINQUISHMENT BASE MAP

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

PACIFICORP EAST MOUNTAIN LMU UTU-73336
FEDERAL COAL LEASE RELINQUISHMENTS &
AREAS TO BE RETAINED WITH WILDFIRE BURN AREA

DRAWN BY: K. LARSEN

SCALE: 1" =4400'

DATE: SEPTEMBER 10, 2018

DRAWING #: MAP 1

SHEET 1 OF 1

REV.

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-024319

LEASE ACTIVITIES

1) Coal Lease Number: UTU-024319 *(Full Relinquishment)*

2) Lessee Name and Address:
PacifiCorp
c/o Interwest Mining Company
1407 West North Temple, Suite 110
Salt Lake City, Utah 84116

3) Utah Division of Oil, Gas, and Mining (DOGM) mine permit number: C/015/0018 (Deer Creek Mine).

4) Date of request: _____ Date filed: _____.

5) Acres requested to be relinquished: 1,000.00; Entire lease? YES ☒ NO ☐ (See attached map.) Comments: *Refer to Exhibit A for the legal descriptions of area relinquished. No areas retained. See also Figure 1 (a map depicting the area to be relinquished in its entirety).*

Original Lease Acreage: 1,040.00 Relinquished to date: 40.00 acres Remaining: 1,000.00 acres

- *Partial relinquishment: 40.00 acres – Accepted effective: 4/24/1992*

6) Have all bonus bid payments been paid? YES ☐ NO ☐ N/A ☒ (If "NO", date anticipated to be paid in full: ___)

7) Are lease rental payments up to date? YES ☒ NO ☐ N/A ☐ (If "NO", date anticipated to be brought up to date: _____)

8) Has the lessee or the former lessee, if previously assigned, conducted mining activities on this lease? YES ☒ NO ☐ (If "NO", complete question 14, then proceed to question 23)

9) Type of mining conducted: Longwall ☒, Room & Pillar ☐, Surface ☐, Other ☐ (Explain) _____

10) If underground mined, excluding surface disturbances associated to subsidence, was there any surface disturbance conducted in association with the underground operation(s)? YES ☐ NO ☒ (If "YES", describe:

11) Date of initial mining: February 1993; last mining: October 1995

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-024319

12) Number of coal beds mined: 1 coal seam (Blind Canyon

13) Range of thickness of coal removed for each bed: 7' - 10'

14) Have all estimated recoverable coal reserves been recovered? YES ☒ NO ☐ N/A ☐ (If "NO", tons to remain in place: _____; Justification to leave these reserves must be provided.)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain Logical Mining Unit with a determination that maximum economic recovery has been achieved.*

15) Was an R2P2 modification required to account for deficient recovery? YES ☒ NO ☐ (If "NO", explain: _____)
    - *Refer to BLM approval letter dated March 23, 2016 (copy enclosed) regarding the final R2P2 for the Deer Creek Mine and final disposition of the East Mountain LMU with a determination that maximum economic recovery has been achieved.*

16) Have all production royalty payments been paid to ONRR? YES ☒ NO ☐ (If "NO", date anticipated to be paid in full: _____)

17) Did subsidence occur? YES ☒ NO ☐ (If "YES", continue; if "NO", proceed to 23)

18) Has it been demonstrated that the surface above subsided areas has been substantially stabilized per the criteria outlined in Appendix A? YES ☒ NO ☐ N/A ☐ (If "YES", please attach supporting documentation.)

19) Has the surface area been inspected to determine impacts to surface topography per the criteria outlined in Appendix B? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation. If "NO", date when inspection is scheduled: ___)
    - *Surface topography inspections were conducted through annual reconnaissance flights.*

20) Have there been any impacts to surface or groundwater per the criteria outlined in Appendix C? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to hydrographs*

21) Have there been any impacts to vegetation per the criteria outlined in Appendix D? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
    - *Refer to DOGM write up. In addition, the Trail Mountain wildfire in June 2018 burnt the majority of the vegetation and baked the soils on this federal coal lease.*

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-024319

22) Have there been any impacts to private improvements per the criteria outlined in Appendix E? YES ☐ NO ☒ N/A ☐ (If "NO", attach supporting documentation.)
   - *There are no known improvements.*

23) Has CERCLA Certification been submitted per the criteria outlined in Appendix F? YES ☒ NO ☐ N/A ☐ (If "YES", attach supporting documentation.)
   - *As of the date of this submittal. Refer to Appendix F.*

24) Was there any surface disturbance conducted independent of mining activities? YES ☐ NO ☒ (If "YES", describe: _____)

25) Have all concerned agencies commented on this relinquishment request? YES ☐ NO ☐ (If "NO", who has not? _____)

26) After review, BLM proposes the relinquishment of ___ acres (Attach acreage adjustments).

27) Is approval recommended at this time? YES ☐ NO ☐ (If "NO", items deficient or other areas of concern:

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

_____; Date completed / Satisfied: _____

Checklist and Documentation of Findings
Federal Coal Lease Relinquishment
Under 43 CFR 3452
UTU-024319

Exhibit A

Full Relinquishment

The legal description for full relinquishment of UTU-024319 is described below:

Federal Coal Lease UTU-024319		
Lease Readjustment Effective Date:		5/1/2010 to 5/1/2020
Lessee of Record:		PacifiCorp
Federal Coal Lease Acres:		**1,000.00**
Description of Lease Acreage Being Relinquished		**Acres**
T16S, R7E, SLB&M Emery County, UT		
Sec 27:	SW¼	160.00
Sec 28:	SE¼	160.00
Sec 33:	E½, E½W½, SW¼SW¼	520.00
Sec 34:	W½NW¼, W½E½NW¼, NW¼SW¼	160.00
	Total Lease Acres for Full Relinquishment:	**1,000.00**
	Total Lease Acres Remaining:	**0.00**

FEDERAL COAL LEASE UTU-024319
Checklist and Data Documentation for
Federal Coal Full Lease Relinquishment
Under 43 CFR 3452

APPENDIXES A - F

Appendix “A” Subsidence and Surface Stabilization

Appendix “B” Evaluation of Impacts to Surface Topography

Appendix “C” Evaluation of Impacts to Ground and Surface Water Hydrology

Appendix “D” Evaluation of Impacts to Vegetation

Appendix “E” Evaluation of Impacts to Private Improvements

Appendix “F” Environmental and CERCLA Certification

Deer Creek Mine
Federal Coal Lease UTU-024319 Full Lease Relinquishment
Appendix A

Subsidence and Surface Stabilization

Mining History

This lease is comprised of a single contiguous block of coal reserves in the Blind Canyon seam. Coal reserves were recovered by longwall methods. Mining in the Blind Canyon seam took place between 2/1993 and 10/1995.

The following narrative provides details related to PacifiCorp's subsidence monitoring and control plan for East Mountain, including the Deer Creek Mine.

Subsidence Monitoring Plan

The establishment of a subsidence monitoring plan is a requirement of the Division of Oil, Gas and Mining (DOGM) detailed in R645-301 -525.440.

PacifiCorp 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 PacifiCorp 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. In 1987, with the concurrence of the State of Utah Division of Oil, Gas & Mining (DOGM), PacifiCorp discontinued on-the-ground monumentation and began collecting 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. PacifiCorp submits a comprehensive report annually to the BLM, USFS, and the Utah Division of Oil, Gas, & Mining.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. PacifiCorp has been using aerial photogrammetry - based subsidence modeling since 1980. This method has proven to be the best way to collect subsidence data on East Mountain. A baseline photogrammetric survey was conducted in 1980 that included over 21,000 elevations measured on approximate 200-foot spacing grid. 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 is not as good, and inaccuracies of greater than ten feet can occur. In

steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data.

Annual Subsidence Survey Procedures

Aerial photographs of the entire East Mountain LMU area are used in conjunction with widely spaced survey control points on the ground to produce a digital elevation model of the ground surface in successive years from which a surface subsidence map is generated for each year. The ground control points are marked and surveyed using conventional survey methods, then flagged so that they can be seen in photographs taken from the air. Approximately 100 aerial photographs of East Mountain area are taken along 7 flight lines that traverse the LMU area from north to south. Overlapping portions of photographs taken from successive viewpoints along the flight lines produce stereoscopic views of the ground surface. These 93 views of overlapping photograph pairs are called "models" in the photogrammetric process. Elevations of the ground surface over the entire permit area are then calculated using a computer-aided stereo plotter, and verified using the known survey points. Ground elevations are calculated for a grid of approximately 200-foot centers, optimized for terrain. The baseline data, including surveying and flagging ground control points, acquiring the aerial photographs, and generating the surface grid and map, for the East Mountain Area were collected in 1980. These elevations will then be compared to elevations measured from the photographs taken annually in each summer. Using this method, ninety percent of the points measured will be accurate to within plus or minus one-half foot.

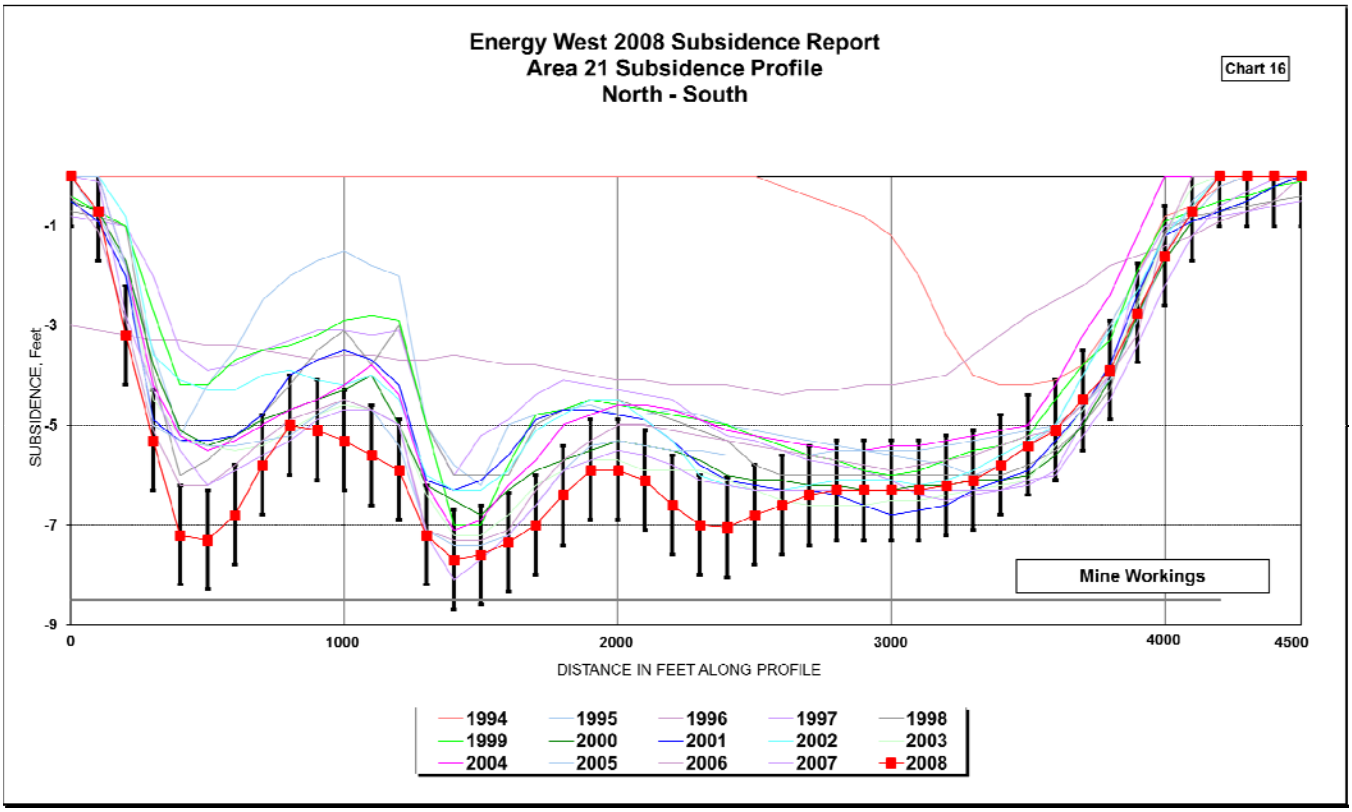
PacifiCorp participated with the governmental agency task force which included representatives from the Bureau of Land Management, Forest Service and the Division of Oil, Gas and Mining, to develop *"Memorandum of Understanding for Processing of Requested to Relinquish Federal Coal Leases (10-MOU-97-001)"*. This document established "Standards for Relinquishment Consideration" including the amount of accepted variation in annual subsidence data. As stated in the MOU, the area will be considered stable, if the cumulative subsidence during the period (3 years) has been 1 foot or less under normal circumstances. Based on this agreement, subsidence measurements and areas and subsidence areas shown on PacifiCorp's annual subsidence maps show areas of total measurable subsidence greater than two feet. PacifiCorp's experience on East Mountain since 1980 has shown that the areas of minimum detectable subsidence, i.e., one foot or more, very rarely extend outside of the outline of the total mine workings, even in areas where more than one seam has been mined.

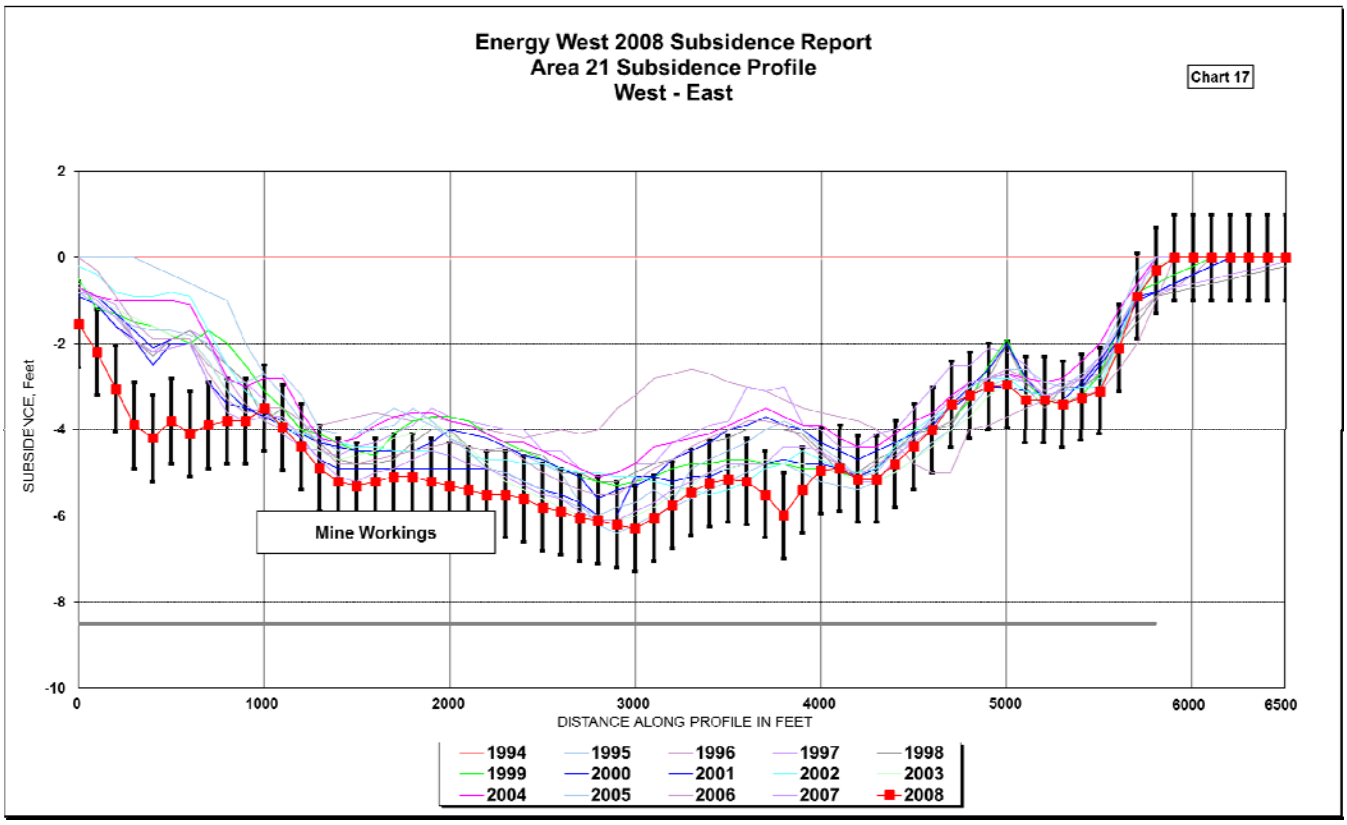
PacifiCorp's contractor maintained survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinate points on photos within $\pm$0.5 foot. Following this procedure the operator conducted an aerial photo survey annually of all areas that were undermined. PacifiCorp has continued monitoring all areas undermined until the operator and DOGM agree that the subsidence in a given area has become stable and no further monitoring is necessary.

Federal Lease UTU-024319 Subsidence Data

Subsidence in the lease UTU-024319 area was monitored from 1994 to 2008. Subsidence measurements by photogrammetric methods were used, and subsidence profiles (shown on the following figures and accompanying maps) show subsidence measurements made between 1994 and 2008. Photogrammetric methods allow more complete subsidence monitoring coverage in areas that are topographically rugged and difficult to measure using conventional surveying methods.

