



STATE OF UTAH  
NATURAL RESOURCES  
Oil, Gas & Mining

ACT/015/009 #2  
Norman H. Bangerter, Governor  
Dee C. Hansen, Executive Director  
Dianne R. Nielson, Ph.D., Division Director

355 W. North Temple • 3 Triad Center • Suite 350 • Salt Lake City, UT 84180-1203 • 801-538-5340

April 3, 1987

Mr. Allen Klein, Acting Chief  
Division of Federal Programs  
Western Field Operations  
Office of Surface Mining  
Brooks Towers, 1020 15th Street  
Denver, Colorado 80202

Dear Mr. Klein:

Re: Final Decision Document, Technical Analysis and Supporting  
Documentation, Trail Mountain Coal Company, Trail Mountain Mine,  
Tract 2 Lease, ACT/015/009-1, File #2 and #4, Emery County, Utah

Attached are the items referenced above for the Tract 2 lease addition at the Trail Mountain Mine in Emery County, Utah. As noted in the Division's March 5, 1987 letter transmitting the Draft of this material, we are forwarding this final decision upon completion of the required public comment period for this permitting action. No comments were received.

Trail Mountain Coal Company has apprised DOGM that the approval of this lease addition as soon as possible is necessary to maintain production at the mine. Therefore, it is my hope that your office can expedite in every manner possible the approval of this permit. If there is anything which this office can do to assist you in processing this action please contact me.

Best regards,

Dianne R. Nielson  
Director

JJW/djh  
cc: A. Childs, Trail Mountain Coal  
Tech Review Team  
0800R/64

MINE PLAN INFORMATION

Tract 2 Lease

Mine Name: Trail Mountain Mine State ID: ACT/015/009-1

Operator: Trail Mountain Coal Company County: Emery

Controlled By: Diamond Shamrock  
Contact Person(s): Allen P. Childs Position: Mine Engineer  
Telephone: (801) 748-2140

New/Existing: New Lease Mining Method: Underground

Federal Lease No(s): U-49332  
Legal Description(s): T 17 South Range 6 East SLB&M Sec. 25 S1/2 NW1/4, W1/2 SW1/4, W1/2 E1/2 SW1/4; Sec. 26 SE1/4 NE1/4, E1/2 SW1/4 NE1/4, E1/2 SE1/4, E1/2 W1/2 SE1/4; Sec. 35 N1/2 NE1/4, SE1/4 NE1/4, E1/2 SW1/4 NE1/4, E1/2 SE1/4, E1/2 W1/2 SE1/4

State Lease No(s): None on this lease addition  
Legal Description(s): \_\_\_\_\_

Other Leases (identify): None on this lease addition

Legal Description(s): \_\_\_\_\_

Ownership Data:

<u>Surface Resources (acres)</u>	<u>Existing Permit Area</u>	<u>Proposed Permit Area</u>	<u>Total Life Of Mine Area</u>
Federal	<u>80 acres</u>	<u>641.47 acres</u>	<u>721.47</u>
State	<u>640 acres</u>		<u>640.0</u>
Private	<u>53.5 acres</u>		<u>53.5</u>
Other			
TOTAL	<u>773.5 acres</u>	<u>641.47 acres</u>	<u>1414.97 acres</u>

Coal Ownership (acres):

Federal	<u>80 acres</u>	<u>641.47 acres</u>	<u>721.47 acres</u>
State	<u>640 acres</u>		<u>640 acres</u>
Private	<u>53.5 acres</u>		<u>53.5 acres</u>
Other			
TOTAL	<u>773.5 acres</u>	<u>641.47</u>	<u>1414.97 acres</u>

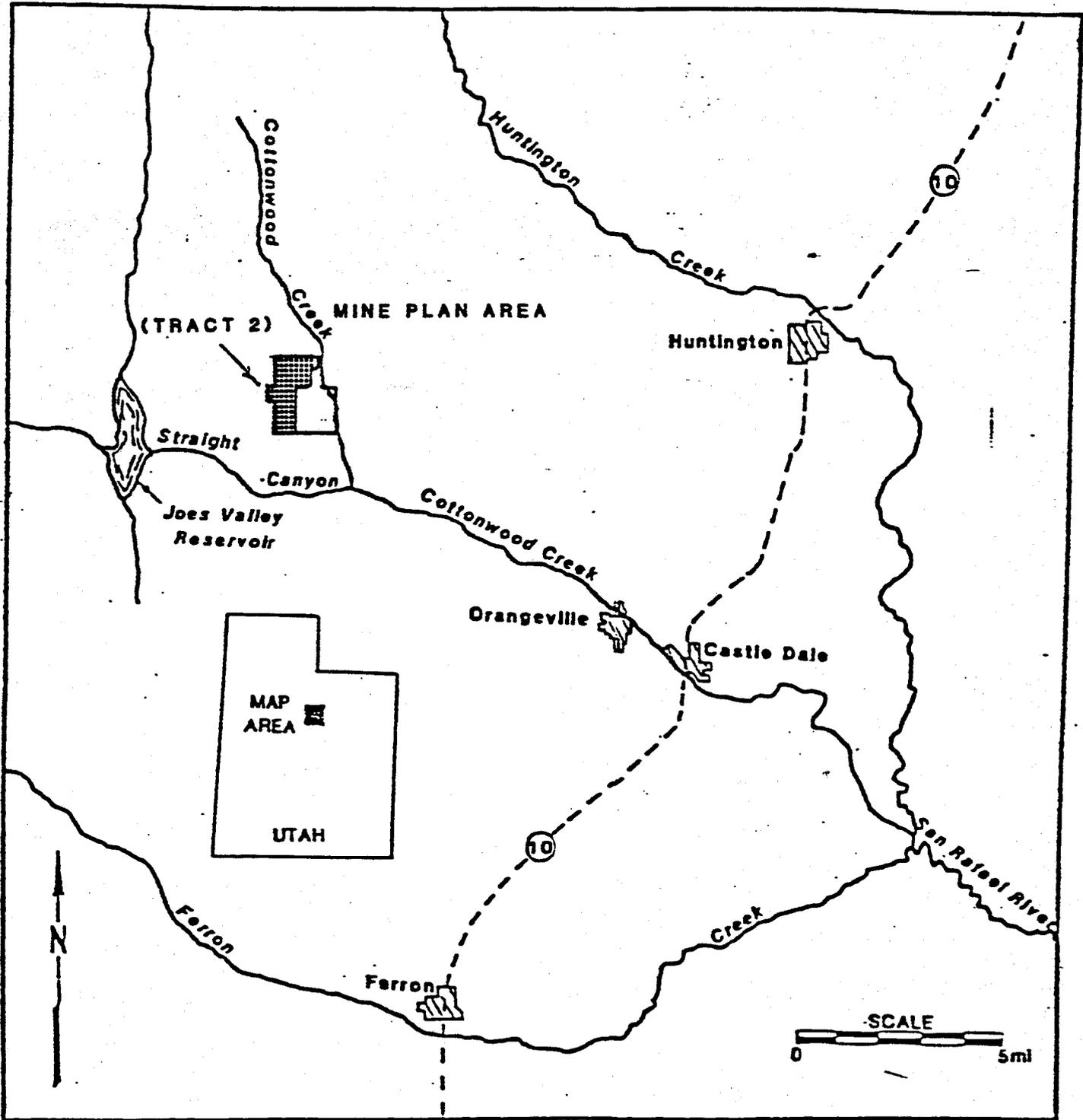
<u>Coal Resource Data</u>	<u>Total Reserves (1981)</u>	<u>Total Recoverable Reserves (1981)</u>
Federal	9,193,430	4,796,776
State		
Private		
Other		
TOTAL		

(\*Table 3 - 1 MRP)

<u>Recoverable Reserve Data</u>	<u>Name</u>	<u>Thickness</u>	<u>Depth</u>
Seam	Hiawatha Seam	8-8 1/2'	
Seam			

Mine Life: 11 years  
 Average Annual Production: 450,000 tons Percent Recovery: 56%  
 Date Projected Annual Rate Reached: June 1987  
 Date Production Begins: Upon Permit Apvl Date Production Ends: Approx. 1998  
 Reserves Recoverable By: (1) Surface Mining: \_\_\_\_\_  
 (2) Underground Mining: 4.7 million tons  
 Reserves Lost Through Management Decisions: \_\_\_\_\_  
 Coal Market: \_\_\_\_\_