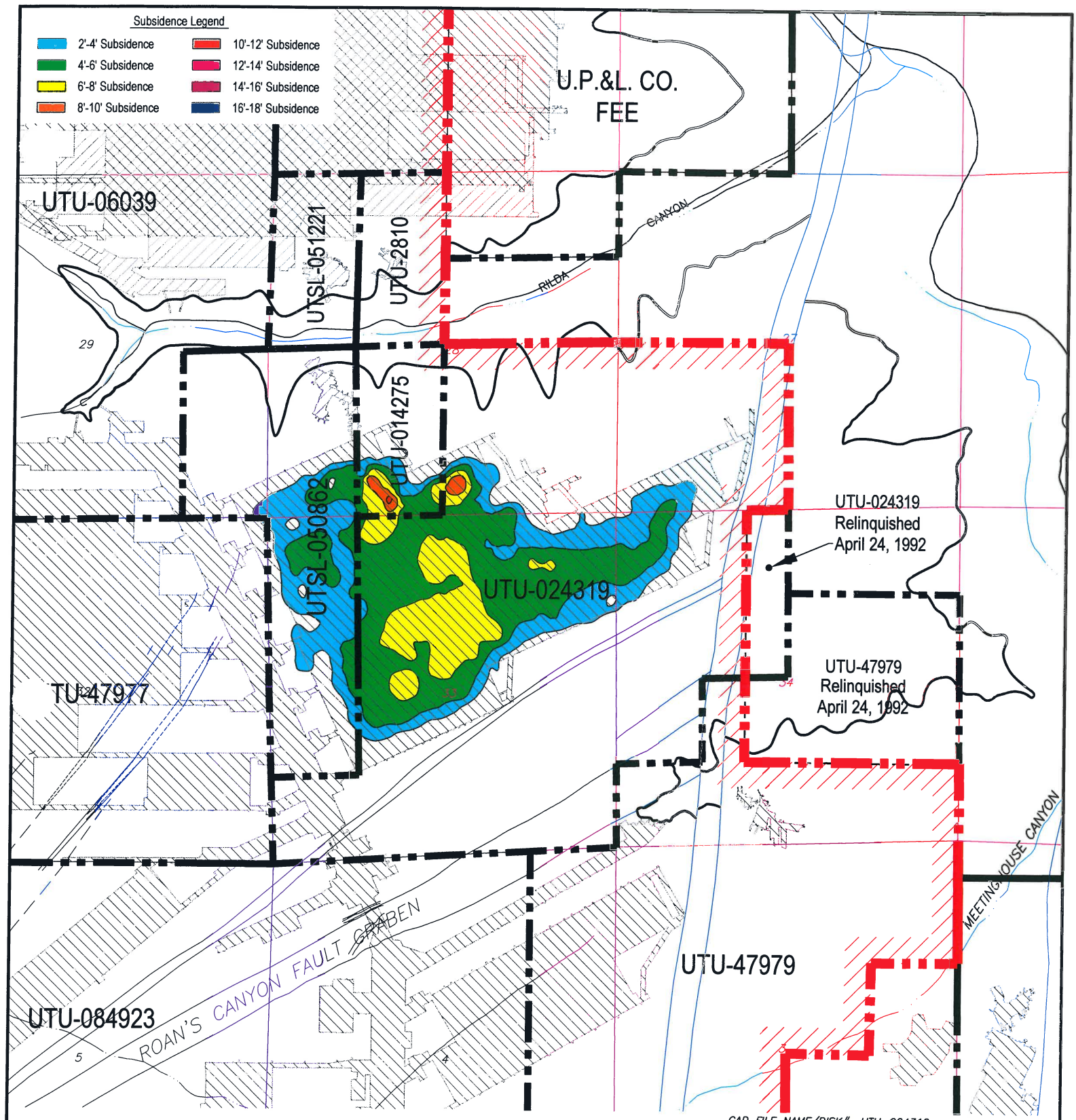
PacifiCorp delineated a series of two profiles (Area 21) covering the main longwall panel district in Lease UTU-024319, including the dual-seam mining overlay area, are shown on the following figures and accompany maps. Subsidence within this area has reached a maximum of just over 9 feet. Some minor cliff spalling of the Castlegate Sandstone occurred during undermining. Appropriate measures for protection of property and the public were taken during the subsidence of cliffs that were predicted to spall, including warning signs along the Rilda Canyon road to make the public aware of the potential hazards. No change in subsidence has occurred since 2009, and the area is stable (see following figures and map). Also, the subsidence contour maps for 2017, included herein, show no increase in subsidence.





Aerial surveys conducted annually by helicopter 1999 - 2017 have detected no additional subsidence-related effects on the surface in UTU-024319.

The proposed relinquishment area of Lease UTU-024319 is stable and subsidence is substantially complete.



CAD FILE NAME/DISK#: UTU-024319

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-024319 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

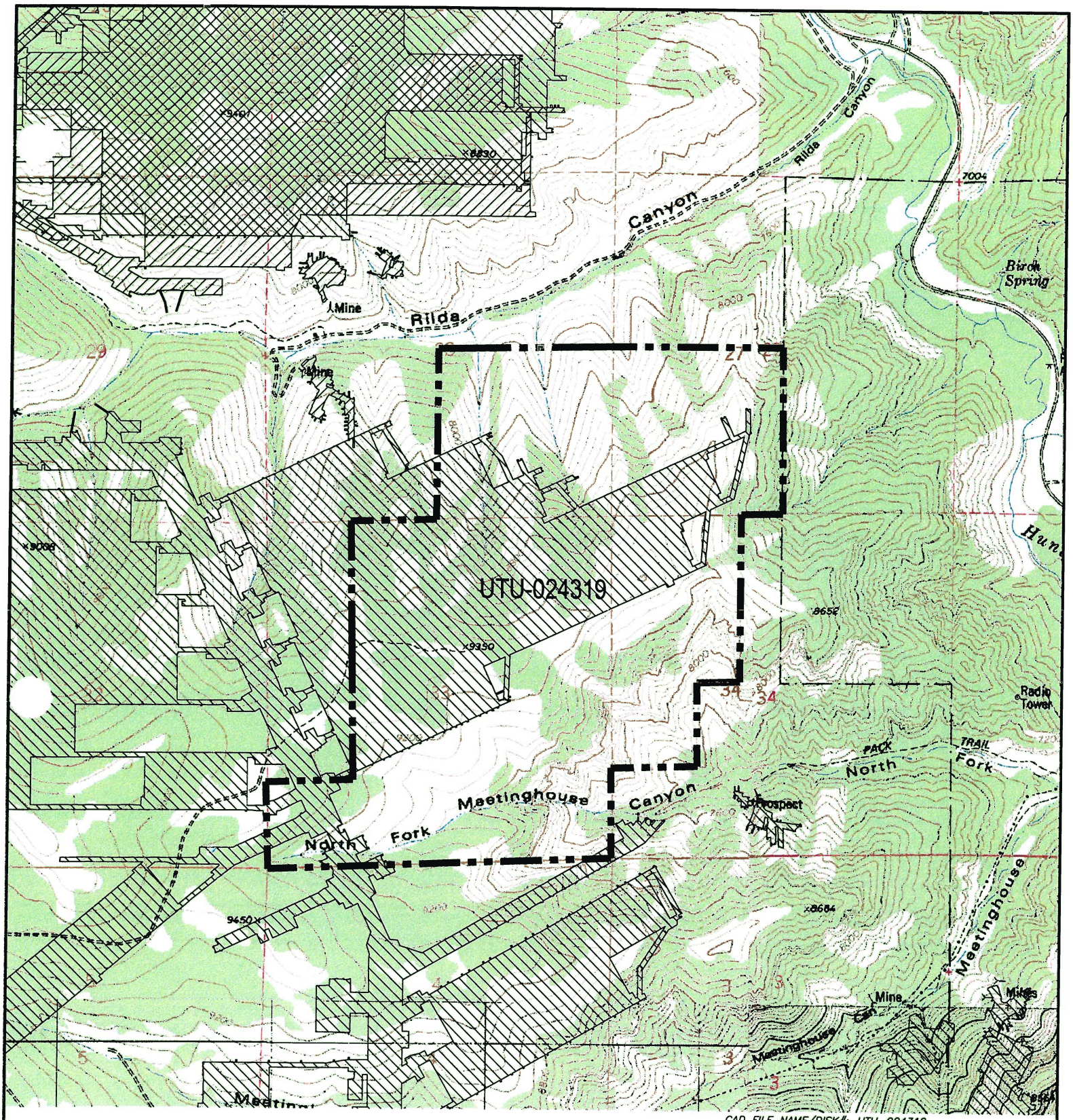
EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-024319
SUBSIDENCE BASE MAP

DRAWN BY: K. LARSEN	APPENDIX A	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-024319 Full Lease Relinquishment
Appendix B

Evaluation of impacts to Surface Topography

PacifiCorp has demonstrated that subsidence is substantially complete and that the surface has stabilized; refer to Appendix A. Based on the aerial observations and supporting data, the relinquishment area of Lease UTU-024319 is stable and subsidence is substantially complete. No surface facilities or installations were located within UTU-024319. No restoration and/or mitigation efforts are required for Lease UTU-024319. Please refer to the Appendix B - Topographic Surface Map. This map shows the relationship between the topographic surface, the mine workings, and the UTU-024319 lease boundaries seam outcrop.



CAD FILE NAME/DISK#: UTU-024319

HIAWATHA SEAM MINE WORKINGS

BLIND CANYON SEAM MINE WORKINGS

FEDERAL LEASE ACREAGE RELINQUISHED

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-024319
TOPOGRAPHIC BASE MAP

DRAWN BY: K. LARSEN	APPENDIX B	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV. ___

Deer Creek Mine
Federal Coal Lease UTU-024319 Full Lease Relinquishment
Appendix C

Evaluation of Impacts to Ground and Surface Water Hydrology

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 97 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface hydrology impossible. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the surface hydrology characteristics of the area.

The following section provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within UTU-024319 and surrounding area (North Rilda Ridge).

Since 1979 detailed data on the hydrology of the East Mountain 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, 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.

The hydrologic monitoring plan for the Deer Creek Mine Mill Fork Lease Area is specified in Volume 12 Hydrologic Section in the approved Mining and Reclamation Plan (MRP). Lease UTU-024319 is near to the Mill Fork Lease area and includes within the adjacent ½ mile zone some of the surface sites that are part of the surface hydrology monitoring plan.

As outlined by the BLM, the interested parties have agreed that under normal circumstances, the minimum time period for continued monitoring will be three years. During this time period the operator/lessee will establish that the surface has substantially stabilized according to Appendix "A".

The following sections will describe and provide detail concerning the groundwater and surface water resources within and adjacent to Federal Lease UTU-024319.

Regional Groundwater Hydrology

The characteristics 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 Mill Fork Area, a discussion of pertinent regional geologic features is presented below.

Regional Geology

The North Rilda Ridge 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 dropping steeply to the valley below. Relief of up to 5,000 feet is measured from Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the mining areas located within the North Rilda Ridge 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. 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 PacifiCorp mining area covers portions of East Mountain.

The geologic formations exposed in the PacifiCorp mining area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age. 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, and the Flagstaff Limestone (Tertiary). 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 member of the Mancos Shale and consists of light to medium gray marine mudstones. The marine Masuk Member of the Mancos Shale was deposited in an open marine environment (Mayo and Peterson, 2001). The Masuk Member is a highly erodeable

calcareous, gypsiferous, and carbonaceous dark gray colored shale. It is continuously exposed along the eastern edge of the Wasatch Plateau, and is exposed in the North Rilda Ridge area. The Masuk Member is approximately 1,300 feet thick. Westward thinning wedges of the Masuk inter-finger with tongues of the Star Point Sandstone. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and inter-tonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive sandstones totaling about 400 feet in thickness.

The Star Point Sandstone forms massive cliffs where exposed at the surface. The sandstone was deposited as seaward thinning (east), marine, shoreface blanket sands that are laterally continuous (Mayo and Peterson, 2001). Landward (west), these sandstones terminate abruptly into the mud- and organic-rich backshore facies (Van Wagoner and others, 1990). Because many of the organic-rich facies are now mineable quality coal, locally the Star Point Sandstone has immediate contact with coal seams. Elsewhere sandstone bodies of the Star Point Sandstone are overlain and underlain by lower shoreface and open marine shales of the Mancos Formation. What this means is that the marine shoreface sandstones are three dimensionally encased by low-permeability marine shales and fine-grained carbonaceous backshore coal-bearing facies (Mayo and Peterson, 2001).

The Star Point Sandstone thins eastward and merges with the underlying Masuk Member of the Mancos Shale. Three prominent tongues of the Star Point Sandstone inter-finger with the Mancos Shale. These three sandstone members, from top to bottom, are the Spring Canyon, Storrs, and Panther Sandstones. In the North Rilda Ridge area, the Spring Canyon tongue is approximately 100 feet thick, lies about 80 feet above the Storrs tongue, and consists of massive, fine- to medium-grained sandstone. The Storrs tongue lies about 120 feet above the Panther tongue and consists of 50 feet of soft, friable sandstone. The basal Panther tongue is approximately 100 feet thick and consists of massive, cross-bedded delta front sandstones Mayo and Peterson, 2001).

Even though the Star Point Sandstone exists throughout the entire East Mountain property, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. Permeability and the limiting factors 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, will be discussed in detail in the section entitled REGIONAL GROUNDWATER CHARACTERISTICS. 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 of this 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 total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The upper portion of the Blackhawk Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001). In these delta and flood-plain environments layers of mud are more abundant than channel sands. Sandstone channels are generally isolated from each other both laterally and vertically by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). The upper portion of the Blackhawk Formation also contains some thin carbonaceous shale layers and thin coal seams that are not of economic interest.

The lower portion of the Blackhawk Formation contains the mineable coal deposits and consists of more thinly bedded sandstone and shale layers (Johnson, 1978). The coal-bearing units of the lower Blackhawk Formation overlie and are laterally juxtaposed to marine shoreface sandstones of the Blackhawk Formation and Star Point Sandstone (Mayo and Peterson, 2001). On a large scale, these sandstone bodies are laterally continuous but terminate abruptly into the mud- and organic-rich backshore faces in a landward direction (Van Wagoner and others, 1990). However, individual rock layers are lenticular and discontinuous, with abundant shaley interbeds. The fine to medium grained sandstones occur as thin- to massively-bedded paleochannel deposits. The paleochannels increase in frequency, thickness, and lateral extent upward in the formation. There is also a vertical repetition of erosional scours within the upper sandstones (Marley, 1979).

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 approximately 250 to 350 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The formation was deposited from bed-load fluvial channel systems. The Castlegate Sandstone is made up of coarse-grained, often conglomeratic, fluvial sandstone. Thin inter-beds of siltstone and claystone occur in lower portion the formation. Sandstone dominates over mudstone and individual sand channels may be thin, wide, or interpenetrating. Although the primary porosity is high, the existence of mudstone drapes and pervasive carbonate and silica cement greatly reduces the overall porosity (Mayo and Peterson, 2001, Appendix B).

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 350 feet thick and forms steep slopes which extend upward from the Castlegate Sandstone.

The Price River Formation was deposited from mixed-load fluvial channel systems that have sandstone/mudstone ratios intermediate between bed-load and suspended-load channel systems (Mayo and Peterson, 2001). Sandstones and mudstones occur in about equal proportions. Point bars that develop in this type of system are larger than those in suspended-load channel systems. Mudstone drapes created during low flow stages of the active fluvial system separate the sandstones from each other both horizontally and vertically (Mayo and Peterson, 2001).

The North Horn Formation forms the cap rock for much of East and Trail mountains where the Flagstaff Limestone has been eroded away. Mudstones dominate the rock types present and are generally gray, light brown, to purple 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 North Horn Formation is approximately 850 to 1,000 feet thick in the North Rilda Ridge area.

The North Horn Formation was deposited in an alluvial-plain/suspended-load fluvial channel environment (Mayo and Peterson, 2001, Appendix B). In such environments layers of mud are more abundant than sands, which occur in sandstone channels. The sandstone channels are generally isolated from each other, both laterally and vertically, by mud-rich overbank and inter-fluvial rocks (Galloway, 1977). In the study area the formation consists primarily of shale with discontinuous sandstone channels, minor lenses of limestone, and conglomerate. Highly bentonitic mudstones, which swell when wetted, are common in the lower two-thirds of the formation.

The Flagstaff Limestone caps the uppermost portions of East Mountain is the youngest formation exposed in the East Mountain area. It typically forms small exposures on top of the plateau. A thickness of 105 feet was measured on Trail Mountain immediately south of the study area (Davis and Doelling, 1977). Maximum thickness in the Mill Fork Area is approximately 80-100 feet. There is no Flagstaff Limestone in the North Rilda Ridge area.

The Flagstaff Limestone consists of carbonates, marls, and some thin sandstone stringers deposited in lacustrine, marginal lacustrine, and alluvial plain depositional environments (Garner and Morris, 1996). It primarily consists of light- to medium-gray colored limestone containing abundant secondary fractures produced during uplift and subaerial exposure (Mayo and Peterson, 2001, Appendix B).

Regional 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 encourages the infiltration of melting snow. Conversely, the many areas with steep slopes have a much more limited infiltration opportunity. All of the geologic formations which surface 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 Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it discharges in the form of springs.

Data have been collected from numerous coal exploration drill holes, from within the adjacent 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 tables in the North Horn and the Price River formations, 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. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow.

Flagstaff Limestone

This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation. Exposures of the Flagstaff Limestone

are limited to a narrow north-south trending ridge located several miles west of the North Rilda Ridge area.

North Horn Formation

This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper and lower portions of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Upper Price River Formation or Castlegate Sandstone below. The mudstones present swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives PacifiCorp the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the water bearing strata in the North Horn Formation because the channels are discontinuous and not interconnected.

Upper Price River Formation

The Upper Price River Formation is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally devoid of water because it lacks adequate recharge.

Castlegate Sandstone

The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water saturated. It is often dry or slightly damp in some zones. It is devoid of significant water because it lacks.

Blackhawk Formation

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams and the upper portion of the Star Point Sandstone Formation. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata. Channel systems were part of a deltaic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium grained sand with similar characteristics to the Star Point Sandstone Formation. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., non-permeable mudstone, carbonaceous mudstone, coal seams, and inter-bedded mudstones/siltstones and sandstones) generally act as aquicludes which impede vertical groundwater flow to the lower stratigraphic units. In areas other than where faulting and fracturing have created secondary permeability, the migration of water from the perched aquifers-sandstone channel systems of the Blackhawk Formation to the Star Point Sandstone Formation is limited. Extensive mining in the Cottonwood/Wilberg complex, which produces coal from the Hiawatha seam, is stratigraphically located directly on top of the upper member of the Star Point Sandstone. Only minor quantities of groundwater have been produced from the Star Point Sandstone. The coal seams of the Blackhawk Formation are effective in impeding vertical groundwater movement. In many areas in the adjacent mines where roof coal was left in place because of abundant thickness or as an additional effort to support the immediate roof, production of groundwater occurred only when roof support was installed or when a roof failure occurred exposing the overlying sandstone channel systems. Listed below are hydrologic characteristics of individual rock types reported by the USGS, Open File 84067.

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained. Hydraulic Conductivity: I, impermeable to water even at pressures of 5,000 pounds per square inch (psi).					
				Hydraulic Conductivity (feet per day)	
Geologic Unit	Lithology	Depth below land surface	Porosity %	Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5x10-2	3.7x10-3
	Slt	1,545	3	9.3x10-8	1.2x10-7
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1x10-2	3.9x10-3
	Sh	2,170	4	1.1x10-8	---
	Slt	2,265	2	2.0x10-7	2.2x10-6
Star Point Sandstone	Ss, m	2,466	17	3.1x10-2	1.1x10-2
	Ss,	2,493	11	1.5x10-2	6.6x10-3

In the adjacent Cottonwood and Deer Creek mines, the majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes. Many locations within the mines have been monitored in the past, but a limited number of accessible long term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

Based on data from the adjacent mines, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. 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. It appears that the water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity. In an attempt to quantitatively evaluate saturated sandstone channels, a dripping channel in the 6th West area of the Deer Creek Mine was investigated. The channel, located near a minor fault with very limited displacement, has the dimensions of >2,000 feet in length, 150 feet in width and a maximum thickness of 25 feet. An array of uphole monitoring wells was installed across the width of the channel. The wells were 15 to 25 feet deep and were open along their entire depth. Each well was equipped with a shutoff valve and pressure gauge. The idea was to conduct a pump test by letting selected wells gravity drain and simultaneously measuring pressure change in nearby wells. Because a maximum of about 2 psi was recorded in the well (i.e. (5 feet of water) we were unable to conduct the test. What the well did demonstrate was that the sandstone channel was not fully saturated and it was a perched, unconfined groundwater system.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that recharge to the Blackhawk is limited because of the above confining formations and many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine - along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. The fractures sealed readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

Significant quantities of groundwater were also encountered in the Deer Creek Mine, 4th South area, where development entries intersected fractures/faults associated with the Roans Canyon Fault system. As with other areas where groundwater has been intercepted, the flow from the 4th South/2nd Right area has decreased rapidly, from approximately 2000 gpm in March 1990 to approximately 120 gpm in December 1990. Exploratory drilling was utilized in the development entries to locate and map the extent of the water producing fracture. The water producing zone was isolated utilizing an inflatable packer and a pressure gauge was installed to monitor the head differential. Pressure readings recorded were similar to those of Roans Canyon Fault crossing at 3rd North, with readings varying from 80-90 pounds per inch. This calculates out to approximately 200 feet of head. The amount of overburden in the area where the water

producing fracture was encountered is approximately 1800-2000 feet. In reviewing the dewatering curve and the initial head differential, groundwater produced from the interception of the water producing fracture was a function of storage and recharge to the fault is limited. To monitor the potential impact of mine dewatering, PacifiCorp installed a series of wells in both the Deer Creek and Cottonwood/Wilberg mines (refer to Volume 9 Hydrologic Section Maps HM-2 and HM-3). These wells were incorporated in the hydrologic monitoring program in 1989. Well development information was detailed in the 1989 Annual Hydrologic Monitoring Report and in Volume 9 - Hydrologic Support Information). Only the wells in the Deer Creek Mine along the axis of the Straight Canyon Syncline revealed a change which could possibly be related to mine dewatering. In addition to the in-mine monitoring PacifiCorp installed a series of surface wells to monitor the potential impacts in Cottonwood Canyon located to the south of Mill Fork and in Rilda Canyon located to the east of Mill Fork. To evaluate the effects on the surface springs and surface drainage systems PacifiCorp maintains an extensive monitoring program. Data collected will be reported annually in the Hydrologic Monitoring reports.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant and include 1) structural rolls with overlying fluvial channels, 2) Pleasant Valley and Roans Canyon Fault systems, 3) fractures and joints (lineaments), and 4) surface and in-mine drill holes.

Star Point Sandstone

The Star Point Sandstone overlies and inter-tongues with the Masuk Shale. The formation is approximately 350 to 400 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Star Point Sandstone due to the inter-fingering nature of the contact between the two units.

The Star Point Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicate that the Star Point Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Star Point Sandstone is where it has been intersected by the major canyons in the plateau or where faulting has caused secondary permeability. This, plus the fact that the Star Point Sandstone is only slightly to moderately permeable, allows only limited flow of groundwater through the formation. Drill holes completed in the Deer Creek, Wilberg/Cottonwood and Genwal mines have defined the piezometric gradient in the lower Blackhawk/Star Point Sandstone system in isolated areas and confirmed the

groundwater flow conforms with the topographic relief and structural features, i.e., regional dip, Straight Canyon Syncline, and regional faulting.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000). Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years), have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates and lack of fluctuations of in-mine monitoring wells.

Solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggesting that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

Water in most of the Blackhawk/Star Point aquifer is confined under pressure between shale and siltstone beds within the aquifer (USGS, Lines, Open File Report 84067). Water is released from storage from confined aquifers mainly by compression of the sandstones and less permeable, confining beds as pressure in the aquifer declines. The quantity of water that can be released from storage is dependent on the storage coefficient, which is about 1x10-6 per foot of thickness for most confined aquifers (USGS Lines, Open File Report 84067). Data collected by PacifiCorp on the Roans Canyon Fault System in 1988, 3rd North fault crossing, confirmed the USGS storage coefficient estimations, with values ranging from 1.6x10-4 to 7.0x10-6. Transmissivity values computed for pump tests conducted by the USGS on Trail Mountain on semi-penetrating wells in the Blackhawk/Star Point aquifer ranged from 0.7 to 100 ft^2/day with a majority of the two results ranging from 1 to 10 ft^2/day. The computed transmissivity of 100 ft^2/day was greater than the laboratory data (listed early in this section) and was believed to be due to secondary permeability in the form of fractures. Transmissivity results ranging from 0.7 to 10 ft^2/day are indicative of the low permeability rock in most of the Cretaceous and Tertiary strata within the Wasatch Plateau.

Structural Hydrologic 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 the North Rilda Ridge area.

Folding:

Strata in the North Rilda Ridge area are gently folded in two broad structural features. The Flat Canyon Anticline crosses to the west of the lease 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. The strata within Lease UTU-024319 are located on the southeastern limb of the Flat Canyon Anticline, which is also the northwestern limb of the Straight Canyon Syncline. Strata dip about 2 - 4 degrees to the southeast.

Faulting:

There is no faulting within the UTU-024319 lease area. The nearest known faulting to the lease area is the Mill Fork fault graben. The Mill Fork fault graben passes about 1 mile to the northwest of the lease area. 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 southeast corner of the lease 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 not intercepted this fault zone and exploration drilling in the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

Springs and Seeps

Prior to coal leasing, lands administrated by the United States Forest Service require sufficient environmental baseline data to be analyzed during the National Environmental Protection Act (NEPA) analysis process. In preparation for coal leasing through the lease-by-application process, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). Data collected by Genwal Resources was determined by the Forest Service to meet the requirements of the Data Adequacy Standards. Information submitted to the Forest Service included: location, flow and quality (data indicates

general trends, date of collection generalized and quality limited to field data). With PacifiCorp's acquisition of the Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2002. Evaluation of the data revealed similar geologic occurrences to the southern portion of East Mountain, (majority of the groundwater resources discharge from the North Horn Formation in a down-dip configuration), which has been monitored by PacifiCorp for more than thirty years. The water reconnaissance program of the Mill Fork Area was initiated with an aerial survey via helicopter. During the reconnaissance survey, previous baseline survey data was evaluated for field location accuracy. Based upon initial observations, PacifiCorp commenced a field program in 2000 to completely map, field mark and photograph each groundwater source. Previous baseline studies were utilized as a guide of potential groundwater resources. The entire area of the Mill Fork Area and adjacent area was traversed. During the field reconnaissance process, when water resources were encountered, they were tracked to the source. At the sources, the sites were located utilizing GPS surveying techniques (GPS - equipment: Trimble Asset Surveyor, differentially corrected, horizontal accuracy sub-meter), digitally photographed, field marked with a brass tag and measurements were taken of flow and temperature. PacifiCorp retained identification system established during the previous surveys, except for the Joes Valley area and Mill Fork Ridge. In these two areas, several springs were labeled with multiple tags of different numbers and separate springs were labeled the same identification. In addition to the field measurements, PacifiCorp collected baseline water quality samples. Not all sites were sampled, collection of water quality samples were restricted to sites where representative samples could be obtained. At selected sites, springs were also sampled for isotopic data. These sites were selected based on geographic location, geologic formation, and occurrence.

During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the Mill Fork Area. 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 included in the Deer Creek Mine MRP. The springs on East Mountain originate in several different ways; 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. Field observations along with 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 intersects the land surface. Field observations along with 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. 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.

Numerous springs are located along and within the Joes Valley Graben. Generally, the springs are located within the North Horn Formation (Bald Mountain Ridge located west of the Mill Fork Area) along the fault zone and the alluvial valley deposits. Many of the largest springs surveyed for the Mill Fork Area are located along this fault system west of the Mill Fork Area. 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 (example: Bald Ridge area). 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. Seasonal flow variation collected for the Mill Fork Area compares directly to the data collected for the southern portion of East Mountain and data collected by Genwal resources to the north.

The following table provides a breakdown of spring locations by geologic formation and surface drainage:

MILL FORK PERMIT AREA (Energy West 2000-2002 Surveys) SPRINGS by GEOLOGIC FORMATION and SURFACE DRAINAGE						
Drainage System	Geologic Formation					
	Alluvium	Flagstaff	North Horn	Upper Price River	Castle Gate	Blackhawk

Huntington Drainage						
Crandall Canyon	0	0	0	7	1	0
Mill Fork Canyon	0	0	44	10	1	5
Right Fork of Rilda Canyon	0	1	39	1	0	0
Cottonwood Drainage						
Un-Named Drainages of Joes Valley	35		29	19	6	0
Total Number of Springs = 198						

Groundwater Quality

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reported 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 Formation and overlying formations (Danielson et al., 1981). During the Energy West 2000 - 2002 seep and spring surveys, a total of one hundred twenty-nine (129) samples were collected with a range of dissolved solids from 207 to 390 mg/l. 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. Although 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 extreme 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 downward because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of the data indicates that a relationship exists between elevation and the total dissolved solids concentration of 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.

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. 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. Historical data from PacifiCorp's on-going East Mountain Hydrologic Program has demonstrated that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist. Data collected in 2000-2001 confirms the trends historical in data collected for southern East Mountain, i.e., despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.

PacifiCorp began in-mine quality monitoring in 1977 (Cottonwood/Wilberg and Deer Creek mines). With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. As with the springs the quality varies from individual sites, but quality from the individual sites remains constant versus time.

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 Star Point Sandstone-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned earlier, water quality degrades from the north to the south and also vertically.

PacifiCorp contracted Mayo & Associates in 1996 to conduct comprehensive study to characterize the hydrology and hydrogeology of the East and Trail Mountains. The hydrogeology of the PacifiCorp leases were evaluated by analyzing: 1) solute and isotopic composition of surface and ground waters, 2) surface and groundwater discharge data, 3) piezometric data, and 4) geologic information. The following lists the key points and conclusions from the 1996 study:

Conclusions from the 1996 Mayo & Associates Hydrologic Investigation

1. The δ2H and δ18O compositions demonstrate that all ground waters are of meteoric origin (i.e. snow and rain).
2. Active and inactive groundwater regimes occur in the mine lease area.
3. The active regime includes alluvial groundwater, groundwater in the Flagstaff Formation, and all near surface exposures of the other bedrock formations except, perhaps, the Mancos Shale. The near surface extends about 500 to 1,000 feet into cliff faces. Ground waters in the active regime contain abundant 3H and anthropogenic 14C.
4. Comparison of long-term discharge hydrographs with precipitation records demonstrates that active regime ground waters: 1) are in direct hydraulic communication with the surface, 2) are recharged by modern precipitation, and 3) have large fluctuations in spring discharge rates which can be attributed to seasonal and climatic variability. High-flow/low-flow discharge rates vary as greatly as 600 gpm to nearly dry; however, most high flow rates are less than 50 gpm.
5. Despite the seasonal variability in discharge rates, the solute concentrations of active region ground waters do not exhibit significant seasonal variability.
6. The inactive regime includes groundwater in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). Mine workings are largely part of the inactive regime. The sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. Coal seams are hydraulic barriers to groundwater flow. The blanket sands of the Star Point Sandstone are also largely in the inactive zone. Except where exposed near cliff faces, faults encountered in mine workings are part of the inactive regime. Except near cliff faces, faults are not conduits for vertical hydraulic communication between otherwise hydraulically isolated pockets of groundwater.
7. Inactive region groundwater systems contain old groundwater (i.e. 2,000 to 12,000 years), and are not influenced by annual recharge events or short term climatic variability.
8. In-mine inactive regime ground waters occur in nearly stagnant, isolated zones which have extremely limited hydraulic communication with other inactive regime ground waters in the vicinity of mine workings and with near-surface active regime ground waters as evidenced by the following:

    a) Ground waters discharging into mine openings have 14C ages ranging from 2,000 to 12,000 years

b) Roof drip rates rapidly decline when water is encountered in the mine indicating that the saturated zone above the coal seam is not hydraulically continuous and has a limited vertical and horizontal extent.
c) Unsaturated conditions have been identified in boreholes drilled vertically into sandstone channels located above coal seams.

9. The fact that inactive region ground waters encountered in mine openings do not have an infinite age means that, at some time, there has been some hydraulic communication with the surface. This communication is extremely limited as illustrated by calculated steady state recharge-discharge rates of faults and sandstone channels in the inactive zone which range from 0.001 to 1.23 gpm.
10. Groundwater in the Star Point Sandstone is part of the inactive regime as evidenced by the 6,000 year 14C age of the sample from well TM-3. In the down dip direction along the axis of the Straight Canyon Syncline, potentiometric pressures in the Spring Canyon member results in upwelling of groundwater into Hiawatha seam mine openings. Such upwelling may locally reduce the pressure in the Spring Canyon member.
11. Aerially extensive groundwater regimes in the lower Blackhawk Formation and Star Point Sandstone do not exist within the lease area. Therefore, it is not meaningful to create piezometric surface maps of these systems.
12. Stream flow is dependent on snow melt, precipitation and thunderstorm activity. There is no apparent hydraulic communication between stream flow and groundwater encountered in mine openings.
13. The groundwater discharging into the Rilda Canyon alluvial collection system is of modern origin and is closely tied to seasonal recharge. This is evidenced by its modern radiocarbon and 3H contents and by the discharge hydrographs. The alluvial groundwater is not related to the groundwater encountered in the mines.
14. The groundwater discharging in Cottonwood Canyon near Cottonwood Spring and Roans Spring discharges from glacial deposits and is of modern origin. The radiocarbon and 3H contents of this water indicate a modern origin. The water in the shallow glacial deposits is not related to the groundwater encountered in the mines.

In addition to the study conducted in 1996, Mayo & Associates were retained in 2000 to investigate hydrologic resources of the Mill Fork Area and adjacent areas. The purpose of this investigation is to 1) characterize the groundwater and surface water systems in the Mill Fork Area, and 2) determine the probable hydrologic consequences of underground coal mining to surface waters and ground waters within the Mill Fork Area. The hydrology and hydrogeology of the Mill Fork Area area have been evaluated by analyzing: 1) solute and isotopic compositions of

surface waters and ground waters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information (refer to Appendix B for complete details).

Chemical Evolution of Groundwater (excerpt from Mayo & Associates Study)

a. Chemical Reactions

Solute compositions of groundwaters are the result of interactions between groundwater and bedrock lithology and between groundwater and atmospheric and soil gases. The general reactions responsible for the chemical evolution of groundwaters in the vicinity of the study area and inside the coal mines are described below:

Groundwater acquires most of its CO2(g) in the soil zone where the partial pressure of CO2 greatly exceeds atmospheric levels. This CO2 combines with water to form carbonic acid according to

$$CO2(g) + H2O = H2CO3 \quad (1)$$

Carbonic acid dissociates into H+ and HCO3- as

$$H2CO3 = HCO3^- + H+ \quad (2)$$

The H+ ions temporarily decrease the pH of the water but are quickly consumed by the dissolution of carbonate minerals that are abundant in the soil zone and in most aquifers. Carbonate mineral dissolution is represented as

$$2H+ + \underset{\text{(dolomite)}}{CaMg(CO3)2} = Ca2+ + Mg2+ + 2HCO3^-, \text{ and} \quad (3)$$

$$H+ + \underset{\text{(calcite)}}{CaCO3} = Ca2+ + HCO3^- \quad (4)$$

The net effect of reactions 2 through 4 is to increase the pH and the Ca^{2+}, Mg^{2+}, and HCO_3^- contents of waters. Dissolution of gypsum, which is present in minor amounts in many formations in the region, can elevate the Ca^{2+} and SO_4^{2-} contents in the absence of additional $CO_{2(g)}$ and H^+ according to

$$\underset{\text{(gypsum)}}{CaSO_4 \cdot 2H_2O} = Ca^{2+} + SO_4^{2-} + 2H_2O \quad (5)$$

Elevated Na^+ concentrations may result from either the dissolution of halite or from ion exchange on clay particles or on sodium zeolites (Mayo and others, 2000). Halite dissolution will increase the overall solute

concentration (i.e. TDS) and will yield equal Na^+ and Cl^- contents when the solute compositions are reported in the meq/l units. Halite is not abundant in the study area. Ion exchange will not directly elevate the overall solute content, but will result in increased Na+ concentrations with corresponding decreases in $Ca2^+$ and/or Mg^{2+} concentrations. Halite dissolution may be represented as

$$NaCl = Na+ + Cl^- \quad (6)$$

And the ion exchange may be represented by reactions involving the sodium zeolite analcime,

$$2NaAlSi_2O_6 \bullet H_2O + Ca2+ = Ca(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (7)$$

$$2NaAlSi_2O_6 \bullet H_2O + Mg^{2+} = Mg(AlSi_2O_6)2 \bullet H_2O + 2Na^+, \quad (8)$$

or clay mineral exchange which may be represented as

$$Ca^{2+} + Na\text{-clay} = 2Na^+ + Ca\text{-clay} \quad (9)$$

$$Mg^{2+} + Na\text{-clay} = 2Na^+ + Mg\text{-clay} \quad (10)$$

Solute Compositions

a. Streams

(1) Crandall Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Mill Fork Creek have a mean TDS of about 300 mg/l and are of the Ca^2+-Mg^2+-HCO^{3-} type with lesser amounts of SO_4^{2-}. This water includes drainage from the Mill Fork Area as well as the area to the north.

(2) Mill Fork Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Crandall Creek have a mean TDS of about 480 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with lesser amounts of SO_4^{2-}. Most of this water originates in the Mill Fork Area.

(3) Rilda Canyon Drainage

Water quality samples taken below the confluence of the north and south forks of Rilda Creek have a mean TDS of about 400 mg/l and are of the Ca^{2+}-Mg^{2+}-HCO_3^- type. This water is mostly drainage from the Mill Fork Area.

b. Springs

The solute compositions of ground waters from nearly all of the springs in the Mill Fork Area are of similar chemical type. This is seen in the similarity of the shapes of the Stiff diagrams and the clustering of the data points on the Piper plot. All of the springs in the Mill Fork Area for which chemical analyses are available are of the Ca^{2+}-Mg^{2+}-HCO_3^- type with variable amounts of SO_4^{2-}. This chemical type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2(gas) according to equations 1-4 above.

Mineral saturation calculations indicate that most of the springs and streams in the study area are at or above saturation with respect to the carbonate minerals calcite and dolomite. What this means is that the chemistry of the spring water is near equilibrium with respect to these minerals, and thus there is not a thermodynamic tendency to dissolve additional carbonate minerals if these are encountered in the groundwater system. Waters with saturation indices less than log = -0.1 have a thermodynamic tendency to dissolve the mineral species should they be encountered in the groundwater system and waters with a saturation indices greater than log = 0.1 have a thermodynamic tendency to precipitate the mineral species.

For additional dissolution of carbonate minerals to occur, an influx of $CO_{2(g)}$ into the groundwater system must occur. Common sources of $CO_{2(g)}$ in this environment include CO_2 produced by root respiration and organic decay in the soil zone and bacteriological processes resulting in the oxidation of CH_4 (methane). No surface or groundwater in the study area is near saturation with respect to gypsum. What this indicates is that, if gypsum is encountered along a waters flow path, dissolution of the gypsum will occur, resulting in elevated Ca^{2+} and SO_4^{2-} concentrations. Groundwater from the Blackhawk Formation and Star Point Sandstone encountered in nearby mine environments is supersaturated with respect to both calcite and dolomite indicating that the water has the thermodynamic tendency to precipitate these minerals.