<u>Modifications that have been approved:</u>	<u>Date:</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
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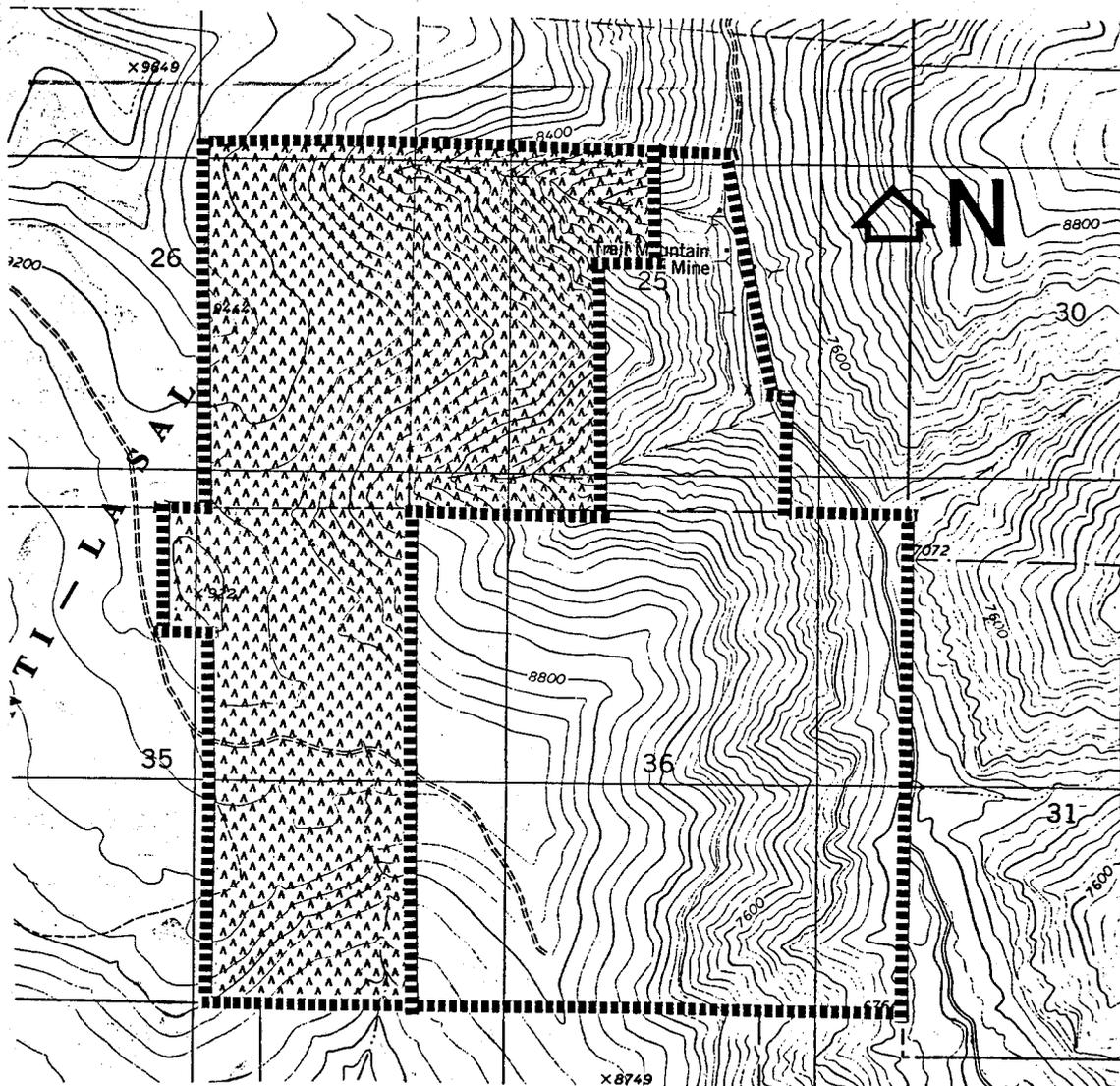
Location of the Trail Mountain Mine Plan Area.

FIGURE 1

FIGURE 1-1

Trail Mountain Coal Company  
Tract 2 Lease  
ACT/015/009-1

(Township 17 South, Range 6 East SLBM)



SCALE 1'' : 24000''



## Tract 2 Permit Area

Tract 2 Lease - 641.47 acres  
Surface Ownership - Manti La Sal National Forest  
Coal Ownership - USA

(adapted from plate 4-3, Tract 2 application 3-87)

FINDINGS DOCUMENT

Trail Mountain Coal Company  
Tract 2 Lease  
Trail Mountain Mine  
ACT/015/009-1, Emery County, Utah

April 3, 1987

1. The plan and the permit application are accurate and complete and all requirements of the Surface Mining Control and Reclamation Act (the "Act"), and the approved Utah State Program have been complied with (UMC 786.19(a)).
2. The applicant proposes acceptable practices for the reclamation of disturbed lands. These practices have been shown to be effective in the short-term; there are no long-term reclamation records utilizing native species in the western United States. Nevertheless, the regulatory authority has determined that reclamation, as required by the Act, can be feasibly accomplished under the Mining and Reclamation Plan (MRP) (UMC 786.19(b)).
3. The assessment of the probable cumulative impacts of all anticipated coal mining activities in the general area on the hydrologic balance has been made by the regulatory authority. The reclamation plan proposed under the application has been designed to prevent damage to the hydrologic balance in the permit area (UMC 786.19(c) and UCA 40-10-11(2)(c)). (See Cumulative Hydrologic Impact Analysis (CHIA) compiled by OSM in April 1984 and the updated synopsis attached to this Findings Document.)
4. The proposed permit area for the Tract 2 lease is:
  - A. not included within an area designated unsuitable for underground coal mining operations;
  - B. not within an area under study for designated lands unsuitable for underground coal mining operations;
  - C. not on any lands subject to the prohibitions or limitations of 30 CFR 761.11(a) (national parks, etc.), 761.11(f) (public buildings, etc.) and 761.11(g) (cemeteries);
  - D. not within 100 feet of the outside right-of-way line of a public road (UMC 761.11);
  - E. not within 300 feet of any occupied dwelling (UMC 786.19(d)). (See MRP Section 782.16.).

5. The regulatory authority's issuance of a permit is in compliance with the National Historic Preservation Act and implementing regulations (36 CFR 800) (UMC 786.19(e)). (See attached letter from State Historic Preservation Officer (SHPO) dated February 13, 1987.)
6. The applicant has the legal right to enter and complete reclamation activities in the permit area through federal coal lease U-49332 (UMC 786.19(f)).
7. The applicant has shown that prior violations of applicable laws and regulations have been corrected (UMC 785.19(g)). (Memo of March 3, 1987 from Joe Helfrich, Division of Oil, Gas and Mining (DOGM), Inspection and Enforcement section.)
8. Neither Trail Mountain Coal Company nor its parent company, Diamond Shamrock, are delinquent in payment of fees for the Abandoned Mine Reclamation Fund (UMC 786.19(h)) (communication, Valerie Coleman, OSM, Washington, D. C., March 26, 1987).
9. The applicant does not control and has not controlled mining operations with a demonstrated pattern of willful violations of the Act of such nature, duration and with such resulting in irreparable damage to the environment as to indicate an intent not to comply with the provisions of the Act (UMC 786.19(i)) (communication, Valerie Coleman, OSM, Washington, D. C., March 26, 1987).
10. Underground coal mining and reclamation operations to be performed under the permit will not be inconsistent with other operations anticipated to be performed in areas adjacent to the proposed permit area (UMC 786.19(j)).
11. A detailed analysis of the proposed bond has been made. The bond estimate is \$463,711.00 in 1989 dollars. The regulatory authority has made appropriate adjustments to reflect costs which would be incurred by the state, if it was required to contract the final reclamation activities for the mine site. The bond shall be posted (UMC 786.19(k)) with the regulatory authority prior to final permit issuance.
12. No lands designated as prime farmlands or alluvial valley floors occur on the permit area (UMC 786.19(l)).
13. The proposed postmining land-use of the permit area has been approved by the regulatory authority (UMC 786.19(n)). (See TA, Section UMC 817.133.)

14. The regulatory authority has made all specific approvals required by the Act, and the approved State Program (UMC 786.19(n)).
15. The proposed operation will not affect the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitats (UMC 785.19(o)).
16. All procedures for public participation required by the Act, and the approved Utah State Program have been complied with (UMC 786.11-.15).

Prior to the permit taking effect, the applicant must agree to comply with the special stipulations in the permit and post the performance bond for reclamation activities.

*John H. Hitchcock* 4-3-87  
DOG M Lead Reviewer

*Anneth E. May* <sup>LM03</sup> for Lowell Beasly  
Administrator, Mineral Resource  
Development and Reclamation Program

*Anneth E. May* 4/3/87  
Associate Director, Mining

*Danner Nelson* 4-3-87  
Director



STATE OF UTAH  
NATURAL RESOURCES  
Oil, Gas & Mining

Norman H. Bangerter, Governor  
Dee C. Hansen, Executive Director  
Dianne R. Nielson, Ph.D., Division Director

355 W. North Temple • 3 Triad Center • Suite 350 • Salt Lake City, UT 84180-1203 • 801-538-5340

March 3, 1987

TO: John Whitehead  
FROM: Joseph C. Helfrich, Compliance Coordinator *JCH*  
RE: Compliance Status Review on Trail Mountain Coal  
Company/Natomas Coal Company, ACT//015/009

As of the writing of this letter, Trail Mountain Coal Company has no NOV's or CO's which are not corrected or in the process of being corrected. Any NOV's or CO's that are outstanding are in the process of administrative or judicial review. There are no finalized Civil Penalties which are outstanding and overdue in the name of Trail Mountain Coal Company.

Finally they do not have a demonstrated pattern of willfull violations, nor have they been subject to any bond forfeitures for any operation in the state of Utah.

re  
0422Q-49

Mine File  
J. Whitehead

Moab District  
P. O. Box 970  
Moab, Utah 84532

3482  
U-49332  
(U-067)

MAR 13 1987

Memorandum

To: Senior Project Manager for Utah, Office of Surface Mining,  
Denver, Colorado

From: District Manager, Moab

Subject: Trail Mountain Mining and Reclamation Plan (MRP),  
Tract II Revision (UT-0017)

On February 24, 1987, we received maps and pages transmitted with your letter dated February 10, 1987, and identified as "01/22/87 UTDUGH Transmittal of Completeness Deficiency Responses for Tract II Revision" for the subject mine plan. The memorandum asks for our analysis, recommendations and/or concurrence within the scope of our agency's regulations to the pending mine plan.