TDS concentrations of springs in the study area fall in the narrow range of 207 to 390 mg/l. A probability plot of the ordered ranking of the TDS of ground waters collected during the 2000-2001 spring and seep survey indicate a single population with a normal distribution. The fact that all of the Mill Fork Area springs discharging from alluvial systems, the North Horn Formation, Price River Formation, Castlegate Sandstone, and Blackhawk Formation have the same chemical character is of particular significance. In other areas in the Wasatch Plateau, bedrock springs commonly have a broader range of TDS and chemical type, which is related to the bedrock formation from which the springs

discharge (Danielson and others, 1981; Mayo and Associates, 1997d; Mayo and Morris, 2000).

The mean TDS for each geologic formation ranges from 253 mg/l in the North Horn Formation to 322 mg/l in the Price River Formation. That there is not a greater variability in TDS, or a greater number of groundwater types represented in the springs in the study area implies that there is not a great deal of variation in the soil zone processes or mineralogy of the matrix of the groundwater systems from which these springs emanate. We believe that the lack of variability in groundwater solute chemistry occurs because the groundwater systems that support springs in the area flush large quantities of groundwater through the thick soil zone and shallow fractured bedrock. Over thousands of years, some of the soluble minerals which were once present in the shallow bedrock and in the soil have been leached away. Because these groundwater systems do not come into contact with rocks deeper in the geologic formations (which vary substantially in their soluble mineral contents) there is little variation in the chemical type of groundwater.

Although there is little variability in the chemical type and TDS of groundwater discharging from springs in the Mill Fork Area, there is considerable variability in the TDS and solute compositions of spring discharge waters and the solute composition of spring discharging from the Blackhawk Formation in the nearby Trail and Cottonwood Mine areas. We interpret the overall greater TDS and degree of chemical variability in the Blackhawk Formation in the Trail and Cottonwood Mine waters as a result of great precipitation variability in the Trail and Cottonwood Mine areas. Except for Joes Valley Alluvium, Mill Fork Area ground waters recharge and discharge from very wet upland areas. Trail and Cottonwood Mine groundwater recharge and discharge from a variety of elevations and recharge domains.

In-Mine Groundwater

Extensive in-mine samples of Blackhawk Formation roof drip water are available from Energy West's mines which include Cottonwood, Wilberg, Trail Mountain, and Deer Creek. A limited number of in-mine samples from the Star Point Sandstone are also available from the Deer Creek and Cottonwood Mines (Mayo and Associates, 1997d) and from public documents for the Crandall Canyon Mine (Mayo and Associates, 1997a).

(1) Blackhawk Formation

In-mine roof drips from the Blackhawk Formation are of the Ca^{2+}- Mg^{2+} -HCO_3- -SO_4^{2-} type with appreciable amounts of Na^+. These ground waters have elevated TDS contents relative to Blackhawk spring waters in the Mill Fork Area and are generally chemically

dissimilar to springs in the Mill Fork Area. The two spring samples from the Deer Creek and Cottonwood Mine areas have similar solute contents as the in-mine samples. Mayo and others (2000) found the elevated TDS in coal mine roof drip water to be the result of a cascading series of chemical reactions involving the oxidation of pyrite which increases the SO_4^{2-} concentration and releases H^+ ions. The H^+ ions are consumed by dissolution of additional carbonate minerals (i.e., calcite and dolomite) elevating the Ca^{2+} and Mg^{2+} contents. In the process acid mine drainage (AMD) is prevented. Ion exchange of Ca^{2+} and Mg^{2+} on the sodium zeolite analcime increases the Na^+ contents. We anticipate similar in-mine processes will occur in the Mill Fork Area.

(2) Spring Canyon Member

The solute chemical composition of groundwater in the Spring Canyon Member beneath existing mine workings is highly variable (Appendix B Table 4). Conductivities range from 500 to 2,287 µS/cm. Ca^{2+} concentrations range from 5.5 to 64 mg/l and Mg2+ concentrations range from 5.1to 41 mg/l. Na^+ concentrations range from 14 to 550.6 mg/l and Cl^- concentrations range from 5.0 to 221.3 mg/l. The large spatial variations in solute chemistry are attributed to the influence of inter-bedded Mancos Shale tongues which are present in some locations and not in others and are known to contain soluble minerals. The variations in Na^+ are likely the result of the presence or absence of clays with ion exchange capacity. Ion exchange commonly results in elevated Na^+ concentrations at the expense of decreased Ca^{2+} or Mg^{2+} concentrations.

That the solute chemistry in the Spring Canyon Member is not uniform beneath existing mines suggests that there is a partitioning of groundwater systems in the member. This condition is likely the result of inter-bedded lower-permeability layers in the Star Point Sandstone which partition individual sandstone bodies. These findings are substantiated by monitoring well data from 6 wells in the Trail and East Mountain areas and are significant in that they strongly suggest that the Spring Canyon Member does not act as a single regionally continuous aquifer, but rather it supports a series of smaller, discrete groundwater systems.

(3) Joes Valley Fault System

Ground waters in the Joes Valley Fault system and associated sympathetic faults and fractures have been observed in the Crandall Canyon Mine. Data from a public domain document (Mayo and Associates, 1997a, c) indicate the water is of the Ca^{2+} -Mg^{2+} -HCO_3^- type. This water type is consistent with the dissolution of carbonate minerals in the presence of soil zone CO_2 (gas). Slightly elevated SO_4^{2-} concentrations are consistent

with dissolution of minor amounts of gypsum. The relatively low mean Na+ concentration (3.7 mg/l; 0.17 meq/l) indicates that appreciable ion exchange has not occurred. Na^+ and Cl^- contents, in meq/l, are essentially the same, indicating halite dissolution as the Na^+ source.

δ^2H and $\delta^{18}O$

The δ^2H and $\delta^{18}O$ composition of a water molecule falling as precipitation is determined by the temperature at which nucleation of the water droplet occurs. However, other effects related to the bulk composition of the water vapor phase, such as cloud rainout and orographic effects, also can affect the isotopic composition of precipitation.

The stable isotopic compositions of waters are usually analyzed relative to the Meteoric Water Line (MWL). The MWL is empirically derived from the worldwide plotting locations of coastal zone precipitation and is defined by the equation $\delta^2H = 8\ \delta^2O + 10$). Precipitation that forms under cooler conditions will plot lower (i.e. more negatively) along the MWL than will precipitation that forms under warmer conditions.

Except for unusual conditions such as geothermal heating above about 100°C, the δ^2H and $\delta^{18}O$ composition of a groundwater is set at the time of recharge and is not affected by subsurface conditions such as groundwater residence time and mineral dissolution and precipitation reactions. In other words, the recharge and flow history of a groundwater can be evaluated independently of the solute content of the water using stable isotopic compositions.

All ground waters in the study area plot near the meteoric water line indicating a meteoric recharge origin (i.e. rain and snow).

Based on their stable isotopic compositions, ground waters from within both the Interwest and Crandall Canyon Mines are readily distinguishable from each other and from springs and creeks in the Mill Fork Area. These three populations are statistically different from each other at the 95% confidence level. The Mill Fork area spring samples tend to plot more positively relative to the meteoric water line than do the in-mine waters, indicating that the near-surface ground waters recharged under different climatic conditions. The more negative composition of the in-mine ground waters is probably the result of paleo-recharge during cooler, wetter times. The stable isotopic composition of water seldom changes significantly after infiltration into the groundwater system. What this suggests is that modern groundwater systems in the upland areas overlying the mine area are not the primary source of recharge to the groundwater systems encountered in the mines.

Groundwater Ages (^3H and ^{14}C)

The concept of groundwater age is difficult to define because water arriving at a well or spring seldom travels via pure piston flow. Instead it is usually a mixture of water molecules that recharged at different locations and at different times, thus water has no unique age. It is therefore best to think of a groundwater "age" as the mean residence time of the water sampled at the well or spring.

In this investigation, two unstable isotopes, tritium (^3H) and carbon-14 (^{14}C) have been used to evaluate mean residence times. Tritium is a qualitative tool indicating if groundwater has a component of water that recharged since about 1954. Groundwater that recharged prior to about 1954 will contain essentially no tritium. Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil zone gases and near-surface waters. Like tritium, ^{14}C can indicate if groundwater has a component that recharged since the 1950s. Ground waters with ^{14}C contents greater than about 50 percent modern carbon (pmc) contain anthropogenic (i.e., human-induced) carbon associated with atmospheric nuclear weapons testing. It is not uncommon for groundwater issuing from a spring or occurring in a well to be a mixture of old (i.e. containing no ^3H) and modern water.

Groundwater ages have been calculated for 27 springs, 14 in-mine locations, and 6 Star Point Sandstone wells. All spring waters, except for spring 18-4-1 which is located in the southwestern portion of Trail Mountain, contain anthropogenic carbon and appreciable amounts of ^3H and are, therefore, modern. These springs issue from alluvial systems, the North Horn Formation, the Price River Formation, the Castlegate Sandstone, and Blackhawk Formation.

Spring 18-4-1 issues from the Blackhawk Formation-Castlegate Sandstone contact at the down plunge end of the Straight Canyon Syncline and is not in the Mill Fork Area. The spring water does not contain water that recharged since 1954; however, the water was likely recharged less than a few hundred years ago as is indicated by its ^{14}C content.

Most groundwaters collected inside the Cottonwood/Wilberg and Deer Creek Mines contain essentially no tritium (Appendix B Table 5) and have mean ^{14}C ages ranging from 2,000 to 12,000 years. Roof drip waters associated with faults (i.e., 1.5N X 29, 6W X 20, and MN-ME) contain waters 2,000 to 7,000 years old and are not in hydraulic communication with the surface. Both roof drip (i.e. Blackhawk Formation) and wells in the Spring Canyon Member of the Star Point Sandstone in the Crandall Canyon Mine generally have groundwater ages of 13,000 – 19,000 years. These waters contain essentially no tritium and thus represent groundwater systems that are essentially hydraulically isolated from modern near surface hydrologic phenomena.

Two in-mine roof drip samples associated with faults, TW-10 (Roans Canyon) in the Deer Creek Mine and 5th West (Joes Valley Fault) in the Crandall Canyon mine, have ^{3}H contents indicating a component of modern recharge.

Active and Inactive Groundwater Zones

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes (Mayo and Morris, 2000).

Active zone groundwater flow systems contain abundant ^{3}H, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters in the study area demonstrate that all springs, except 18-4-1, issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths. Because the springs in the Mill Fork Area and adjacent areas are not part of large, regional groundwater systems, hydrographs of their discharge rates show both seasonal and climatic fluctuations. During drought cycles, it is not uncommon for discharge from some springs in the active zone to completely cease.

The $\delta^{2}H$ and $\delta^{18}O$ compositions of Mill Fork Area springs relative to in-mine ground waters demonstrate that the Mill Fork Area springs are not part of the same groundwater systems that discharge in the mines.

The active regime includes alluvial groundwater, all of the Flagstaff Limestone, and the near-surface exposures of all other bedrock formations. The "near surface" extends a few hundred feet vertically into the subsurface, about 500 to 1,000 feet into cliff faces and is controlled by fracturing, weathering, and the surface exposures of fluvial channel sands. Further into the cliff faces the discontinuous character of the channel sands prevents active groundwater flow.

Except for mountain fronts and cliff faces, the coal bearing lower Blackhawk Formation and the Star Point Sandstone are generally not exposed at the surface in the Mill Fork Area and are not part of the active zone. In Cottonwood Canyon, located south of Mill Fork Area, the Star Point Sandstone is within a few hundred feet of land surface and is part of the active zone as evidenced by the tritium content, 1.10 TU, in Well CCCW-1S. Elsewhere Star Point Sandstone samples have groundwater ages of 6,000 to 19,000 years. In the Mill Fork Area the lower Blackhawk Formation and Star Point Sandstone are not exposed near the land surface, except at cliff faces, and are not in the active zone.

Except for mining operations near cliff faces, the in-mine environment is generally not part of the active zone. However, in-mine groundwater containing tritium (i.e., 1 TU or more) in TW-10 (Roans Canyon Fault) and 5th West Fault (Joes Valley Fault-Genwal Mine) indicate that locally the inactive zone extends into the mine environment where fracture zones, that are associated with major faulting, are currently under tensional stress. The extension of the active zone into the mine environment along fractures is localized as evidenced by the absences of tritium and old ^{14}C ages in in-mine groundwater collected elsewhere along the fracture zone.

Inactive zone groundwater systems contain old groundwater (i.e. 2,000 to 19,000 radiocarbon years, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Except for the immediate vicinity of Joes Valley Fault, we believe that groundwater intercepted in the Mill Fork Area will be part of the inactive zone and will not be in hydraulic communication with either near surface groundwater or surface water systems. Mining within 200 to 300 feet of Joes Valley Fault is problematic in that the area is under tension and deep groundwater may be part of the active zone.

Two fundamentally different groundwater regimes, active (near surface) and inactive (deep subsurface and in-mine) that occur in the vicinity of the Mill Fork Area and elsewhere in the Utah Coal District are due to the vertical and horizontal heterogeneity of the bedrock. The rock formations consist primarily of alternating and interpenetrating layers of somewhat permeable sandstone and impermeable shale and mudstone. Individual rock layers are generally not continuous over great horizontal distances. Rather, one rock facies commonly grades horizontally into another facies. Fluvial deposits consisting of sandstone channels, which locally support groundwater systems, typically interpenetrate with shale and mudstone units. Thus, layers of shale or claystone that have very low permeabilities encase individual sandstone layers both horizontally and vertically. Although the permeability of individual sandstone bodies may locally be relatively high, the ability of these rocks to transmit water horizontally over great distances is low because of the discontinuous nature of the sandstones. Due to the pervasiveness of low permeability shales and mudstones, the potential for vertical groundwater flow is

minimal.

Because of the limited potential for groundwater to migrate vertically through the stratigraphic section, active zone recharge waters commonly infiltrate only into the soil zone and shallow, fractured bedrock. Most groundwater moves downward through the shallow subsurface until the first impermeable layer is encountered where it migrates laterally and is discharged at the surface as a spring or seep.

Regional Groundwater Systems

A report by the U.S. Geological Survey (Lines, 1985) states that there exists a regional aquifer in the lower Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau. Lines also postulates that the regional aquifer is recharged by the downward migration of ground waters from overlying perched groundwater systems in the North Horn and Price River Formations. This idea is not correct. Ground waters encountered within mine openings in the lowermost Blackhawk Formation occur primarily within discontinuous sandstone channels. It is not uncommon for some of these channels to be completely dry, while others are partially or completely filled with water. Between these sandstone channels, the surrounding shales and claystones of the Blackhawk Formation are usually dry. The discontinuous nature of the saturated sediments in the lowermost Blackhawk Formation, and the unconfined conditions under which these ground waters exist do not support the idea of a deep, regional system with groundwater flowing from areas of recharge to areas of discharge.

Additionally, radiocarbon and tritium groundwater age dating indicates that groundwater in the shallow perched groundwater systems are modern (post-1954) and in-mine groundwater in the Blackhawk Formation and Star Point Sandstone are thousands of years old.

We believe that the presence of swelling clays and impermeable shales in the rocks in the unsaturated zone between the overlying perched systems and the Blackhawk Formation effectively prohibit downward vertical migration of waters from the perched systems. Lines (1985) analyzed cores taken from well (D-17-6) 27bda-1 and found the hydraulic conductivities of the shales and siltstones to be very low (i.e. 10-7 to 10-8 ft/day). One shale sample was found to be effectively impermeable even when a hydraulic pressure of 5,000 psi was applied.

Because there are no regionally extensive groundwater regimes in the lower Blackhawk Formation or Star Point Sandstone within the lease area, it is not possible to draw meaningful potentiometric surface maps of these systems.

Lines (1985) also reported that water was likely leaking from the Joes Valley Reservoir

downward into the "lower Blackhawk / Star Point aquifer" in Straight Canyon. We believe that this is incorrect. Groundwater collected from well TM-3, which is completed in the Star Point Sandstone in Straight Canyon just below the reservoir, has a radiocarbon age of 6,000 years, while water in Joes Valley Reservoir is of modern origin. Water levels in TM-3 do not respond to seasonal fluctuations in the water level in Joes Valley Reservoir, indicating that there is little or no hydraulic communication between the reservoir and water in the Star Point Sandstone. Groundwater was sampled at UG-3 in the lower Blackhawk Formation in the Trail Mountain Mine. This water has a radiocarbon age of 5,500 years, which is likewise not consistent with water from the reservoir.

Summary of 2001 Mayo & Associates Study

In summary, all groundwater encountered in springs monitored in the Mill Fork permit Area discharge from active, shallow groundwater systems. No evidence exists that suggests a large, regional-type aquifer occurs in the area. All of the springs analyzed in the study area exhibit large-scale fluctuations in discharge rates in response to the annual snowmelt event. The springs are also sensitive to longer-term variations in climate. Carbon-14 and tritium dating of spring and stream waters indicate that the springs contain anthropogenic (human-induced) carbon and levels of tritium consistent with recharge in the past 50 years. Stable isotopic δ^2H and $\delta^{18}O$ data from springs and streams at the surface indicate that the recharge sources for these groundwater systems are different from those that recharged the groundwater systems encountered in the mine environment.

Almost all groundwater encountered in in-mine environments is not related to shallow, active zone groundwater systems from which springs and streams discharge. ^{14}C dating indicates that groundwater entering the underground workings in most locations is thousands of years old. When groundwater is encountered in the mine, inflow rates commonly decrease rapidly and most inflows eventually dry up completely. This indicates that the groundwater systems encountered in the mine are not part of large regional groundwater systems. There is no relationship between groundwater inflow rates measured in the mine and the annual snowmelt event or long term climatic trends. This demonstrates a lack of hydraulic communication between the groundwater systems encountered in the mine and active zone groundwater systems near the surface.

Conclusions from 2001 Mayo & Associates Study

- Ground waters discharging from springs are part of active zone groundwater systems. Isotopic analysis indicates that groundwater from the active zone is of modern origin (recharged less than 50 years ago). Seasonal variations in discharge rates from active zone springs indicate that flowpath lengths are short and that groundwater travel times from recharge areas to discharge areas are generally less

than one year. The abundance of shale and claystone units in the geologic section prohibits significant downward migration of active zone ground waters into deeper horizons.

- Analysis of the solute chemistry of ground waters discharging from springs and seeps indicate that depths of circulation in these systems are shallow. The modern groundwater ages of shallow ground waters in the study area support this conclusion.

- Groundwater encountered in most locations in the mines is many thousands of years old. Groundwater in the Star Point Sandstone ranges from approximately 1,000 to 19,000 years old. Groundwater in the Blackhawk Formation within the mines ranges in age from about 2,000 to 14,000 years, whereas groundwater in the Joes Valley Fault system ranges in age between about 2,500 and 5,000 years. None of these groundwaters have appreciable tritium concentrations, indicating that no recharge has occurred in the past 50 years.

- Groundwater encountered in the northwest corner of the Crandall Canyon Mine discharges from a series of fractures located near the Joes Valley Fault. Tritium data indicate that a component of this water recharged in the past 50 years, whereas ^{14}C data indicate that another component recharged more than 3,500 years ago. This groundwater appears to originate from a sandstone channel in the mine roof.

- More than two-thirds of all non-alluvial springs in the Mill Fork Area discharge from the North Horn Formation. The abundance of springs in the North Horn Formation is the result of the large area of exposed North Horn in the upland areas where precipitation is greatest, and the presence of the abundant claystone and shale layers which inhibit significant downward migration of precipitation into the formation.

- The fact that Little Bear Spring discharges modern water and has large variations in discharge rates suggests that it is the discharge location of an active zone groundwater system. Because inactive zone groundwater systems in the Star Point Sandstone beneath the mine are tens of thousands of years old and do not exhibit seasonal variations in discharge, these groundwater systems are precluded as potential contributors to the discharge from Little Bear Spring. The very low permeability in the Star Point Sandstone beneath the mine indicates that diffuse flow through the Star Point Sandstone beneath the mine cannot contribute

significant groundwater to the discharge from the spring.

Limited data suggest the possibility that Little Bear Spring may receive significant recharge where the fracture system from which it emanates crosses streams and active zone groundwater systems in drainages south of Little Bear Canyon. The conditions in Mill Fork Canyon seem favorable for recharge to the spring.

WATER MONITORING – NORTH RILDA RIDGE AREA

A. GROUNDWATER

Groundwater within the North Rilda Ridge area was monitored according to the schedules in established in the Deer Creek MRP. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining. There are no surface springs within the lease area of UTU-024319 that is to be relinquished. PacifiCorp has conducted baseline and operational monitoring of spring sources adjacent to the lease area. The nearest springs within ½ mile of the relinquishment boundary are located at the North Emery Water Users Special Service District Rilda Canyon Springs collection system, which taps a series of alluvial springs in the floor of Rilda Canyon.

East Mountain Springs - Mill Fork

In preparation for coal leasing, Genwal Resources conducted baseline spring and seep surveys from 1994-1996 (northern portions of the lease were surveyed in 1989-90). With PacifiCorp's acquisition of the adjacent Mill Fork State Coal Lease (reverted to the BLM on August 1, 2011 and designated as federal lease UTU-88554), a complete re-evaluation of groundwater resources was initiated in 2000 and continued through 2001. During the 2000-2002 baseline evaluation, a total of 198 springs were identified within and adjacent to the lease plan area. 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 was tabulated on the "Springs Geologic Conditions Inventory" sheets located in the Deer Creek MRP. The springs on East Mountain originate in several different ways (see Springs and Hydrologic Drainage Maps and HM-1A Hydrology Data Map in the Deer Creek MRP); however, many springs share the same mode of occurrence and, in some cases, are related.

The ground water monitoring plan in Appendix C includes a selection of springs based on the following criteria:

- Stratigraphic position
- Area of potential influence from subsidence

- Aerial distribution
- Established water rights
- Measurable flow based on historical surveys
- Reliable measuring point(s)

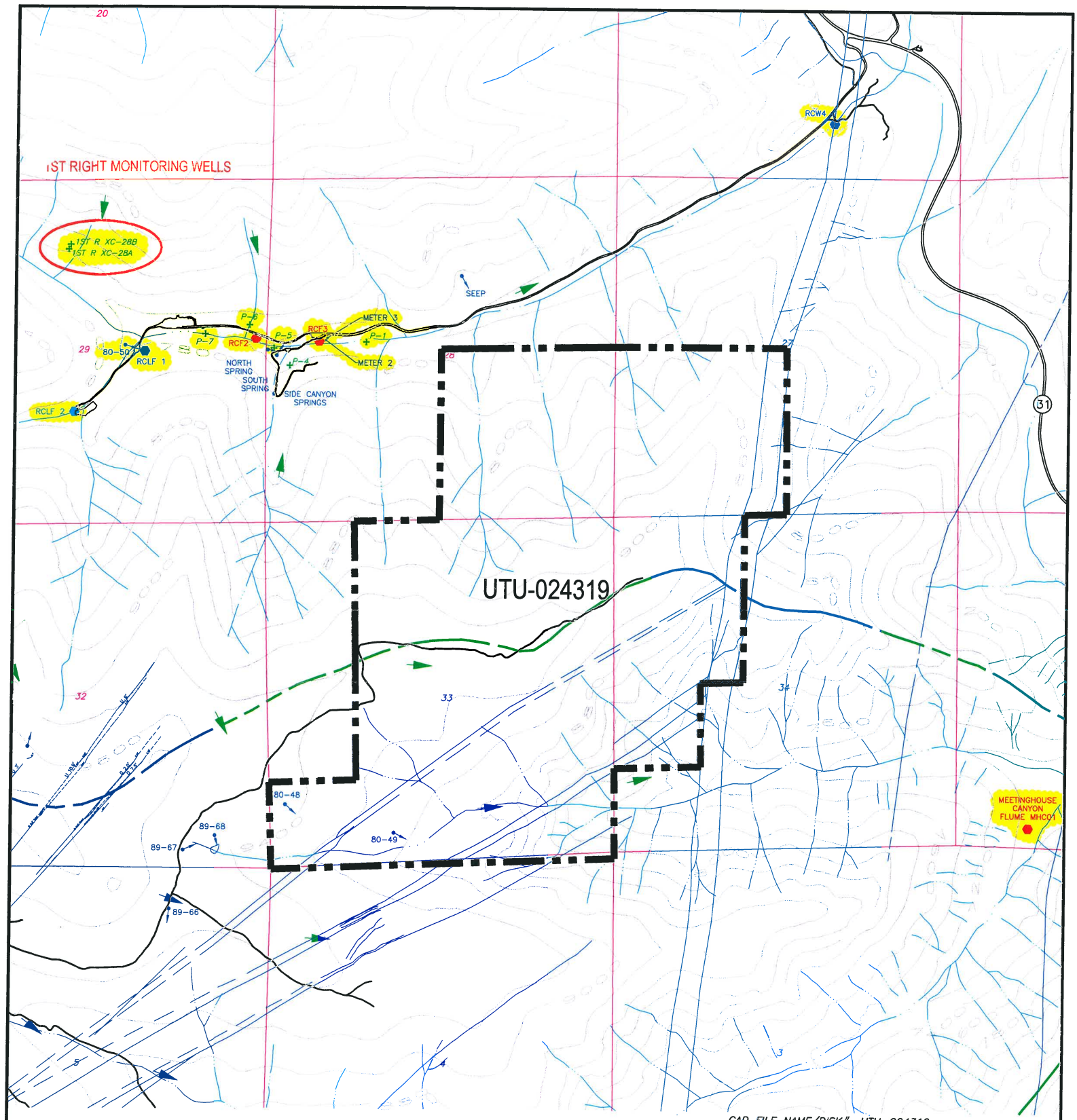
Water samples were collected and analyzed during the months of July and October of each year. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality." Monitoring of groundwater sites will continued for a minimum of three years after the last date of mining (date of last mining - January 2015). PacifiCorp has submitted a formal application to reduce hydrologic monitoring after the minimum three year time period.

Selection of the springs to be monitored was based upon the factors listed along with discussions with the water users (CVSSD, Emery Conservancy District, NEWUSSD) and the surface management agency. There are no surface springs located within the lease or within ½ mile of the lease boundary. The spring collection system operated by the North Emery Water Users Special Service District is within ½ mile. Data related to monitoring point RCF3 is included in Appendix C.

Surface Hydrology

The Deer Creek Mine area is located in the headwater region of the San Rafael River Basin. The surface drainage system of the Federal Lease UTU-024319 forms part of the Huntington Creek drainage.

Most of the drainages in and adjacent to Lease UTU-024319 are ephemeral. The surface flows from the lease area drain to the north into Rilda Canyon and to the south into Meetinghouse Canon which report to Huntington Creek. As detailed in Appendices A and B, the amount of subsidence is limited and effects of subsidence did not alter surface flow characteristics of the ephemeral drainages.



LEGEND

- FEDERAL LEASE ACREAGE RELINQUISHED
- FAULT (DASHED WHERE INFERRED)
- WATER MONITORING STATION WITH FLUME
- WATER MONITORING STATION
- MONITORING WELL
- DRAINAGE DIVIDE
- UT-0022896-002 UPDES DISCHARGE LOCATION
- TYPICAL GROUND WATER MOVEMENT
- WATER MONITORING LOCATIONS

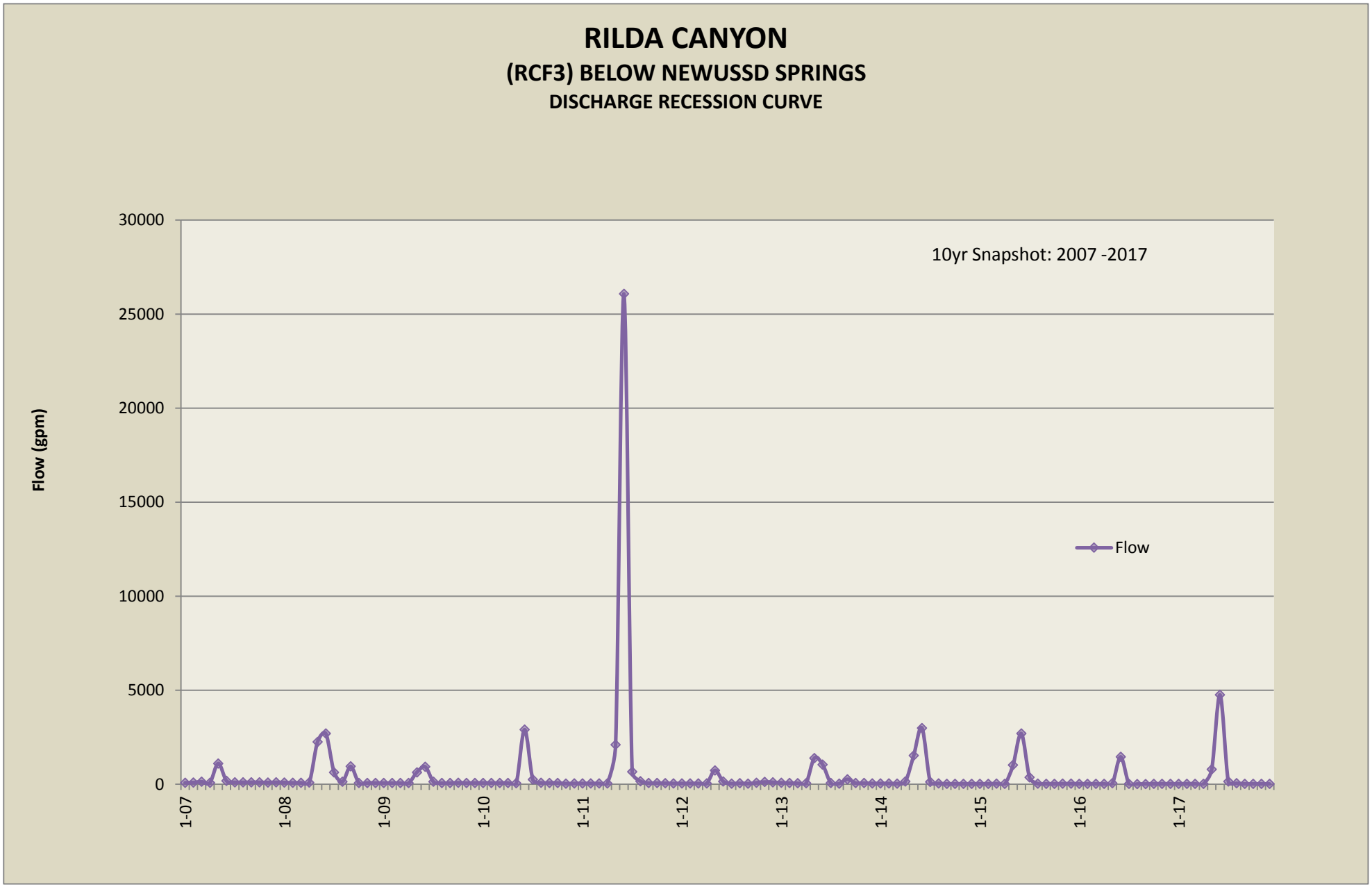
N

CAD FILE NAME/DISK#: UTU-024319

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-024319
HYDROLOGIC DRAINAGE MAP

DRAWN BY: K. LARSEN	APPENDIX C	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV.


RILDA CANYON
(RCF3) BELOW NEWUSSD SPRINGS
DISCHARGE RECESSION CURVE
10yr Snapshot: 2007 -2017
Flow (gpm)
30000
25000
20000
15000
10000
5000
0
1-07
1-08
1-09
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
Flow

RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - BELOW NEWUA SPRINGS

2017** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
20170313	0.0	354.0	99.2	0.0	32.0	1013.0	8.1	493.0	0.2	0.1	59.6	0.0	0.0	8.1	4.2	28.5	177.0	0.0	611.0
20170608	0.0	222.0	60.7	0.0	2.0	449.0	10.2	239.0	0.5	0.0	21.2	0.0	0.0	8.6	1.0	5.4	15.0	165.0	252.0
20170907	6.0	320.0	82.0	0.0	15.0	885.0	10.4	407.0	0.1	0.0	49.1	0.0	0.0	8.6	3.1	20.9	137.0	0.0	514.0
20171205	0.0	331.0	90.7	0.0	12.0	901.0	13.1	443.0	0.1	0.0	52.6	0.0	0.0	8.0	3.4	21.6	143.0	8.0	575.0
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2017																			
MIN	0	222	61	0	2	449	8	239	0	0	21	0	0	8	1	5	15	0	
MAX	6	354	99	0	32	1013	13	493	1	0	60	0	0	9	4	29	177	165	
MEAN	0.00	306.75	83.14	0.00	15.25	812.00	10.45	395.50	0.23	0.01	45.62	0.01	0.00	8.32	2.91	19.11	118.00	43.25	
2016**																			
MIN	0.0	205.0	55.2	0.0	1.0	381.0	8.7	210.0	0.0	0.0	17.5	0.0	0.0	8.0	0.0	4.4	12.0	0.0	272.0
MAX	6.0	350.0	95.0	0.0	10.0	880.0	9.9	483.0	0.5	0.0	59.6	0.0	0.0	8.1	2.9	23.6	159.0	56.0	589.0
MEAN	1.5	302.8	82.3	0.0	7.8	746.5	9.4	398.5	0.3	0.0	46.8	0.0	0.0	8.1	2.1	18.5	115.0	19.3	493.0
2015**																			
MIN	0	218	52	0	2	419	10	218	0	0	22	0	0	8	1	5	14	0	277
MAX	0	343	87	0	10	895	10	454	3	0	58	0	0	9	3	24	157	221	583
MEAN	0	303	78	0	8	769	10	388	1	0	47	0	0	8	2	19	117	83	506
2014**																			
MIN	0	339	85	0	9	871	0	425	0	0	52	0	0	8	3	25	139	0	550
MAX	6	343	89	0	10	920	0	447	0	0	54	0	0	8	4	55	170	0	586
MEAN	3	341	87	0	10	896	0	436	0	0	53	0	0	8	3	40	155	0	568
2013**																			
MIN	0	205	53	0	1	155	0	221	0	0	20	0	0	8	1	7	17	0	214
MAX	5	339	97	11	10	901	0	486	12	0	59	0	0	9	3	25	154	1092	562
MEAN	3	274	76	3	6	599	0	351	3	0	39	0	0	8	2	16	88	284	386
2012**																			
MIN	0	250	67	0	4	576	8	297	0	0	32	0	0	8	1	12	56	0	334
MAX	30	350	101	0	10	921	8	495	0	0	59	0	0	8	3	26	159	8	556
MEAN	8	312	85	0	8	782	8	413	0	0	48	0	0	8	2	20	113	4	468
2011**																			
MIN	0	212	59.9	0	2.0	423	8.70	228	0.16	0.00	19.14	0.00	0.00	7.95	0.80	4.79	13.0	0.0	258
MAX	5	351	97.0	0	11.0	899	8.70	481	14.79	0.00	58.07	0.03	0.00	8.54	2.82	24.63	152.0	1786.0	573
MEAN	1	287	79.9	0	7.0	702	8.70	373	3.86	0.00	42.22	0.02	0.00	8.19	1.97	16.74	95.0	448.0	436
2010**																			
MIN					2.0	411	6.10	221	0.29		18.45	0.00		7.87	0.81	5.10	13.0	0.0	233
MAX					11.0	922	10.20	510	1.37		62.65	0.04		8.56	3.10	26.36	157.0	100.0	592
MEAN					7.3	765	8.80	419.75	0.65		48.58	0.02		8.14	2.42	19.78	111.3	34.0	488
2009**																			
MIN	0	217	62		2	462	8	251	0		23	0		8	1	7	26	6	288
MAX	15	374	108		10	1005	9	545	1		67	0		8	3	30	183	90	678
MEAN	9	330	91		8	840	8	448	1		53	0		8	3	22	130	31	550
2008**																			
MIN	0	179	61		2	470	9	242	1		22	0		8	1	5	18	8	247
MAX	20	378	115		10	1072	16	577	1		70	0		9	4	29	213	12	742
MEAN	10	322	97		8	911	12	471	1		55	0		8	3	23	147	10	571
2007**																			
MIN		285	77.6		6.0	834	10.09	378	0.20		44.70	0.02		7.54	1.86	15.60	90.0	5.0	438
MAX		400	132.0		12.0	1304	12.48	614	1.17		69.10	0.09		8.04	3.51	30.06	255.0	6.0	746
MEAN		370	111.2		10.2	1128.2	11.26	536.2	0.50		62.75	0.05		7.79	3.14	26.11	196.0	5.5	652.6
2006**																			
MIN		220	62		3.0	487	10.3	252	0.16		23.8	0		7.78	0.98	6.4	25	6	278
MAX		376	112		12.0	1073	12.5	563	0.30		69.0	0		8.18	3.32	26.8	185	18	626
MEAN		328	94		8.8	906	11.7	454	0.25		53.3	0		7.97	2.57	20.9	135	10	517
HISTORICAL 1989-2016																			
MIN	0.0	179.0	50.4	0.0	1.0	155.0	4.4	204.0	0.0	0.0	17.5	0.0	0.0	7.5	0.0	4.4	7.0	0.0	199.0
MAX	38.0	500.0	132.0	30.0	50.0	1304.0	15.5	748.0	14.8	0.4	70.2	0.2	5.0	8.8	5.0	55.0	255.0	1786.0	746.0
MEAN	6.6	344.7	84.5	3.1	8.7	748.0	8.7	403.5	0.7	0.0	45.5	0.0	1.1	8.1	2.3	17.9	107.3	67.5	464.1
COUNT	67	103	103	62	103	104	79	103	101	56	103	75	59	104	100	103	103	79	103

*** Quality parameters are reported as mg/l unless otherwise noted.**
**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

Deer Creek Mine
Federal Coal Lease UTU-024319 Full Lease Relinquishment
Appendix D

Evaluation of Impacts to Vegetation

Note: A significant wildfire has occurred (June 6 – 26, 2018) on this lease since the Deer Creek Mine ceased production in 2015 and after sealing and abandonment in 2017. Approximately 97 percent of the vegetation on this lease was burned in the fire (see fire outline and extents on Map #1). Burning occurred over nearly all of the areas that were undermined. While PacifiCorp maintains that there were no reported or measured effects to surface water caused by mining on this lease, the destruction of the vegetative cover on this lease has rendered any further study of mining related effects on the surface vegetation. Both the surface water runoff and recharge situations have been permanently altered. Future events in the burned area such as aggravated erosion, drainage repairs and re-seeding by the U.S. Forest Service will permanently change the vegetation characteristics of the area.