The deficiency responses submitted by Trail Mountain were reviewed and found compatible with the regulations for coal recovery and protection. BLM's recommendation for approval of the resource recovery and protection plan (R2P2) for Tract II remains as stated in our letter of May 19, 1986.

BLM has no jurisdiction over the surface and land uses as the tract is entirely inside the Manti-LaSal National Forest.

Within the limits of our authority, we concur with the Trail Mountain Mine R2P2 on file in Price and the revisions as stated. Should you have any questions, please call Stephen Falk in Price at (801) 637-4584.

AS/ GENE NODINE

cc:  
Trail Mountain Coal Co.  
~~DOGL~~  
USO (U-921)

SHFalk:ks:3/5/87  
6240 Mag Card

RECEIVED  
MAR 16 1987

DIVISION OF  
OIL, GAS & MINING

Orig: Mine file  
W. Decker  
J. Whitehead  
JAN 27 1987  
RECEIVED  
JAN 28 1987

Moab District  
P. O. Box 970  
Moab, Utah 84532

DIVISION OF  
OIL, GAS & MINING

3482  
U-29332  
(U-067)

**MEMORANDUM**

**TO:** Senior Project Manager for Utah, Office of Surface Mining,  
**FROM:** District Manager, Moab  
**SUBJECT:** Trail Mountain Mining and Reclamation Plan (MRP),  
Tract 2 (UT-0017) Revision

On December 30, 1986 we received the maps and pages transmitted with your letter dated December 18, 1986 and identified as "12/01/86 Utah DGM Transmittal of MRP Updates for the Tract II Lease Revision" for the subject mine plan. The memorandum requested our recommendation on the resource recovery and protection plan (R2P2) and BLM's analysis of post-mining land uses and conflicts. These items have been reviewed.

Tract II is essentially adding the recently acquired emergency Federal coal lease U-49332 to the Trail Mountain MRP (Act/015/009). Since issuance, the complete Trail Mountain MRP has been transferred from the Branch of Solid Minerals, BLM State Office, Salt Lake City to the San Rafael Resource Area office, Moab District, in Price where field engineers responsible for operations and lease management would have access to the complete plan. Comments concerning the review of the R2P2 (43 CFR 3482) for this mine will henceforth come from this District. The revisions are compatible with the regulations for coal recovery and protection. BLM's review and approval of the R2P2 for Tract II remains as stated in our letter of May 19, 1986.

BLM has no jurisdiction over the surface and land uses as the tract is entirely inside the Manti-LaSal National Forest.

Within the limits of our authority, we concur with the Trail Mountain Mine R2P2 on file in Price and the revisions as stated. Should you have any questions please call Stephen Falk in Price at (801) 637-4584.

/S/ GENE NODINE

cc: Trail Mtn. Coal Co.  
DGM  
USO (U-921)

SWFalk:lp:1/20/87:Mag II



STATE OF UTAH  
NATURAL RESOURCES  
Wildlife Resources

1596 West North Temple • Salt Lake City, UT 84116-3154 • 801-533-9333

December 29, 1986

~~XXXXXXXXXX~~  
~~XXXXXXXXXX~~

J. Whitehead  
Orig mine file  
~~XXXXXXXXXX~~

Norman H. Bangerter, Governor  
Dee C. Hansen, Executive Director  
William H. Geer, Division Director

RECEIVED  
JAN 05 1987

Dr. Dianne R. Nielson, Director  
Utah Division of Oil, Gas and Mining  
355 West North Temple  
3 Triad Center, Suite 350  
Salt Lake City, UT 84180-1203

DIVISION OF  
OIL, GAS & MINING

Attn: John Whitehead

Dear Dianne:

The Division has evaluated Trail Mountain Coal Company's November 21, 1986 updated Mining and Reclamation Plan for Tract 2 lease addition to the Trail Mountain Mine.

Page 22, Second paragraph - Are there areas where potential subsidence from mining could impact an existing cliff raptor nest? If so, the MRP must identify such and mitigation methodology. To date no nests are known in Tract 2. If a raptor nest were to occur, loss due to subsidence is considered to be substantial.

Appendix 7-E, Macro Invertebrate Study (Cottonwood Creek) - The differences in substrate and vegetation overstory between the two sample sites is substantial. This diminishes our ability to evaluate differences between control and experimental (potential impact area) data. The small number of replicate samples would also confound an evaluation if the control and experimental sites were more closely matched.

Considering that control and experimental sites each showed diversity indices suggestive of polluted systems and the biotic index showed the experimental and control to be slightly stressed, mining is not likely a measurable influence on the stream system. As a result, we concur with the author that additional studies relative to mining are not necessary.

Thank you for an opportunity to review the MRP and provide comment.

Sincerely,

William H. Geer  
Director

File ACT/015/009 #2  
c.c. J. Whitehead

RECEIVED  
FEB 20 1987

DIVISION OF  
OIL, GAS & MINING



NORMAN H. BANGERTER  
GOVERNOR

DCED

STATE OF UTAH  
DEPARTMENT OF COMMUNITY AND  
ECONOMIC DEVELOPMENT

February 13, 1987

Division of  
State History  
(UTAH STATE HISTORICAL SOCIETY)

MAX J. EVANS, DIRECTOR  
300 RIO GRANDE  
SALT LAKE CITY, UTAH 84101-1182  
TELEPHONE 801/533-5755

John J. Whitehead  
Permit Supervisor/Permit Hydrologist  
Division of Oil, Gas and Mining  
355 W. North Temple  
3 Triad Center, Suite 350  
Salt Lake City, Utah 84180

RE: MRP Completeness Deficiency Responses, Trail Mountain Coal Company, Trail Mountain Mine, ACT/015/009, Emery County, Utah

In Reply Please Refer To Case No. G828, E418

Dear Mr. Whitehead:

The Utah Preservation Office has received for consideration the above mentioned amended project. After review by our staff, we note that the Trail Mountain Mine completeness deficiency response has no new material that affects cultural resources. Therefore, we have no comment on the amendments to this project.

The above is provided on request for assistance as outlined by 36 CFR 800 or Utah Code, Title 63-18-37. If you have questions or need additional assistance, please contact Lorraine Dobra at (801) 533-7039.

Sincerely,

Max J. Evans  
Director and  
State Historic Preservation Officer

LAD:jrc:G828, E418:3825V



116 State Capitol Building  
Salt Lake City, UT 84114  
Telephone 801-533-5245

Howe file  
J. Whitehead

## office of planning and budget

Norman H. Bangertter, Governor Dale C. Hatch, C.P.A., J.D., Director Michael E. Christensen, Ph.D., Deputy Director

**RECEIVED**  
MAR 06 1987

DIVISION OF  
OIL, GAS & MINING

March 5, 1987

Lowell P. Braxton  
Division of Oil, Gas and Mining  
3 Triad Center, Suite 350  
355 West North Temple  
Salt Lake City, Utah 84180-1203

SUBJECT: Determination of Completeness, Tract II Lease, Diamond Shamrock,  
Trail Mountain Coal Co., Trail Mountain Mine  
State Application Identifier #UT870213-030

Dear Mr. Braxton:

The Resource Development Coordinating Committee of the State of Utah has reviewed this proposed action and no comments have been indicated.

Thank you for the opportunity of reviewing this document. Please address any other questions regarding this correspondence to Carolyn Wright (801) 533-4971.

Sincerely,

Michael E. Christensen  
Deputy Director

MEC/jw

## FINAL TECHNICAL ANALYSIS

Trail Mountain Coal Company  
Trail Mountain Mine - Tract II  
ACT/015/009, Emery County, Utah

April 3, 1987

### INTRODUCTION

The Tract 2 lease constitutes an underground addition of 641.47 acres to the approved Trail Mountain Mine permit area. This analysis includes regulations which are applicable to impacts related to the underground mining proposed in the Tract 2 lease addition. Regulations pertaining strictly to the surface effects of underground mining such as topsoil, disturbed area drainage, roads, revegetation, etc., are formally addressed in the existing approved permit and technical analysis completed on November 14, 1984.

No surface disturbance is planned for the Tract 2 permit area of the Trail Mountain Coal Mine.

### UMC 817.13-.15 Casing and Sealing of Exposed Underground Openings (RVS)

The applicant describes procedures for temporary and permanent borehole sealing in Appendix 10(B), Chapter III of the MRP.

Permanent abandonment of the proposed underground monitoring well, TM-3 (Appendix 7-1), includes sealing water-bearing units with cement, backfilling other portions of the well with heavy mud, drill cuttings or cement, and installing a five-foot cement plug at the surface.

During monitoring, TM-3 will be temporarily sealed by installing casing and a threaded cap for access.

No new portals will be developed in conjunction with the Tract 2 permit.

## Compliance

The applicant has provided adequate plans for temporary and permanent borehole sealing that are designed to prevent acid or toxic drainage from entering surface or ground waters and to minimize disturbance to the prevailing hydrologic balance.

The applicant is in compliance with this section.

## Stipulations

None.