Vegetation of Lease UTU-024319 is diverse, ranging from sagebrush, pinyon – juniper to brush, with groves of aspen trees and spruce - fir. A breakdown of vegetation type in the relinquishment area is shown below (mid-level vegetation provided by the Manti-LaSal National Forest Price Office):

Vegetation Types – UTU-024319:

Aspen	AS
Barren/Sparse Vegetation	BR/SV
Black Sagebrush	BLSB
Bristlecone Pine/Limber Pine	BC/LM
Douglas-fir Mix	DFmix
Mountain Big Sagebrush	MSB
Mountain Mahogany	MM
Mountain Shrubland	MS
Riparian Woody	RW
Spruce/Fir	SF
Upland Herbaceous	UHE

Previous relinquishment documents submitted by PacifiCorp have included comparative sets of periodic infrared aerial photographs to detect changes in vegetation that might be related to mining. Until 2011, PacifiCorp had submitted aerial photographs on 1-year intervals and color infrared photographs on 5-year intervals. PacifiCorp attempted to detect changes in vegetation that might be caused by mining using both the color and color infrared images without success. The inability to detect changes in vegetation that might be caused by mining is due to several factors – spreading insect infestations in forests, forest fires, variation in precipitation from year to year, variations in the time of year when each set of photographs is taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes

that might be caused by mining activities. PacifiCorp amended the Deer Creek Mine permit to exclude this requirement in 2011; UDOGM approved the amendment on July 28, 2011 (see following correspondence and permit changes).

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 7, 2011

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

Subj: **Amendment to Remove the Commitment to Conduct Periodic Vegetation Surveys using Color and Color Infrared Aerial Photographs, Pacificorp, Deer Creek Mine, C/015/0018, Emery County, Utah**

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an amendment to remove the commitment to conduct periodic vegetation surveys using color and color infrared photographs from the Deer Creek Mine Permit. Submission of this amendment is in response to the 2010 Annual Report Review Completion, Task ID #3793, requesting submission of aerial photography for vegetation monitoring purposes.

Energy West has had aerial photographs taken of the active mining areas in black and white every year, and color and color infrared every 5 years. Energy West has attempted to detect changes in vegetation that might be caused by mining by interpreting these sets of photographs without success. The inability to detect changes in vegetation that might be caused by mining using color and color infrared images is due to several factors - spreading insect infestations in forest stands, variations in precipitation from year to year, variations in the time of year when the photographs are taken, and the quality of the photographs themselves. These factors make it difficult or impossible to detect any changes that might be caused by mining activities. Aerial photography, whether color or color infrared, will no longer be used for this purpose.

This amendment includes changes in Volume 1 as outlined below. Please refer to redline/strikeout text herein:

- Volume 1, Part 2 Environmental Resources, page 2-174

A redline/strike copy of the amended page has been included with this submittal. The required C1/C2 forms are also included. If you have any question or concern with this submittal please feel free to call myself at (435) 687-4712 or Dennis Oakley at (435) 687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Enclosures: C1/C2 Forms
Volume 1, Part 2 Environmental Resources, page 2-174

cc file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts ~~and final effects of the underground mining activities~~ on vegetation at the Deer Creek mine ~~on vegetation~~. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas ~~that will be impacted by underground mining~~. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) ~~will be~~ has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

~~Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.~~ Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

~~Each vegetation type mapped and monitored will be based on a~~

~~dominant overstory and a dominant understory species to be consistent with Unita Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.~~

The vegetation monitoring information for reference areas and reclamation sites ~~and an~~ will be evaluat~~ion~~ed ~~of the impacts of mining on vegetation will be~~ and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

Stat. of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

July 28, 2011

Kenneth S. Fleck, Geology and Environmental Affairs Manager
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Final Approval, Deer Creek Mine, C/015/0018, Remove Vegetation Survey Commitment, Task ID #3869

Dear Mr. Fleck:

The above-referenced amendment was conditionally approved on July 21, 2011 upon receipt of 8 clean copies. We received the requested clean copies on July 28, 2011. Enclosed is a stamped incorporated copy for insertion into your copy of the Mining and Reclamation Plan.

Thank you for your help during this process. If you have any questions, please feel free to call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
Enclosure
cc: Kenneth Walker, OSM
Jeff McKenzie, BLM
Pam Brown, USFS
Larry Crist, USFWS w/o
Marc Stilson, Water Rights w/o
Dave Ariotti, DEQ w/o
Chris Wood, DWR w/o
Kevin Carter, TLA w/o
Price Field Office
O:\015018.DER\WG3869\FinApp.doc

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telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • www.ogm.utah.gov

UTAH DNR OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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

July 27, 2011

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

Subj: Clean Copy Submittal for Task ID #3869, PacifiCorp, Deer Creek Mine, C/015/0018, Emery County, Utah

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 approved amendment to update the Deer Creek Mine Mining and Reclamation Plan.

Actions to finalize this amendment include removing and/or replacing the noted pages. As noted above, all clean copy pages are included with this submittal. After stamping "Approved" on the clean copy pages, the Division needs to complete the following:

- Volume 1: Replace Page 2-174

Eight (8) complete clean copies of this amendment are submitted for Division certification. A C2 form is included for organization of removal or replacement of items into the Deer Creek MRP. If you have any questions concerning this amendment, please contact myself at 435-687-4712 or Dennis Oakley at 435-687-4825.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Geology and Environmental Affairs Manager

Cc: file

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive or regressive impacts on vegetation at the Deer Creek mine. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually up to present (2009) has been used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation. There has been no detected stress or any other impacts to vegetation using aerial photography.

Because stress to vegetation within the permit area is so much more subject to the natural forces in nature, (fire, insect infestation, drought, etc.) aerial photography will no longer be used.

Reference area qualitative and quantitative monitoring at the Deer Creek Mine has been conducted at least on five year intervals in the past. Qualitative and quantitative monitoring was last conducted in 2007 and will continue on five year intervals through mine through reclamation and bond release.

The vegetation monitoring information for reference areas and reclamation sites will be evaluated and submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

INCORPORATED
JUL 28 2011
Div. of Oil, Gas & Mining

Replaced

VEGETATION MONITORING PLAN - DEER CREEK MINE R645-301-321

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

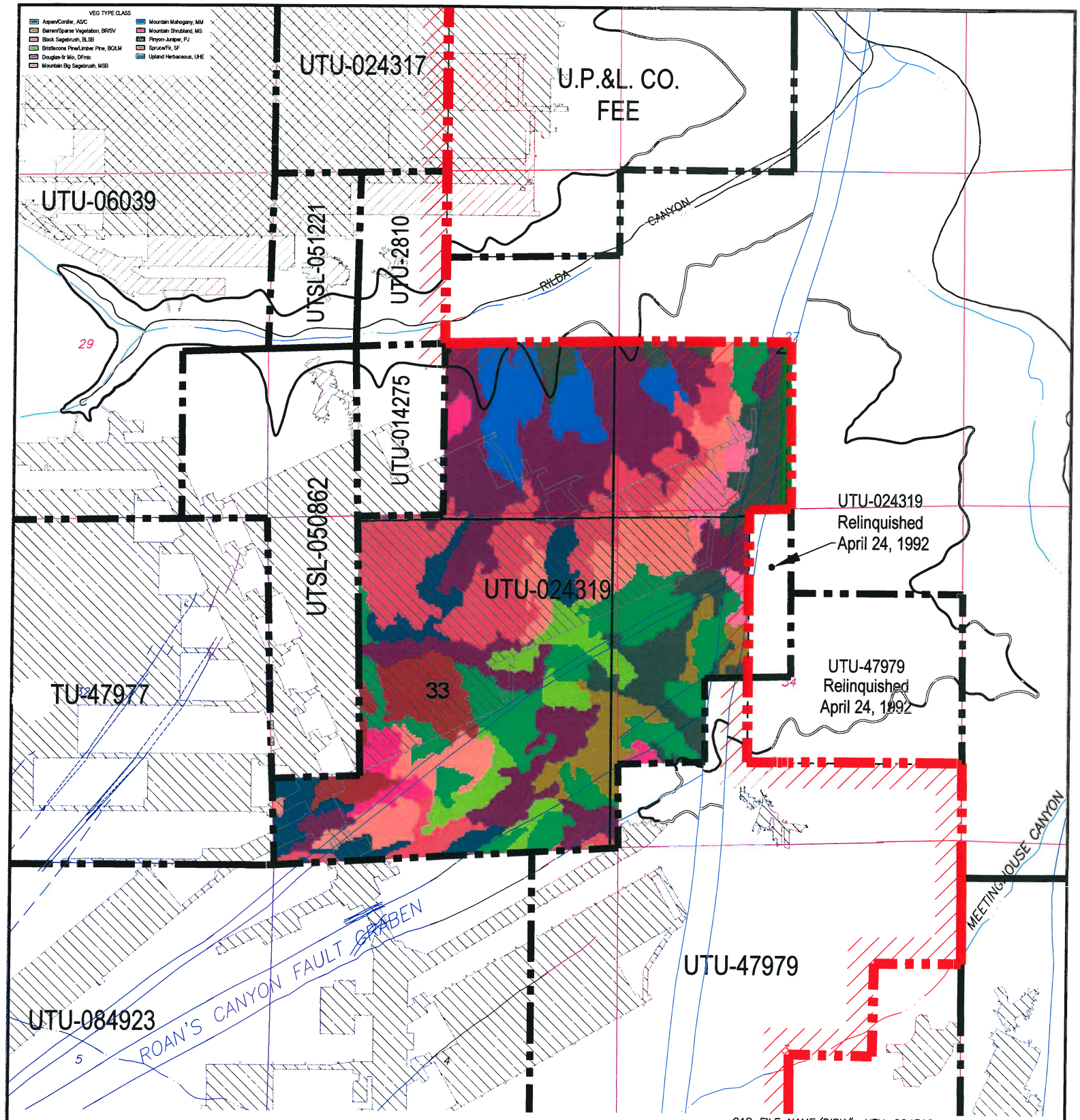
Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R645-301-200

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are

Based on PacifiCorp's observations, no mining-related impacts to vegetation have been witnessed observed or reported in the UTU-024319 area. There were no surface facilities or installations on this lease.



CAD FILE NAME/DISK#: UTU-024319

LEGEND

- LMU BOUNDARY UTU-73336
- COAL OUTCROP
- HIAWATHA SEAM MINE WORKINGS
- BLIND CANYON SEAM MINE WORKINGS
- FAULTS
- UTU-024319 FEDERAL LEASE NUMBER
- FEDERAL LEASE LINE
- ROADS
- DRAINAGE

N

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

EAST MOUNTAIN PROPERTY – DEER CREEK MINE
FEDERAL COAL LEASE RELINQUISHMENT UTU-024319
VEGETATION BASE MAP

DRAWN BY: K. LARSEN	APPENDIX D	
SCALE: 1" =2000'	DRAWING #:	
DATE: APRIL 30, 2018	SHEET 1 OF 1	REV.

Deer Creek Mine
Federal Coal Lease UTU-024319 Full Lease Relinquishment
Appendix E

Evaluation of Impacts to Private Improvements

There are no private surface improvements in Lease UTU-024319.

Appendix "F"

ENVIRONMENTAL AND CERCLA CERTIFICATION

CERCLA certification documents for sealing various districts of panels within the UTU-024319 lease have been submitted when those districts were sealed. The original CERCLA inspection within UTU-024319 to seal the 3rd North B East side panel district took place in February 1996, and BLM approved the sealing plan in February, 1996. CERCLA documents for the remaining portions of the mine workings sealed and abandoned in 2017 are included with this relinquishment request.

On November 29, 2017, a hazardous/toxic waste inspection was conducted underground at Deer Creek Mine to clear the remaining open areas of the mine for permanent sealing. Full documentation of this inspection is included.

ENVIRONMENTAL AND CERCLA CERTIFICATION

Submittal Date: NOV. 7 2018

Lease(s) # UTU-024319 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 9th East, 3rd North B Mains, 1st East - 6th East, 2nd - 6th East Longwall Panels and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

The Environmental Protection Agency promulgated final regulations to implement requirements established in Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments Reauthorization Act (SARA). Under section 120(h), whenever a Federal agency enters into any contract/agreement for the sale or transfer of public land/real property, and on which any hazardous substance was stored for one year or more, or known to have been released or disposed of, the contract (conveyance document) must include notice of the type and quantity of such hazardous substance, and the time at which such storage, release or disposal was originated. This final rule making became effective October 17, 1990.

Federal coal leases, if developed, result in the operator conducting mining operations on all or parts of the Federal lands. The lessee/operator, under appropriate circumstances, may utilize hazardous substances on the surface or underground on Federal lands. At the time of lease relinquishment, or at the time of any sealing or potentially sealing operation conducted by a Federal lessee, it is necessary for the lessee to inform the BLM and any other surface managing agency of any activities of a lessee that might be subject to CERCLA notification. This information will be utilized to satisfy the requirements under Section 120(h) of CERCLA as amended by SARA.

BLM requires the following information to the extent it is applicable to the Federal coal lease relinquishment area, area or any time that a mining operation seals or places structures possibly sealing an area. BLM will make the company proprietary information public only upon transfer or exchange of the affected lands.

Explanation:
Items 1-5 deal with hazardous substances and environmental issues. Item 6 is a CERCLA certification by an officer of the lessee. Suggested formats follow.

Required Information:

1. A list of any hazardous substances as defined in SARA Title III Consolidated List (40 CER 302.4) used on the lease (by date) or products that contain such substances. This shall include all hazardous substances and materials along with their Chemical Abstract Services Registry Numbers (CASRN), and petroleum based oil and other petroleum products that were used, stored or delivered to the lease. Quantities at this time are not necessary. This is for disclosure purposes only.

2. A copy of all reports of spills occurring on the lease or sealed area.

3. A copy of all reports submitted to the State of Utah listing any spill of petroleum based oil or other petroleum products on the lease exceeding 25 gallons or that cause a threat to human health or the environment.

4. A mine map covering the lease showing the location, type and model of any equipment or machinery that is known to be remaining underground. (this does not include materials and supplies, and hand tools). For every piece of equipment that will be left underground upon lease cessation of operations, please list the quantities of oil, batteries, or other fluids that are remaining, or could be remaining in the equipment.

5. A summary analysis of water quality reports showing whether or not the water quality has been affected by mining. The data that has been collected throughout the years should be the basis for this summary report. The UPDES/NPDES discharge permit requirements for the mine and copies of certifications or samples to show that these requirements have not been exceeded should be part of this analysis. The analysis should compare the water quality at the time of cessation of operations with the water quality that existed prior to mining in the base line analysis. This shall be for all waters that are affected by mining. The company should list any mitigation that was done to alleviate any water quality concerns.

6. An officer of the lessee shall sign and submit a certificate in the form attached for each lease or portion thereof where operations have ceased.

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there have been no reportable quantities of hazardous substances (per 40 CFR 302.4) and Part 373 or used oil (per Utah State Management Rule R-3 15-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

D M Pl _____ 11/7/18 _____

(Officer of the Lessee) (Date)

HAZARDOUS SUBSTANCE REPORT

Submittal Date: NOV. 7, 2018

Lease(s) # UTU-024319 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 9th East, 3rd North B Mains, 1st East - 6th East, 2nd - 6th East Longwall Panels and Remainder of Mine Workings

Coal Bed _Blind Canyon and Hiawatha Coal Seams _

Hazardous Substance / Product	**Date Utilized**	**CASRN** (if applicable)	**Location Used** (Cross-cut if known)
None Spilled -			
See Attached List			

CERCLA CERTIFICATION

Lease(s) # UTU-024319 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 9th East, 3rd North B Mains, 1st East - 6th East, 2nd - 6th East Longwall Panels and Remainder of Mine Workings

Coal Bed: Blind Canyon and Hiawatha Coal Seams

a. Based upon a complete search of all known records of the lessee(s), sublessee(s) and operator(s) (i) for the specified lease or portion thereof relinquished, sealed or potentially sealed, and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed or potentially sealed; and upon our knowledge of past operations, there have been **no** reportable quantities of **hazardous substances** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15), deposited or released within the lease, either on the surface or underground that will harm human health and the environment with respect to any such substances remaining on the property.

b. Based upon a complete search of all known records for the lessee(s), sublessee(s) and operator(s) for the specified lease or portion thereof relinquished, operations ceased or sealed and (ii) for the operations conducted on the specified lease or portion thereof relinquished, operations ceased or sealed; and upon our knowledge of past operations, there has been a release or disposal of a reportable quantity of **hazardous substance** (per 40 CFR 302.4) and Part 373 or **used oil** (per Utah State Management Rule R-315-15) on the surface of the lease or underground, and all remedial action necessary has been taken to protect human health ~ and the environment with respect to any such substances remaining on the property. This shall be documented with sample analytical data from the remediation or removal process.