UMC 817.41 Hydrologic Balance: General Requirements (JRF/RVS)

## Existing Environment and Applicant's Proposal

### Surface Water (JRF)

The applicant discusses surface water in Section 7.2 of the Permit Application. All drainage basins in the Tract 2 permit area are ephemeral with the exception of the basin where springs T-10 and T-14 are located (see Figure 7-1). The applicant does not propose any surface disturbance for the Tract 2 permit area. The applicant will utilize the previously approved surface facilities associated with the Tract 1 permit.

Cottonwood Creek is adjacent to the Tract 2 permit area. The application presents a discussion on water quality and quantity in Section 7.2.2.2. A complete discussion of potential mining impacts on Cottonwood Creek is presented in the Tract 1 permit.

## Compliance

### Surface Water

The applicant does not propose any surface disturbance in the Tract 2 permit area. Impacts to the surface water system would be subsidence related, the reviewer is referred to the ground-water discussion within this regulation and UMC 817.121 for information pertaining to subsidence damages.

This section is not applicable.

## Ground Water (RVS)

### Existing Environment and Applicant's Proposal

The operator provides information about aquifers, springs and mine inflows in Chapter VII, pages 1 through 10, Appendices 7-1, 7-2, 7-3, 7-B, 7-D(1), 7-D(2), 7-D(3), 7-D(5), 7-D(8), 7-D(11), 7-D(12), 7-F, 7-G and Figures 7-1, 7-2 and 7-3.

The operator describes the North Horn Formation, Price River Formation, Blackhawk Formation, and Star Point Sandstone as the major water-bearing lithostratigraphic units in the permit and adjacent area. The operator concludes that zones of "perched" aquifers occur within certain permeable lithologies of the North Horn Formation and Price River Formation, whereas, a regional aquifer occurs within the lower Blackhawk Formation and Star Point Sandstone.

Ground water within and adjacent to the permit area is used by wildlife, livestock watering and underground mine operations.

Figure 7-1 depicts three springs, designated T-10, T14A (North Horn Formation) and T-14 (Price River Formation), occurring within the permit area and projected subsidence area. Spring flow was measured during October 1985 and September 1986. Appendix 7-2 gives an average flow of 1.4 gpm for T-10 and 1.3 gpm for T-14. Spring T-14A occurs adjacent to Spring T-14 (pers. comm. 2/24/87, A. Childs TMCC), and also occurs within the permit area and projected subsidence area. During September 1986, T-14A flow was measured to be 1.43 gpm (Appendix 7-2).

Mine inflow is calculated to be 57 gpm (Appendix 7-H) and is collected in three sump areas entitled Main Sump, Sump 49 and Sump 68 (Figure 7-9). At present, mine inflow is not sufficient to fulfill the needs for underground mine operations and water must be diverted to the workings from Cottonwood Creek. A sustained roof drip, UG-1, has been monitored since 1985 (Appendix 7-D[5]).

Two boreholes, TM-1 and TM-2, have been developed in the Tract 1 permit area for the purpose of evaluating the regional aquifer. Data from these boreholes (Appendix 7-D[5]) agree with previously published information (Appendix 7-B) and indicate water levels occur within 20 feet of the mine floor in areas that are presently developed (Figure 7-1), the potentiometric surface slopes towards the south (Figure 7-1) and transmissivity is approximately 0.68 ft.<sup>2</sup>/day (Appendix 7-D[5]). The applicant proposes to develop an additional ground-water monitoring well, designated TM-3, following completion of development of the 6th West Mains (Appendix 7-1).

Water quality data presented in Appendix 7-2 and Appendix 7-D[5] indicate North Horn Formation and Price River Formation springs are elevated with respect to calcium and magnesium, whereas data from the regional aquifer indicate increased TDS and sodium levels.

The applicant proposes to extract the the Hiawatha seam using room and pillar methods with secondary pillaring everywhere within Tract 2 except beyond the outcropping Castlegate Sandstone (Figure 3-6; Chapter III, pages 5 and 6). Secondary pillaring will not occur where the Castlegate Sandstone does not overlie the Hiawatha seam. Approximately 600 acres will be mined (Chapter III, page 15) in an area where overburden ranges in thickness from 900 to 2,200 feet (Figure 6-6).

The applicant projects that Tract 2 mining will encounter the regional aquifer and estimates that inflows will total approximately 70 to 165 gpm (Appendix 7-F). Furthermore, the applicant commits to deriving, in consultation with the Division, and providing specific mitigation plans for ground water supplies that have been impacted by mining (Chapter VII, page 9 and Chapter III, page 18).

#### Compliance

The applicant has provided adequate information about the use, occurrence and characteristics of ground-water resources within and adjacent to the proposed Tract 2 permit area.

The applicant is in compliance with this section.

#### Stipulations (RVS)

None.

#### UMC 817.42 Water Quality Standards and Effluent Limitations (JRF)

#### Existing Environment and Applicant's Proposal

The Tract 2 permit area will not contain any surface disturbance. The surface facilities associated with the Tract 1 permit will be utilized for the Tract 2 permit.

Mine water discharge associated with the Tract 2 permit area will be made under the approved NPDES discharge permit for mine water. Permit approval and discharge data can be found in Appendix 7-D(8) of the application. The NPDES outfall location is shown on Figure 7-3. The applicant does not anticipate mine dewatering to

affect water quality (Section 7.1.4). Figure 7-9 shows the mine sump network and mine sump design details. Mine inflow has been calculated (Section 7.1.3.2) to be less than the amount required for dust suppression, thus only occasional mine water discharges are anticipated.

### Compliance

Surface water quality impacts are not expected to be associated with the Tract 2 permit area. The present surface facilities associated with the Tract 1 permit are designed to meet all federal and state water quality limitations.

The main (in-mine) sump is designed to allow controlled mine water discharges. The design has met the applicable standards of the state and federal agencies in charge of NPDES permits.

The application is in compliance with this section.

### Stipulations

None.

### UMC 817.48 Hydrologic Balance: Acid-Forming and Toxic-Forming Materials (DD)

This section is not applicable. Coal is not processed at the mine and waste rock will be disposed of underground, therefore acid-forming or toxic-forming materials will not be disposed of on the surface.

### UMC 817.50 Hydrologic Balance: Underground Mine Entry and Access Discharges (RVS)

### Existing Environment and Applicant's Proposal

Rocks in the permit and adjacent area strike N20°W and dip approximately 3.5°SW (Figure 7-9). Mine inflow is calculated to be 57 gpm and is collected in three sump areas prior to dispersal throughout the mine (Ref.).

Portals are updip from the workings and located at elevations between 7,260 and 7,290 feet (Figure 7-9). The belt entry and exhaust portals are at the lowest elevations. Permanent portal seals will incorporate a two-to-four-inch water drain pipe (Figure 3-10) to accommodate the flooding of workings and associated build-up of hydraulic head following mine closure.

## Compliance

Portals are located and constructed to control gravity discharge from the mine. The mine currently experiences inflow of 57 gpm, a rate that is projected to increase to 130-200 gpm upon complete development of Tract 2 coal reserves.

Following mine closure, workings will flood and unplanned discharges may occur. The applicant commits to monitoring on a quarterly basis, as accessible, unplanned discharges (Section 7.1.7, p. 10). Monitoring will derive data pertinent to assessing whether discharges are in compliance with effluent standards of UMC 817.42 and other applicable state rules and federal regulations. The applicant also commits to providing discharge treatment, if necessary, during the period of discharge, or until bond release.

The applicant is in compliance with this section.

## Stipulations

None.

UMC 817.52 Hydrologic Balance: Surface and Ground Water  
Monitoring (JRF)

## Existing Environmental and Applicant's Proposal

### Surface Water

The applicant discusses surface water monitoring in Section 7.2.6. The Tract 2 permit will utilize the approved Tract 1 surface facilities. The Tract 1 water monitoring program is outlined in Appendices 7-D(1)9-(2). The applicant will monitor the North Fork of Cottonwood Creek monthly for flow and field water quality measurements; and quarterly for the chemical suite outlined in Appendix 7-D(1). Figure 7-3 shows the location of all water monitoring stations.

### Ground Water

Section 7.1.6 of the application provides the discussion on ground-water monitoring. Springs T-10, T-14, and T-14A emanate within the zone of potential subsidence (Figure 7-3). T-10 and T-14 will be monitored in accordance with the schedule and parameters outlined in Appendix 7-3.

Two wells (TM-1, TM-2) and an in-mine inflow (Ug-1) are monitored on a quarterly basis as outlined in Appendix 7-D(3). Proposed well, TM-3, will be incorporated into the quarterly underground monitoring program upon completion of the 6th West Mains (Appendix 7-1). On a quarterly basis the operator will inventory the active portion of the mine to document mine location, rate and geologic occurrence of inflows. Upon consultation with DOGM, the operator will select, if any, certain inflows to be monitored. Ground-water monitoring data collected during the calendar year will be summarized and submitted to DOGM on an annual basis (Section 7.1.6).

#### Compliance

The applicant provides a monitoring plan for the runoff-fed ponds within the zone of potential subsidence. Quarterly inspections, when accessible, for subsidence fractures will be performed.

The applicant has sufficient up-gradient monitoring locations (TM-2, TM-23) in the regional (Blackhawk-Star Point) aquifer for Tract 1. Down-gradient monitoring will be at locations T-18 and T-19 (see Figure 7-3). T-18 is a postmining discharge and should be useful in gaging the post mine water quality of the Trail Mountain Mine.

The applicant is in compliance with this section.

#### Stipulations

None.