(Officer of the Lessee) (Date) 11/7/18

PETROLEUM PRODUCT REPORT

Submittal Date NOV. 7, 2018

Lease(s) # UTU-024319 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 9th East, 3rd North B Mains, 1st East - 6th East, 2nd - 6th East Longwall Panels and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Oil or Petroleum product spilled	**Date spilled**	**Amount Spilled** (If > 25 gallons)	**Location Spilled** (Cross-cut if known)
None			

EQUIPMENT REMAINING UNDERGROUND REPORT

Submittal Date: NOV 7, 2018

Lease(s) # UTU-024319 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 9th East, 3rd North B Mains, 1st East - 6th East, 2nd - 6th East Longwall Panels and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Equipment name & model number	**Date Inspected**	**Fluid types/batteries and amount**	**Final location** (Cross-cut if known)
See Attached List			

SUMMARY WATER ANALYSIS REPORT

Lease(s) # UTU-024319 Full Relinquishment

Mine Name and MSHA Mine # Deer Creek Mine #42-00121

Mine Section (if applicable) 9th East, 3rd North B Mains, 1st East - 6th East, 2nd - 6th East Longwall Panels and Remainder of Mine Workings

Coal Bed Blind Canyon and Hiawatha Coal Seams

Dates: 03/91 – 04/15

Submittal Date: NOV. 7, 2018

Hazardous Substance Report CERCLA Page One of Two
Lease(s) UTU-024319
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 9th East, 3rd North B Mains, 1st East - 6th East, 2nd - 6th East Longwall Panels and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (03/91 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
D Cell Nickel Cadmium Battery, 4.8 VDC	03/91 - 4/15	Nickel and Nickel Hydroxide	20 - 32%	Unknown	All Sections
	03/91 - 4/15	Cadmium and Cadmium Hydroxide	13 - 22%	Unknown	All Sections
	03/91 - 4/15	Sodium Hydroxide	0 - 4%	Unknown	All Sections
	03/91 - 4/15	Potassium Hydroxide	0 - 4%	Unknown	All Sections
	03/91 - 4/15	Cobalt Hydroxide	0.5 - 2%	Unknown	All Sections
Chevron Superla White Oil	03/91 - 4/15	White Mineral Oil	100%	8042-47-5	All Sections
Blaster PB Penetrating Catalyst	03/91 - 4/15	Naptha	40 - 50%	64742-94-5	All Sections
	03/91 - 4/15	Petroleum Distillates, hydrotreated	30 - 40%	64742-47-8	All Sections
	03/91 - 4/15	Petroleum Distillates, solvent-dewaxed	20 - 30%	64742-65-0	All Sections
	03/91 - 4/15	Alcohols, C11-15 secondary ethoxylated	0 - 3%	68131408	All Sections
	03/91 - 4/15	Carbon Dioxide Propellant	0 - 3%	124389	All Sections
Krylon Spray Paints	03/91 - 4/15	Propane	14%	74-98-6	All Sections
	03/91 - 4/15	Butane	13%	106-97-8	All Sections
	03/91 - 4/15	Toluene	17%	108-88-3	All Sections
	03/91 - 4/15	Medium Aromatic Hydrocarbons	3%	64742-94-5	All Sections
	03/91 - 4/15	Napthalene	0.40%	91-20-3	All Sections
	03/91 - 4/15	Acetone	41%	67-64-1	All Sections
	03/91 - 4/15	Ethyl 3-Ethoxypropionate	4%	763-69-9	All Sections
Hand Cleaner, Brody Chemical	03/91 - 4/15	Aliphatic Petroleum Distillate	25 - 35%	64742-96-7	All Sections
RD-90 Spray Lubricant	03/91 - 4/15	Petroleum Lube Oil	10 - 20%	64742-65-0	All Sections
	03/91 - 4/15	Deodorized Kerosene	30 - 40%	64742-47-8	All Sections
	03/91 - 4/15	Mineral Oil	20 - 25%	8042-47-5	All Sections
	03/91 - 4/15	Mineral Spirits	5 - 10%	64741-65-7	All Sections
	03/91 - 4/15	Liquified Petroleum Gas	10 - 20%	68476-85-7	All Sections
Extreme Blue Windshield Washer Fluid	03/91 - 4/15	Methanol	<20%	67-56-1	All Sections
	03/91 - 4/15	Denatonium Benzoate	<2%	3734-33-6	All Sections
Carquest Starting Fluid	03/91 - 4/15	Heptane	69 - 79%	142-82-5	All Sections
	03/91 - 4/15	Ethyl Ether	11 - 21%	60-29-7	All Sections
	03/91 - 4/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
	03/91 - 4/15	Hexane	2.80%	110-54-3	All Sections
Blend #0019A Premium Starting Fluid	03/91 - 4/15	Heptane	60 - 70%	142-82-5	All Sections
	03/91 - 4/15	Ethyl Ether ACS Reagent Grade	23 - 33%	60-29-7	All Sections
	03/91 - 4/15	Carbon Dioxide	1 - 11%	124-38-9	All Sections
Diesel Engine Oil	03/91 - 4/15	Zinc Dithiophosphate	<2.5%	68649-42-3	All Sections
Cat Hydraulic Oil SAE 10W	03/91 - 4/15	None			All Sections
Cat Transmission and Drive Train Oil	03/91 - 4/15	None			All Sections
Solcenic 3B-BLK (Emulsion Oil)	03/91 - 4/15	Monoethanolamine	<10%	141-41-3	All Sections
	03/91 - 4/15	Triethanolamine	<5%	102-71-6	All Sections
Chevron Delo 400	03/91 - 4/15	Mineral Oil	70 - 95%	Mixture	All Sections
	03/91 - 4/15	Zinc alkyl dithiophosphate	1 - 5%	68649-42-3	All Sections
Conoco HD Fleet Engine Oil	03/91 - 4/15	Lubricant base oil	87 - 91%	Various	All Sections
	03/91 - 4/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	03/91 - 4/15	Additives	9 - 13%	Proprietary	All Sections
Conoco Transformer Oil	03/91 - 4/15	Hydrotreated dist., Lt. Napthenic	>99%	64742-53-6	All Sections
	03/91 - 4/15	Additives	<1%	Proprietary	All Sections
Contact Cleaner 2000	03/91 - 4/15	Decafluoropentane (HFC-43-10mee)	5 - 15%	138495-42-8	All Sections
	03/91 - 4/15	Cozol 401	80 - 95%	Proprietary Blend	All Sections
	03/91 - 4/15	Carbon Dioxide	3 - 8%	124-38-9	All Sections
Heavy Duty Degreaser	03/91 - 4/15	Trichloroethylene	95 - 99%	79-01-6	All Sections
	03/91 - 4/15	1,2 Butylene Oxide	0.50%	106-88-7	All Sections
	03/91 - 4/15	Carbon Dioxide	1 - 5%	124-38-9	All Sections
Shellzone All-Season Antifreeze/Coolant	03/91 - 4/15	Ethylene Glycol	90 - 98%	107-21-1	All Sections
	03/91 - 4/15	Deionized Water	1 - 3%	7732-18-5	All Sections
	03/91 - 4/15	Phosphoric Acid	1 - 3%	7664-38-2	All Sections

Hazardous Substance Report CERCLA Page Two of Two
Lease(s) UTU-024319
Deer Creek Mine - MSHA # 42-00121
Sealed Mine Sections: 9th East, 3rd North B Mains, 1st East - 6th East, 2nd - 6th East Longwall Panels and Remainder of Mine Workings

Coal Bed Blind Canyon Seam

Note: While these substances were likely transported into, used, or stored in the referenced leases during the time interval shown, (01/86 - 04/15) there are no reports or evidence that any of these substances were spilled or left within the sealed area. No complete list exists that shows all hazardous materials transported into, used, or stored within the referenced area.

Product Name	Date Utilized	Hazardous Ingredient Name	Component Percentage	CASRN	Location Used
Holcim Portland Cement	03/91 - 4/15	Tri-calcium silicate	20 - 70%	12168-85-3	All Sections
	03/91 - 4/15	Di-calcium silicate	10 - 60%	10034-77-2	All Sections
	03/91 - 4/15	Tetra-calcium-alumino-ferrite	5 - 15%	12068-35-8	All Sections
	03/91 - 4/15	Calcium sulfate	2 - 10%		All Sections
	03/91 - 4/15	Tri-calcium aluminate	1 - 15%	12042-78-3	All Sections
	03/91 - 4/15	Magnesium oxide	0 - 4%	1309-48-4	All Sections
	03/91 - 4/15	Crystalline silica (quartz)	0 - 1%	14808-60-7	All Sections
	03/91 - 4/15	Hexivalent chromium		18540-29-9	All Sections
Shot-Set 250 Liquid Accelerator	03/91 - 4/15	Silicic Acid, Sodium Salt	1%	1344-09-S	All Sections
Johnson Controls Lead-Acid Battery	03/91 - 4/15	Lead	34%	7439-92-1	All Sections
	03/91 - 4/15	Lead Dioxide	31%	1309-60-0	All Sections
	03/91 - 4/15	Lead Sulfate	<1%	7446-14-2	All Sections
	03/91 - 4/15	Sulfuric Acid (35%)	34%	7664-93-9	All Sections
Johnsens Heavy Duty DOT 3 Brake Fluid	03/91 - 4/15	Diethylene Glycol Monobutyl Ether	5 - 20%	112-34-5	All Sections
	03/91 - 4/15	Triethylene Glycol	6 - 25%	112-35-6	All Sections
	03/91 - 4/15	Triethelyne Glycol Monoethyl Ether	6 - 25%	112-50-5	All Sections
	03/91 - 4/15	Triethylene Glycol Monobutyl Ether	20 - 39%	143-22-6	All Sections
	03/91 - 4/15	Tetraethylene Glycol Monobutyl Ether	5 - 20%	1559-34-8	All Sections
	03/91 - 4/15	Polyalkylene Glycol Monomethyl Ether	5 - 20%	23783-42-8	All Sections
	03/91 - 4/15	Polyethylene Glycol	5 - 20%	25322-68-3	All Sections
	03/91 - 4/15	Polyethylene glycol monobutyl ether	5 - 20%	9004-77-7	All Sections
	03/91 - 4/15	Polyalkylene Glycols	5 - 20%	9038-95-3	All Sections
	03/91 - 4/15	Diethylene Glycol	5 - 15%	111-46-6	All Sections
	03/91 - 4/15	Diethylene Glycol Monomethyl Ether	<5%	111-90-0	All Sections
Koehler Bright Star Lamp Battery Fluid	03/91 - 4/15	Sulfuric Acid (38%)	100%	7664-93-9	All Sections
Q-Bond Surface Bonding Cement	03/91 - 4/15	Portland Cement		65997-15-1	All Sections
	03/91 - 4/15	Crystalline Silicon Dioxide		13397-24-5	All Sections
	03/91 - 4/15	Calcium Hydroxide		001-305-620	All Sections
	03/91 - 4/15	Calcium Stearate		1592-23-0	All Sections
Roklok 70A	03/91 - 4/15	Polymethylene polyphenyl isocyanate	100%	009016-87-9	15 W
Roklok 70B	03/91 - 4/15	Polyglycols	60 - 100%	Mixture (2)	15 W
	03/91 - 4/15	Dimethylene Glycol	10 - 30%	111-46-6	15 W
Minova Lokset Resin Cartridge	03/91 - 4/15	Calcium Carbonate	60 - 100%	1317-65-3	All Sections
	03/91 - 4/15	Polyester Resin	5 - 15%	Not Reported	All Sections
	03/91 - 4/15	Styrene Monomer	3 - 7%	100-42-5	All Sections
	03/91 - 4/15	Diethylene Glycol	0.5 - 1.5%	57-55-6	All Sections
	03/91 - 4/15	Benzoyl Peroxide	0.5 - 1.5%	94-36-0	All Sections
Foamy Engine Bright Engine Cleaner	03/91 - 4/15	2-Butoxyethanol	2 - 10%	111-76-2	All Sections
	03/91 - 4/15	Aromatic Petroleum Naphtha	2 - 10%	64742-95-6	All Sections
	03/91 - 4/15	Isobutane	2 - 10%	75-28-5	All Sections
	03/91 - 4/15	Petroleum Base Oil	2 - 10%	8008-20-6	All Sections
	03/91 - 4/15	Propane	2 - 10%	74-98-6	All Sections
WD-40 Aerosol	03/91 - 4/15	Aliphatic Hydrocarbon	45 - 50%	64742-47-8	All Sections
	03/91 - 4/15			64742-48-9	All Sections
	03/91 - 4/15			64742-88-7	All Sections
	03/91 - 4/15	Petroleum Base Oil	15 - 25%	64742-65-0	All Sections
	03/91 - 4/15	LVP Aliphatic Hydrocarbon	12 - 18%	64742-47-8	All Sections
	03/91 - 4/15	Carbon Dioxide	2 - 3%	124-38-9	All Sections
Conoco Super Hydraulic Oil (all grades)	03/91 - 4/15	Lubricant base oil	>99	Various	All Sections
	03/91 - 4/15	Additives	<1	Proprietary	All Sections
Conoco Power Tran Fluid	03/91 - 4/15	Lubricant base oil	87 - 91%	Various	All Sections
	03/91 - 4/15	Zinc Compounds	1.0 - 1.5%	Proprietary	All Sections
	03/91 - 4/15	Additives	9 - 13%	Proprietary	All Sections
Powergear EP 5 - 35LB MPL	03/91 - 4/15	Mineral Oil	>95%	Proprietary	All Sections

November 29, 2017

To: BLM File

From: Ken Fleck

Subject: November 29 2017 - BLM Inspection of Deer Creek Mine by Steve Falk, mining engineer from the Price BLM office, and Keenan Storrar, hydrologist from the Utah Division of Oil, Gas, and Mining.

Steve and Keenan arrived at the mine around 9 a.m. and we went underground at 9:30.

We traveled to the 1st Right XC-43 and XC-46 diversion dams, where the final dam at XC-43 was being completed. We verified that the dams have been grouted. At Steve and Keenan's request, we visited the sites of the gravel-covered infiltration galleries at the Rilda Canyon 1st Right fan portal and roadway portal to verify that they have been completed as planned. We visited the site of the XC-52 sump overflow infiltration gallery to verify that it is complete.

We visited the 6th North area and looked at each of the 13 diversion dams to verify their presence, and to verify that they had been tested by filling with water. We discussed the various measures that have been taken to minimize leakage by grouting and installing bentonite. Number 10 dam is partially constructed. We visited the site of the 6th North belt intersection to verify belt and drive removal. We took Steve outside. Keenan and I returned underground and visited the 7th North Seals (no water against seals), the pump room, to show that the main pumps have been removed, leaving the backup pump operating. We visited the 17th West seals to observe the pumps that are to be removed before closure. We stopped at the debris screens at 7N XC 19.5 to discuss how they will be deployed during the final closure process. We stopped at the 7N – Bypass intersection to observe belt structure and drive removal. We stopped at Bypass XC-5.5 to observe the screens there. On the way out of the mine, we observed the refuge chamber at Bypass XC-14 that is to be removed from the mine. We stopped at Bypass – MFA #2 intersection to observe belt structure removal. I showed Keenan the bottom end of the unused monitoring borehole #2014 C to show him that the hole has been plugged.

Keenan mentioned on the way out of the mine that the mine looked very clean and that a lot materials had been removed since his last visit and was pleased by the cleanliness of the areas already cleared of equipment.

We exited the mine at 12:30 p.m.

SUMMARY WATER ANALYSIS REPORT

DEER CREEK MINE

Federal Lease UTU-024319
Full Lease Relinquishment

Mine ID
Utah Pollution Discharge Elimination System (UPDES) Permit Data
Quantity - Historical Data
Quality - Historical Data (UPDES Parameters)
Total Suspended Solids
Iron (Total & Dissolved)
Oil & Grease
Total Dissolved Solids
Ph

UPDES Permit Data:
Deer Creek Mine UPDES Permit: UT0023604
Mine Discharge - Site 002
Permit Renewed on February 1, 2015
Permit Expires on January 31, 2020

Permit Limitations (water discharged to Deer Creek Drainage):

Deer Creek Mine Water Discharge Site 002

	Effluent Limitations				Monitoring Requirements	
Effluent Characteristics	**Average 30 - Day**	**Average 7 - Day**	**Daily Minimum**	**Daily Maximum**	**Measurement Frequency**	**Sample Type**
Flow, MGD	5.0 MGD	NA	NA	NA	Monthly	Measured
Total Suspend Solids, mg/l	15	25	NA	NA	Monthly	Grab
Total Iron, mg/l	NA	NA	NA	1.0	Monthly	Grab
Oil & Grease, mg/l	NA	NA	NA	10	Monthly	Grab
TDS, mg/l	NA	NA	NA	1200	Monthly	Grab
pH, Units	NA	NA	6.5	9.0	Monthly	Grab
Sanitary Waste	NA	NA	NA	None	Monthly	Visual
Oil and Grease, floating, visible foam	NA	NA	NA	None	Monthly	Visual

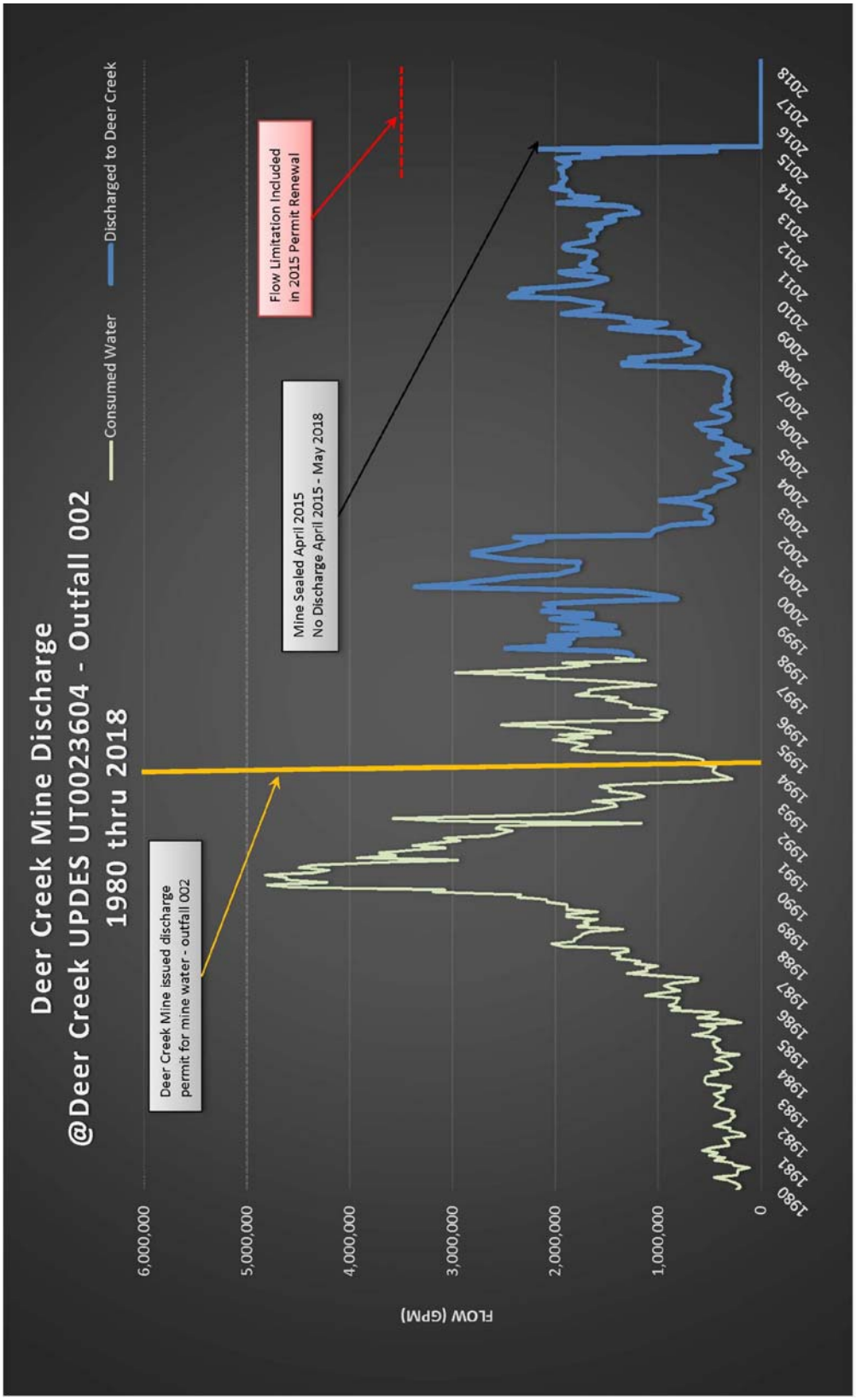
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Site 002: 1980 – 2017