UMC 817.55 Hydrologic Balance: Discharge of Water Into an Underground Mine (JRF)

#### Existing Environment and Applicant's Proposal

The applicant does not propose to route drainage into any of the portal entries. All disturbed areas drain away from the portals (Figure 3-1).

Water for use in-mine is pumped from Cottonwood Creek to the main sump (Figure 7-9). The primary use of this water in the mine is for dust suppression at the working face.

## Compliance

The importing of water for use in-mine is an operational requirement for safety at the working face. It is apparent that this section of the regulations is not intended to be in conflict with 30 CFR 71.100. It is the regulatory authority's conclusion that UMC 817.55 is not applicable to the importation of water into the mine strictly for operational needs, but, in fact, is to address surface water drainage to be disposed of underground.

Since all surface drainage is routed away from portals, the applicant complies with this section.

## Stipulations

None.

## UMC 817.59 Coal Recovery (PGL)

### Existing Environment and Applicant's Proposal

The BLM's Resource Recovery and Protection Plan was approved May 19, 1986 for Tract 2 (Appendix 8). Mining recovery of the coal in Tract 2 is projected to be greater than 50 percent of the total in-place reserves (MRP, page 3-8).

## Compliance

The applicant projects maximum recovery and conservation of the coal resource. The applicant complies with this section.

## Stipulations

None.

## UMC 817.61-.68 Use of Explosives (PGL)

This section is not applicable because there will be no surface blasting associated with this application.

## UMC 817.71-.74 Disposal of Underground Development Waste and Excess Spoil and Non-Toxic and Non-Acid-Forming Coal Processing (PGL)

### Existing Environment and Applicant's Proposal

The main source of underground development waste material comes from the cutting out of overcasts. The rock from the overcasts is

deposited at strategically-located cross cuts or rooms in the mine workings. It is projected that approximately 1,000 tons of development waste will be "gobbed" underground (MRP, page 3-25).

#### Compliance

The applicant will dispose of development waste underground. The applicant complies with this section.

#### Stipulations

None.

#### UMC 817.88 Coal Processing Waste Banks (PGL)

This section is not applicable because the Trail Mountain Mine sells run-of-mine (ROM) coal. There is no coal processing done at this mine site.

#### UMC 817.89 Disposal of Non-Coal Waste (PGL)

This section is not applicable because the designated disposal area for non-coal wastes for this application was permitted under Tract 1.

#### UMC 817.95 Air Resource Protection (KMM)

Since there is no surface disturbance associated with the Tract 2 revision, there will be no adverse impact on air quality within the Tract 2 area (p. III-23). This section is not applicable.

#### UMC 817.97 Protection of Fish, Wildlife and Related Environmental Values (KMM)

#### Existing Environment and Applicant's Proposal

Wildlife resources of the Tract 2 area are described in Chapter X and Appendix 1. Occurrence of mule deer, elk, cougar, rabbits and hares and other small mammals are noted (p. X-3). Impacts on terrestrial animals are not expected because there is no proposed surface disturbance in the Tract 2 area.

The MRP indicates that subsidence may impact springs and cliff habitat of raptors (p. X-4,5). The applicant has committed to a wildlife education program for mine employees and to maintain the relative inaccessibility of the Tract 2 mine area to protect

wildlife. Hydrologic and subsidence monitoring programs will identify impacts on seeps and springs and areas requiring minor revegetation.

#### Compliance

The applicant has limited the adverse impacts on fish and wildlife by using existing surface facilities to access the Tract 2 coal reserves. Mitigation of impacts to water and vegetation resources is proposed where necessary (Chapter X).

The MRP (Chapter 3) indicates that there are currently (1986 data) no raptor nests on escarpments that will be undermined, that annual monitoring will identify any new nests and that these nests will be reported to the Division.

Since potential for escarpment failure is being limited by first mining only and the applicant has committed to consulting with DWR and USFWS on mitigation of nests, as needed, the applicant is in compliance with this section.

#### Stipulations

None.

#### UMC 817.100 Contemporaneous Reclamation (KMM)

##### Existing Environment and Applicant's Proposal

Since no additional surface disturbance is proposed, reclamation of this area is not applicable except for mitigation of subsidence impacts.

#### Compliance

The applicant has committed to mitigation of subsidence impacts through spot revegetation using revegetation methods approved in the Tract 1 permit (p. X-5).

#### Stipulations

None.

UMC 817.111-.116 Revegetation (KMM)

Existing Environment and Applicant's Proposal

The vegetation resources of the Tract 2 area are described in Chapter IX. Principal communities are Grassland - Shrub, Pinyon-Juniper, Conifer and Aspen. Their distribution within the permit area is illustrated on the vegetation map. Since no surface disturbance (except subsidence) is expected, no significant impact on vegetation is expected and no major mitigation measures or revegetation planned.

Compliance

The applicant has committed to spot revegetation using approved methods where necessary (see UMC 817.100). The applicant is in compliance with this section.

Stipulations

None.

UMC 817.121-.126 Subsidence Control (RVS)

Existing Environment and Applicant's Proposal

The applicant provides information about subsidence in Chapter XII, Appendices 1 through 6 and A. Supplementary subsidence information is given on Figures 12-1 through 12-5.

Mining will occur in the Hiawatha seam. Coal extraction will be accomplished by first mining (room and pillar method) followed by second mining or pillar removal (Figure 3-6, Chapter III, pages 5 and 6). Second mining will not occur beneath areas where the Castlegate Sandstone is absent (Figure 3-6). Overburden thickness ranges from approximately 900 to 2,200 feet (Figure 6-6) and mining will encompass approximately 600 acres in the Tract 2 permit area (Chapter III, page 15). The application utilizes a value of 15 degrees, based on studies conducted in adjacent mining areas (Utah Power and Light Company) and overburden thickness, for the angle-of-draw. In addition, the applicant derives a range (1.61 to 2.28 feet) of values for maximum vertical movement (Chapter XII, page 3) in the Tract 2 permit area. Figure 7-1 shows the projected maximum extent of subsidence at the surface.

The applicant identifies renewable resource lands above areas of proposed mining (Chapter XII, Appendix 1, page 12-11). The applicant concludes, on the basis of mining methods, stratigraphy

and overburden thickness, that surface manifestations of subsidence (tension cracking, catastrophic failure) and impacts to renewable resource lands (springs, livestock grazing) will be minimal (Chapter XII, page 4).

The applicant commits to restoring trails or roads that are materially damaged by subsidence and notifying surface owners that may be affected by subsidence of the mining schedule (Chapter XII, Appendix 1, page 12-12).

The applicant provides a subsidence monitoring plan that describes vertical and horizontal data acquisition by photogrammetric and conventional survey methods (Chapter XII, Appendix 2). Monitoring points are located on Figures 12-1 (conventional monuments) and 12-4 (photogrammetric). Limited data analyses from the 10th West Panel in the Tract 1 permit area indicates maximum vertical movement of one foot between 1984 and 1986 (Chapter XII, Appendix 5).

#### Compliance

The applicant provides information about mining methods and locations, overburden thickness and lithology, vertical movement, renewable resource lands and structures.

Maximum subsidence of up to 2.28 feet is projected for portions of the Tract 2 permit area where three springs occur (T-10, T-14, T-14A). The applicant recognizes a potential for subsidence-induced material damage to springs and thus, a possibility for reduction in value or reasonably foreseeable use of surface lands. Accordingly, the applicant proposes to mitigate spring damage and attendant reduction in land-resource value or use by installing guzzlers (Chapter III, page 18). The applicant also commits to restoring or rehabilitating trails or roads that are damaged by subsidence.

The applicant provides a subsidence monitoring plan that describes survey methods, monument locations, data reduction, notification of surface owners and methods of data presentation. A commitment to submit annual subsidence data has been provided as required by UMC 817.121 (Section 12.4.4, p.5).

The applicant describes mitigation for restoring or rehabilitating surface manifestations of subsidence (tension cracking) and provides plans for compensating surface owners for subsidence-impacted lands that cannot be safely grazed or livestock that are injured or killed as required by 817.124 (Section 12.4.3, p.4).

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.131 Cessation of Operations: Temporary (PGL)

Existing Environment and Applicant's Proposal

The applicant commits to continue all required monitoring if operations at Trail Mountain Mine cease (MRP, page 21).

Compliance

The applicant will notify the Division and continue all required monitoring in the event of temporary cessation. The applicant complies with this section.

Stipulations

None.

UMC 817.132 Cessation of Operations: Permanent (PGL)

Existing Environment and Applicant's Proposal

The applicant will reclaim the surface disturbance at Tract 1, per the approved reclamation plan, Volume 2, Chapter 9. All postmining monitoring will be undertaken for hydrologic and subsidence concerns for Tract 2 (7-15, 12-4 MRP).

Compliance

Trail Mountain Mine will be reclaimed according to an approved reclamation plan. The applicant, therefore, complies with this section.

Stipulations

None.

UMC 817.133 Postmining Land Use (KMM)

Existing Environment and Applicant's Proposal

Current and proposed post-mining land uses are grazing, wildlife habitat and recreation (p. III-16, IV-4). Significant limitations on land use are not anticipated since the only surface disturbance

should be from subsidence. Spot revegetation and replacement of impacted water resources are planned (p. III-18, IV-6) to mitigate any adverse impacts on the land use.

#### Compliance

The MRP discusses existing land uses and proposes no changes for post-mining uses. The MRP also discusses the capability of the land to support other uses (Chapter IV). The applicant is in compliance with this section.