Mine Discharge Quantity



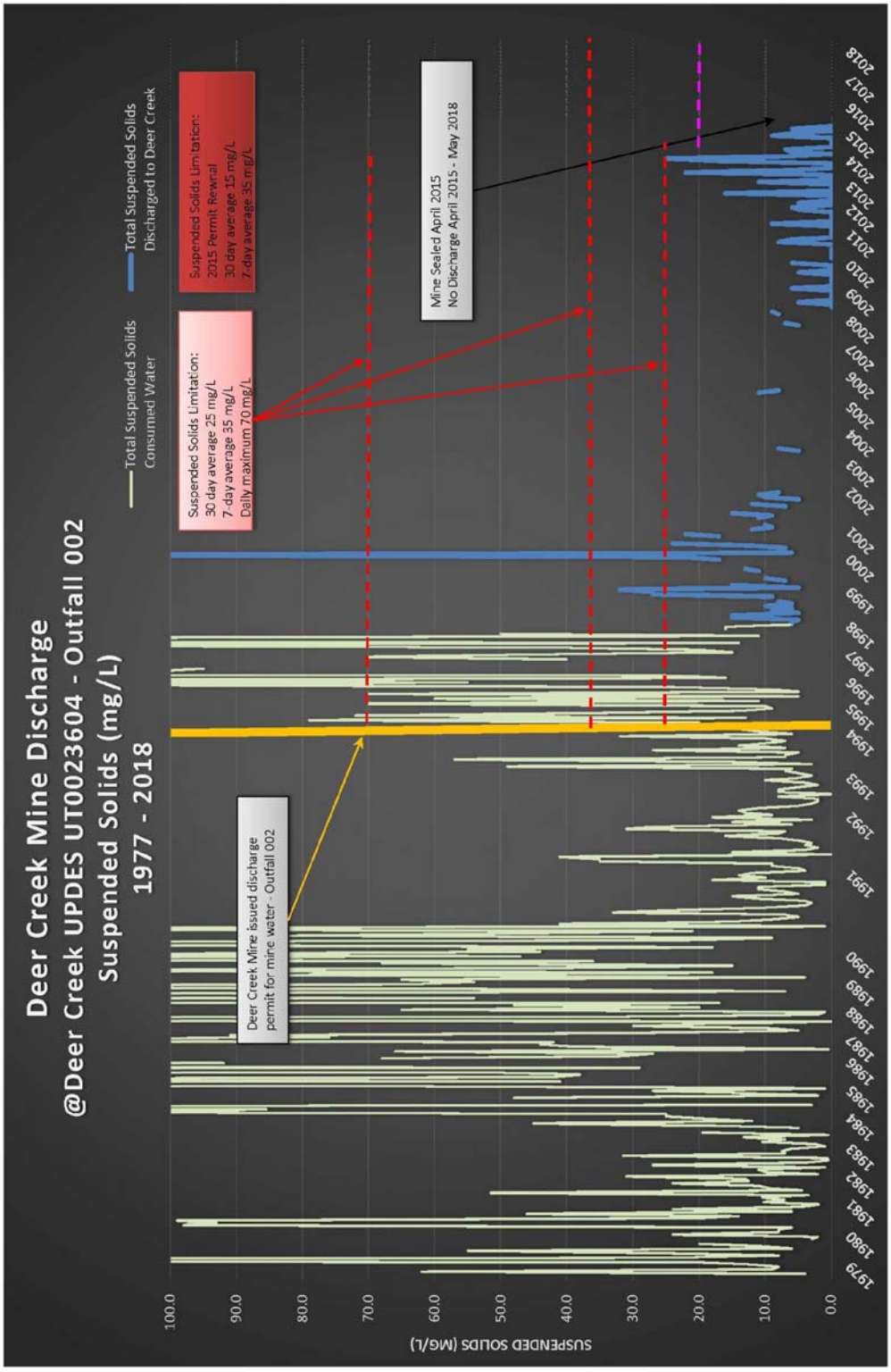
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Water Discharge Water Quality

Parameter: Total Suspended Solids



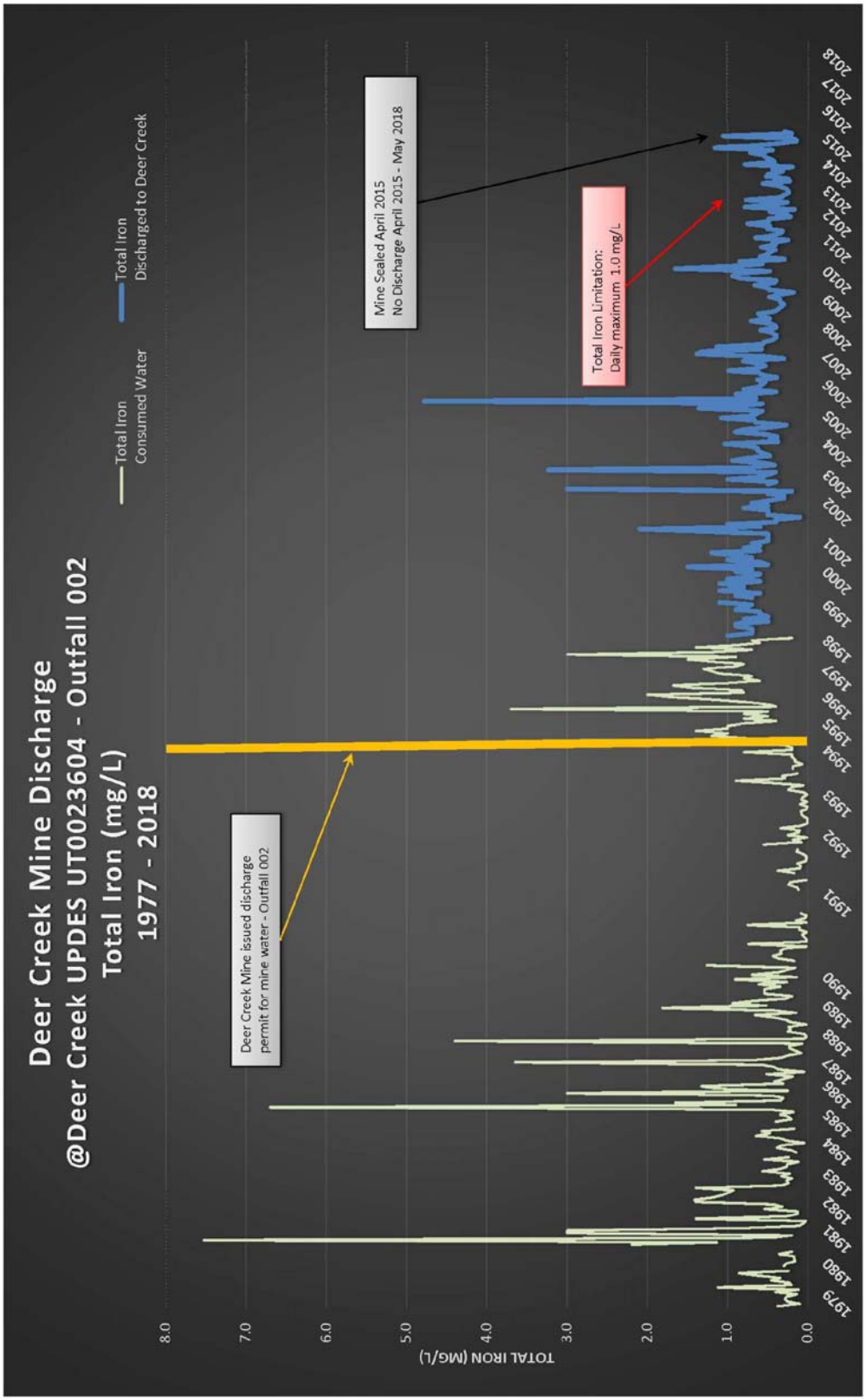
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Total Iron



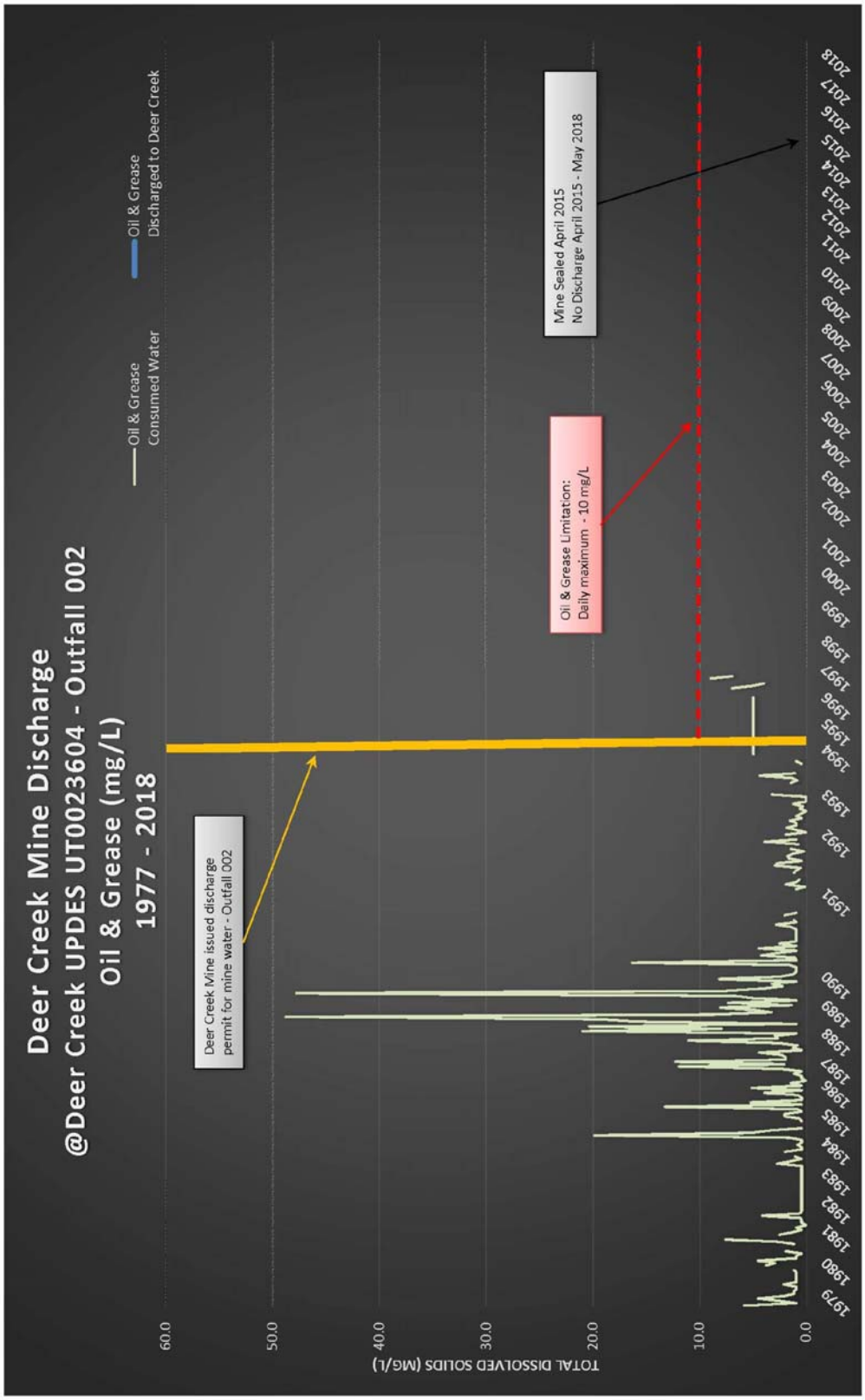
MINE ID

DEER CREEK MINE

UPDES - 0023604

Deer Creek Mine Water Discharge Water Quality

Parameter: Oil & Grease



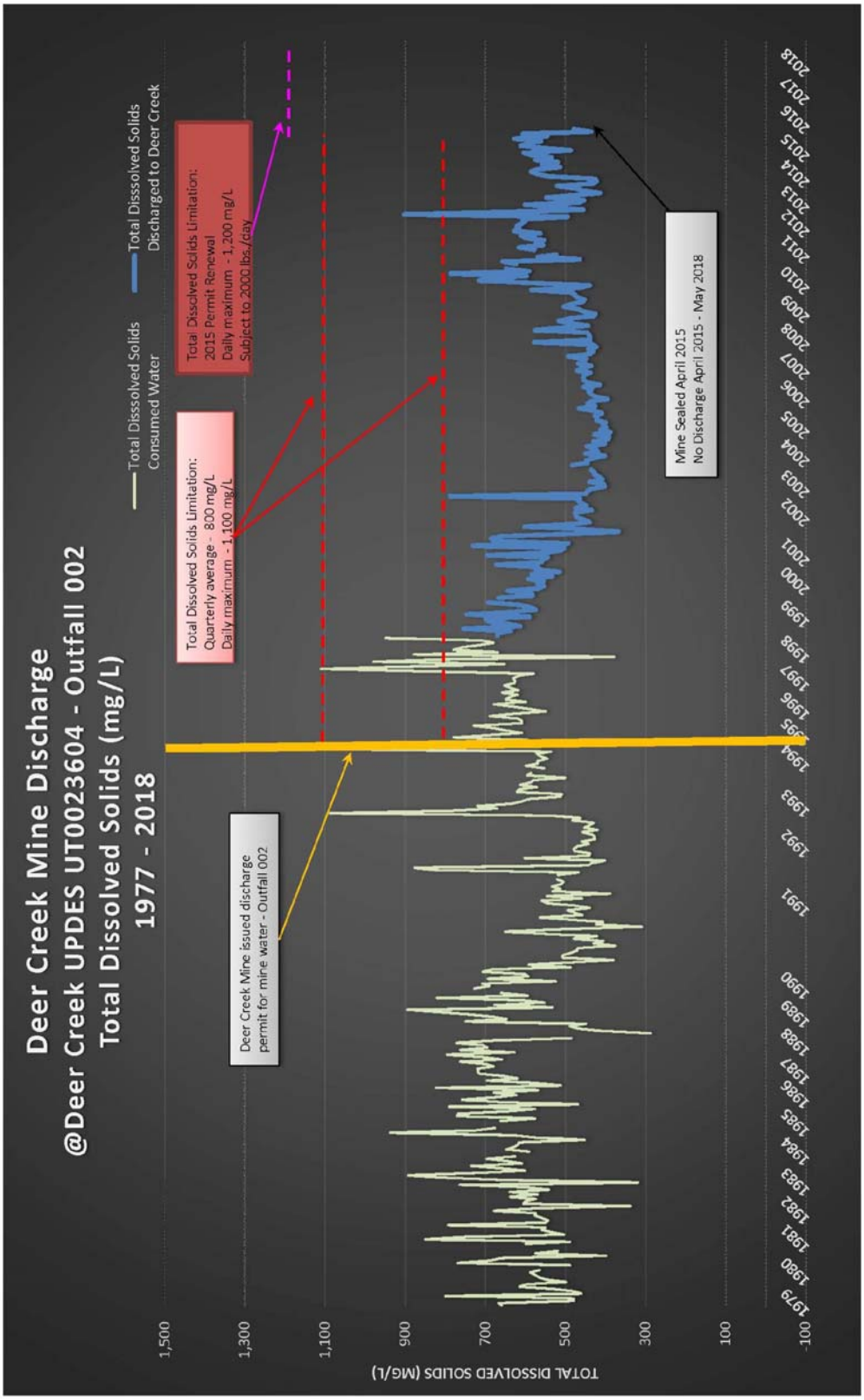
MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

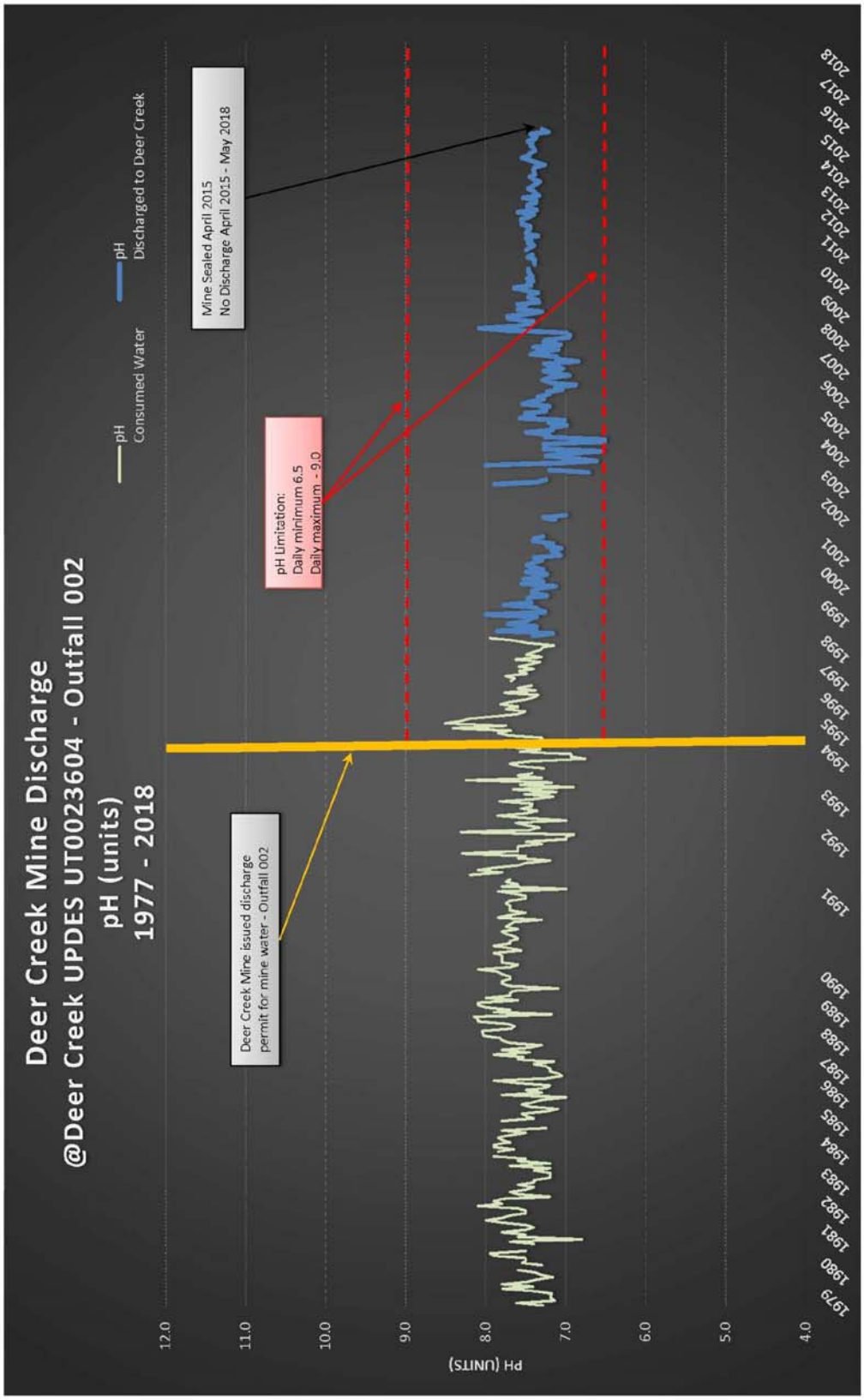
Parameter: Total Dissolved Solids



MINE ID

DEER CREEK MINE

UPDES - 23604

Deer Creek Mine Water Discharge Water Quality

Parameter: pH