#### Stipulations

None.

1134R/11-24

## CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT

Trail Mountain Coal Company  
Trail Mountain Mine - Tract II  
ACT/015/009, Emery County, Utah

February 24, 1987

### I. INTRODUCTION

The purpose of this report is to provide an addendum to the Cumulative Hydrologic Impact Assessment (CHIA) for the Cottonwood Creek Basin in Emery County, Utah. The assessment encompasses the probable cumulative impacts of all anticipated coal mining in the general area on the hydrologic balance, and whether the operations proposed under the application have been designed to prevent damage to the hydrologic balance outside the proposed mine plan area. This report complies with federal legislation passed under the Surface Mining Control and Reclamation Act (SMCRA) and subsequent Utah and federal regulatory programs under UMC 786.19(c) and 30 CFR 784.14(f), respectively.

Trail Mountain Coal Company intends to mine an additional 641 acres of coal through the Tract 2 permit. No additional surface disturbances will be associated with the Tract 2 operations. The approved surface facilities in the Tract 1 permit area will be utilized for the Tract 2 permit area. This report will focus on the ground-water system underlying Trail Mountain.

Trail Mountain Coal Company's Trail Mountain Mine is located along the eastern margin of the Wasatch Plateau Coal Field, approximately 12 miles west of Orangeville, Utah (Figure 1). The eastern margin of the Wasatch Plateau forms a rugged escarpment that overlooks Castle Valley and the San Rafael Swell to the east. Elevations along the eastern escarpment of the Wasatch Plateau range from approximately 6,500 to over 9,000 feet.

Outcropping rocks of the Wasatch Plateau Coal Field range from Upper Cretaceous to Quaternary in age. The rock record reflects an overall regressive sequence from marine (Mancos Shale) through littoral and lagoonal (Blackhawk Formation) to fluvial (Castlegate Sandstone, Price River Formation, North Horn Formation, and lacstine Flagstaff Formation) depositional environments. Oscillating depositional environments within the overall regressive trend are represented by lithologies within the Blackhawk Formation and the North Horn Formation. The major coal-bearing unit within the Wasatch Plateau Coal Field is the Blackhawk Formation.



Vegetation varies from the sagebrush/grass community type at lower elevations to the Douglas fir/aspen community at higher elevations. Other vegetative communities include mountain brush, pinyon-juniper, pinyon-juniper/sagebrush and riparian. These communities are primarily used for wildlife habitat and livestock grazing.

Cottonwood Creek which flows past the Trail Mountain Mine is a perennial tributary to the San Rafael River. The Cottonwood Creek drainage basin encompasses about 205 square miles of mountainous country in the Wasatch Plateau. About 90 percent of the area is higher than 8,000 feet. The average channel gradient along Cottonwood Creek is about 300 feet per mile. The lower reaches of the tributaries to Cottonwood Creek typically have surface relief between the stream channel and tops of adjacent canyon walls of 2,000 feet or more.

## II. CUMULATIVE IMPACT AREA (CIA)

Figure 2 delineates the CIA for current and projected Trail Mountain Mine operations. The CIA includes Cottonwood Creek, two intermittent and several ephemeral drainages. The CIA encompasses approximately 14,507 acres.

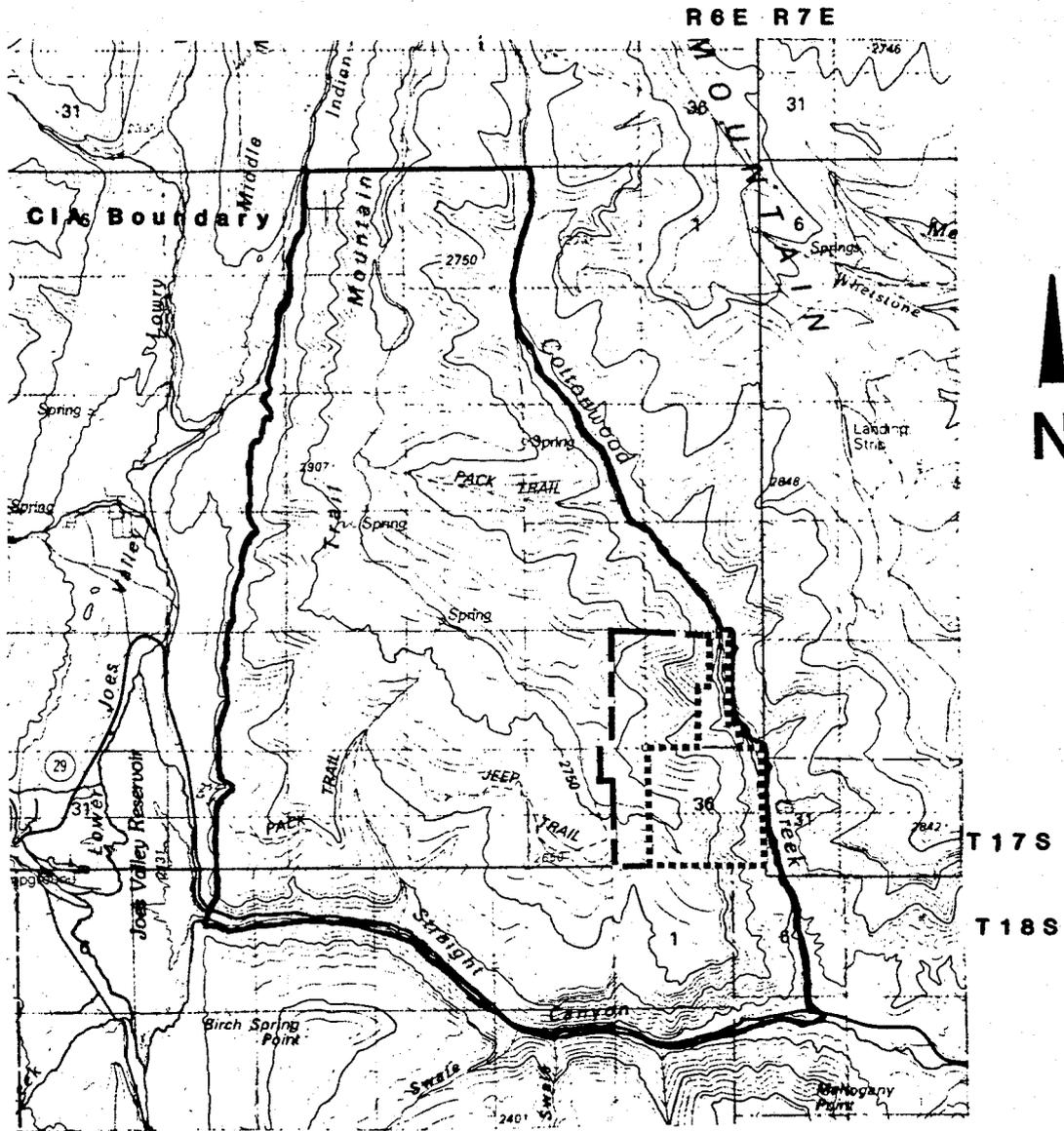
## III. SCOPE OF MINING

Mining on Trail Mountain was initiated around 1898 at the Oliphant Mine and Black Diamond Mine. These mines have been shut down since the late 1940's. Portals were sealed by the Utah Abandoned Mine Reclamation Program in 1983. Both mines are located in Straight Canyon; no further mining is anticipated in this area due to U.S. Forest Service designation of Straight Canyon as a protected area.

Mining at or near the Trail Mountain Mine began in 1898 (Doelling, 1972). Large scale operations started in 1909. Mining continued up to 1967 when the mine was shut down for 10 years (Cottonwood CHIA). The mine was re-opened and is currently owned by Trail Mountain Coal Company.

The Trail Mountain Tract 1 permit area encompasses 773 acres. The Tract 2 permit area encompasses 641 acres. No additional surface disturbance will be associated with the Tract 2 permit. The coal company will utilize the approved surface facilities associated with the Tract 1 permit.

Mining will occur in the Hiawatha seam, as this is the only coal resource of economic interest on Trail Mountain. Production will be from room and pillar methods using continuous mining equipment and



SCALE 1:100 000  
 1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND  
 CONTOUR INTERVAL 50 METERS  
 SUPPLEMENTARY CONTOUR INTERVAL 25 METERS

Tract 1 Permit Area .....

Tract 2 Permit Area ———

Figure 2. Cumulative Impact Area (CIA).

operating two working sections. Pillars will be pulled on retreat with continuous miners. Maximum vertical movement is projected to be 2.68 feet above pillared panels and the maximum lateral extent of subsidence will occur no more than 300 feet outside the Tract 2 permit area.

#### IV. STUDY AREA

##### A. Geology

Lithostratigraphic units outcropping within the study area include, from oldest to youngest, the Mancos Shale, Blackhawk Formation, Castlegate Sandstone, Price River Formation, North Horn Formation, Flagstaff Limestone and Quarternary deposits. Lithologic descriptions and unit thicknesses are given in Figure 3.

Rocks in the study area strike northwest and dip from two to four degrees to the southwest. The Joes Valley Fault occurs along the western boundary of the CIA, where an estimated 2,300 feet of vertical displacement has juxtaposed North Horn Formation (west) against Blackhawk Formation (east). The Straight Canyon Syncline axis trends and plunges southwest across the central portion of the CIA, immediately north and west of the Tract 1 and Tract 2 permit areas (Figure 4).

##### B. Topography and Precipitation

Topography ranges from less than 6,800 feet to over 9,000 feet in the southern and northern portions of the CIA, respectively.

The CIA is characterized by a southerly drainage system of perennial, intermittent and ephemeral streams (Figure 5). The North Fork of Cottonwood Creek is perennial and has headwaters above 9,000 feet. Straight Canyon maintains perennial flow due to Joes Valley Reservoir.

Average annual precipitation ranges from 14 inches to 30 inches in the CIA. The Wasatch Plateau may be classified as semi-arid to sub-humid.

Slopes in the permit and adjacent areas are dominated by the pinyon-juniper vegetative community with the conifer types present on north and west facing slopes at higher elevations. Grassland types are interspersed on knolls and benches of upper slopes and ridgetops. Canyon bottoms are covered by sagebrush vegetation types with riparian vegetation occurring as a narrow band along the streams.

System	Series	Geologic unit	Thickness (feet)	Lithology and water-bearing characteristics
Quaternary	Holocene and Pleistocene	Unconsolidated deposits undifferentiated	0-100	Unconsolidated deposits; clay, silt, sand, gravel, and boulders; yields water to springs that may cease to flow in late summer.
Tertiary	Eocene and Paleocene	Flagstaff Limestone	10-300	Light-gray, dense, cherty, lacustrine limestone with some interbedded thin gray and green-gray shale; light-red or pink calcareous siltstone at base in some places; yields water to many springs. (See table 9.)
	Paleocene	North Horn Formation	800±	Variagated shale and mudstone with interbeds of tan-to-gray sandstone; all of fluvial and lacustrine origin; yields water to springs. (See table 9.)
Cretaceous	Upper Cretaceous	Price River Formation	600-700	Gray-to-brown, fine-to-coarse, and conglomeratic fluvial sandstone with thin beds of gray shale; yields water to springs locally.
		Castlegate Sandstone	150-250	Tan-to-brown fluvial sandstone and conglomerate; forms cliffs in most exposures; yields water to springs locally.
		Blackhawk Formation	600-700	Tan-to-gray discontinuous sandstone and gray carbonaceous shales with coal beds; all of marginal marine and paludal origin; locally scour-and-fill deposits of fluvial sandstone within less permeable sediments; yields water to springs and coal mines, mainly where fractured or jointed.
		Star Point Sandstone	350-450	Light-gray, white, massive, and thin-bedded sandstone, grading downward from a massive cliff-forming unit at the top to thin interbedded sandstone and shale at the base; all of marginal marine and marine origin; yields water to springs and mines where fractured and jointed.
		Masuk Member of the Mancos Shale	600-800	Dark-gray marine shale with thin, discontinuous layers of gray limestone and sandstone; yields water to springs locally.

Figure 3. Stratigraphy of the Trail Mountain Area (From Danielson and Sylla, 1983).

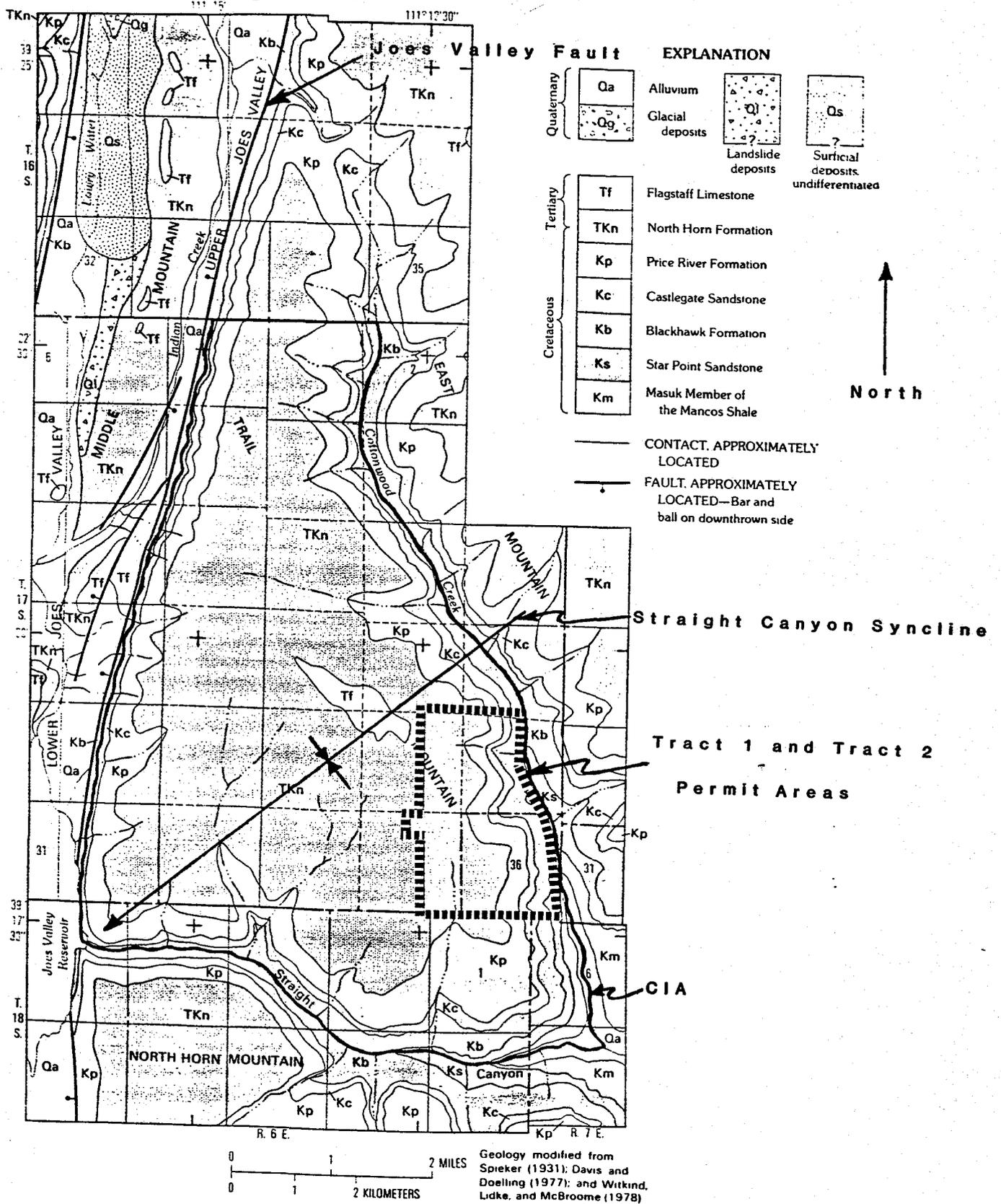
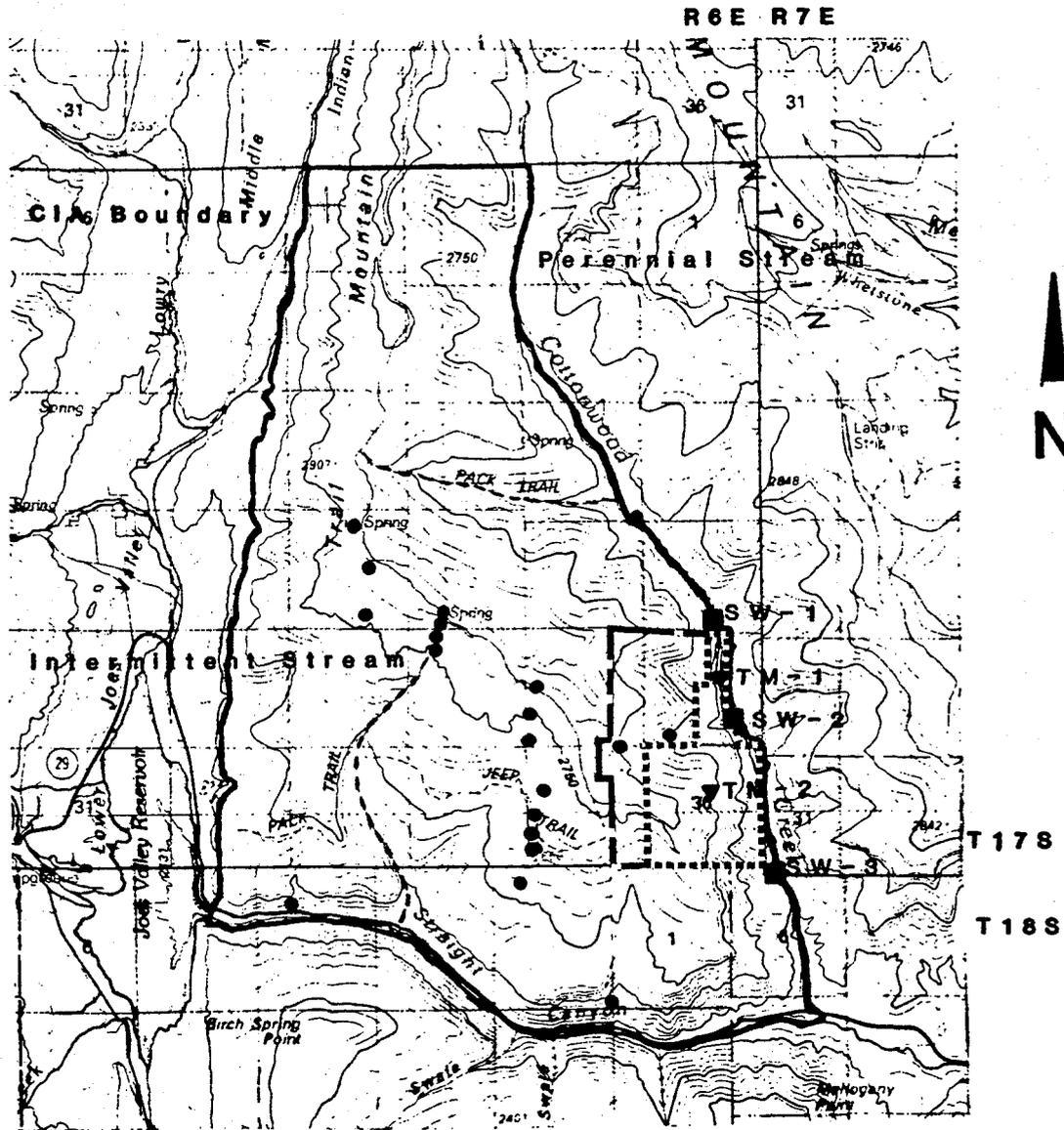


Figure 4. Surficial Geology (Modified from Lines, 1985).



SCALE 1:100 000  
 1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND  
 CONTOUR INTERVAL 50 METERS  
 SUPPLEMENTARY CONTOUR INTERVAL 25 METERS

- ▼ Ground-Water Monitoring Location
- Surface Water Monitoring Location
- Spring
- ..... Tract 1 Permit Area
- - - - Tract 2 Permit Area

Figure 5. Hydrology Map for the CIA.

## V. HYDROLOGIC RESOURCES

### A. Ground Water

The ground water regime within the CIA is dependent upon climatic and geologic parameters that establish systems of recharge, movement and discharge.

Snowmelt at higher elevations provide most of the ground-water recharge, particularly where permeable lithologies or faults/fractures are exposed at the surface. Vertical migration of groundwater occurs through permeable rock units and/or along zones of faulting and fracturing. Lateral migration initiates when groundwater encounters impermeable rocks and continues until either the land surface is intersected (and spring discharge occurs) or other permeable lithologies or zones are encountered that allow further vertical flow.

Ground water is present in all lithostratigraphic units that occur within and adjacent to the permit area. Ground water may occur under localized conditions (Figure 6) that often form a system of perched aquifers and associated springs and/or seeps. The U.S. Geological Survey (USGS) has identified and formally designated the Blackhawk-Star Point aquifer as the only regional ground-water resource in the study area (Danielson, et al 1981 and Lines, 1984).

A total of 6 boreholes have been drilled within the CIA (Figure 3). Two boreholes (TM-1 and TM-2) were completed by Trail Mountain Coal Company within the Tract 1 permit area for the purpose of evaluating ground-water resources. The four remaining boreholes were drilled to the west of the Tract 2 permit area by the U.S. Geological Survey for the purposes of assessing coal (Davis and Doelling, 1977) and ground-water (Lines, 1985) resources.

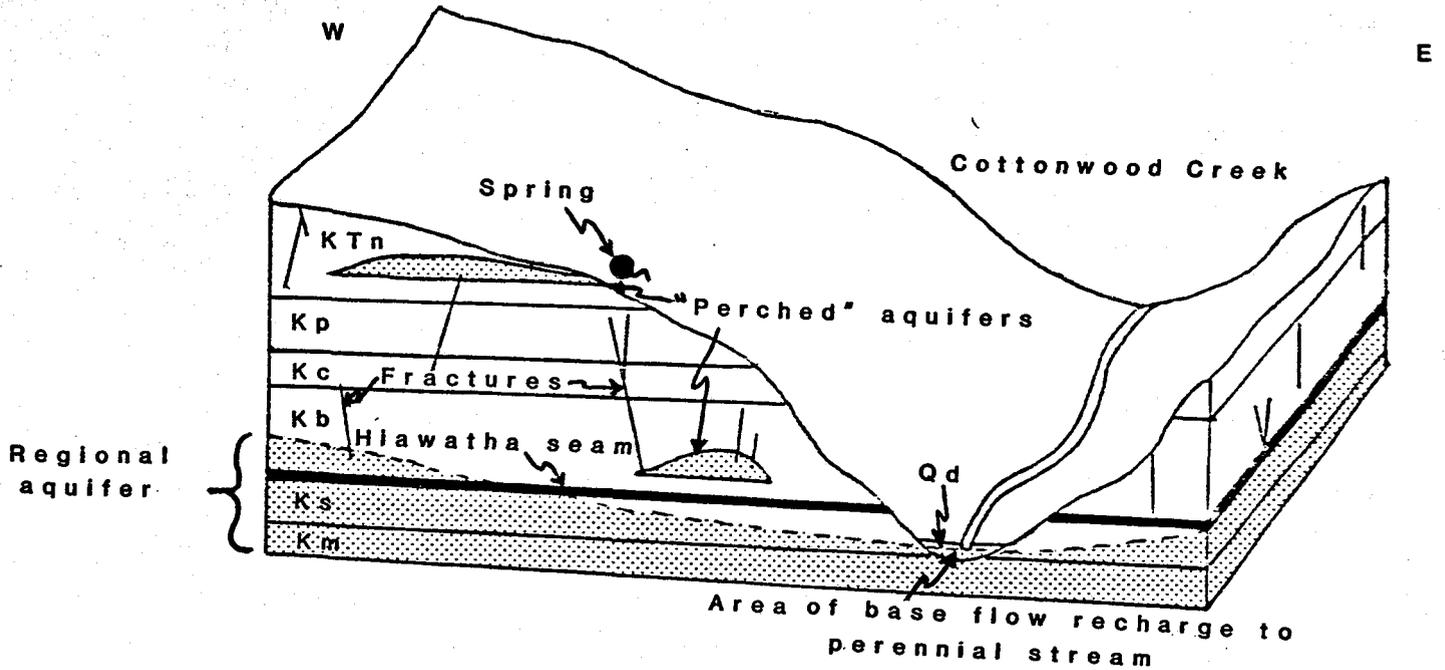
TM-1 (Figure 5) penetrated the Star Point-Blackhawk aquifer as well as the Mancos Shale below the Star Point-Blackhawk aquifer. Figure 7 incorporates water-level data from TM-1, TM-2 and Lines (1985) to derive a potentiometric surface contour map for the Blackhawk-Star Point aquifer. The slope, from 7,700 to 7,100 feet, indicates a north to south direction of regional groundwater flow. The hydraulically flat gradient in the Tract 1 permit area (Figure 7) suggests that the aquifer is being drained by Cottonwood Creek.

Lines (1985) conducted testing on the regional aquifer and the results were simulated in a finite difference three-dimensional computer model. Several responses of the ground-water resource to mine dewatering activities were generated. Lines concluded that mine inflows could be several hundred gallons per minute (gpm). In the Tract 2 Probable Hydrologic Consequences (PHC), using acceptable

**Lithologic Key**

- Qd-Quaternary deposits
- KTn-North Horn Formation
- Kp-Price River Formation
- Kc-Castlegate Sandstone
- Kb-Blackhawk Formation
- Ks-Star Point Sandstone
- Km-Mancos Shale

**A. Before Mining.**



**B. After Mining.**

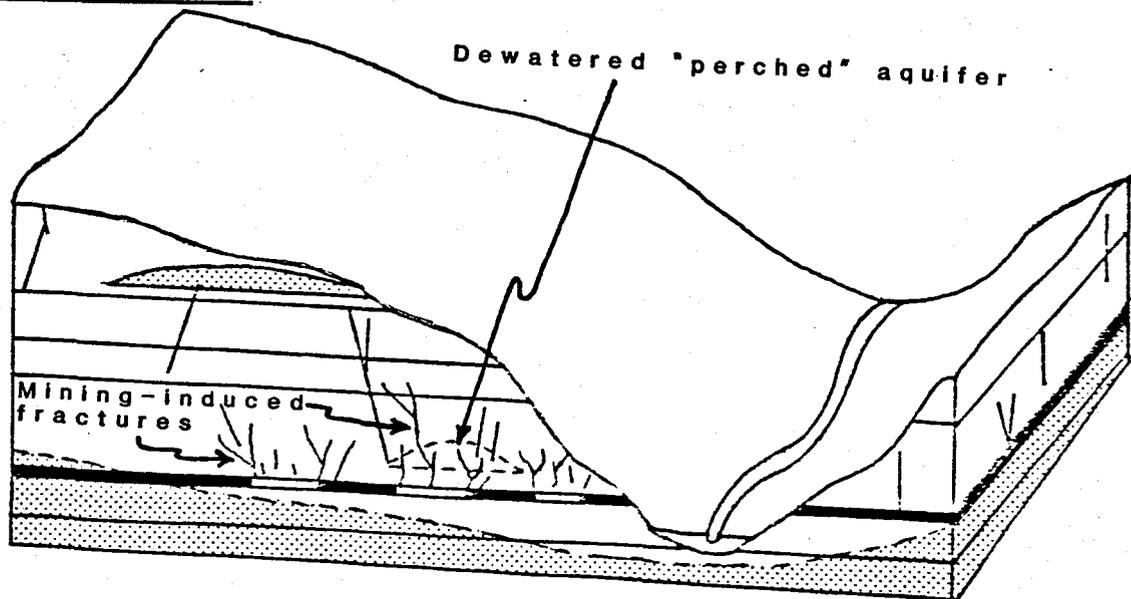
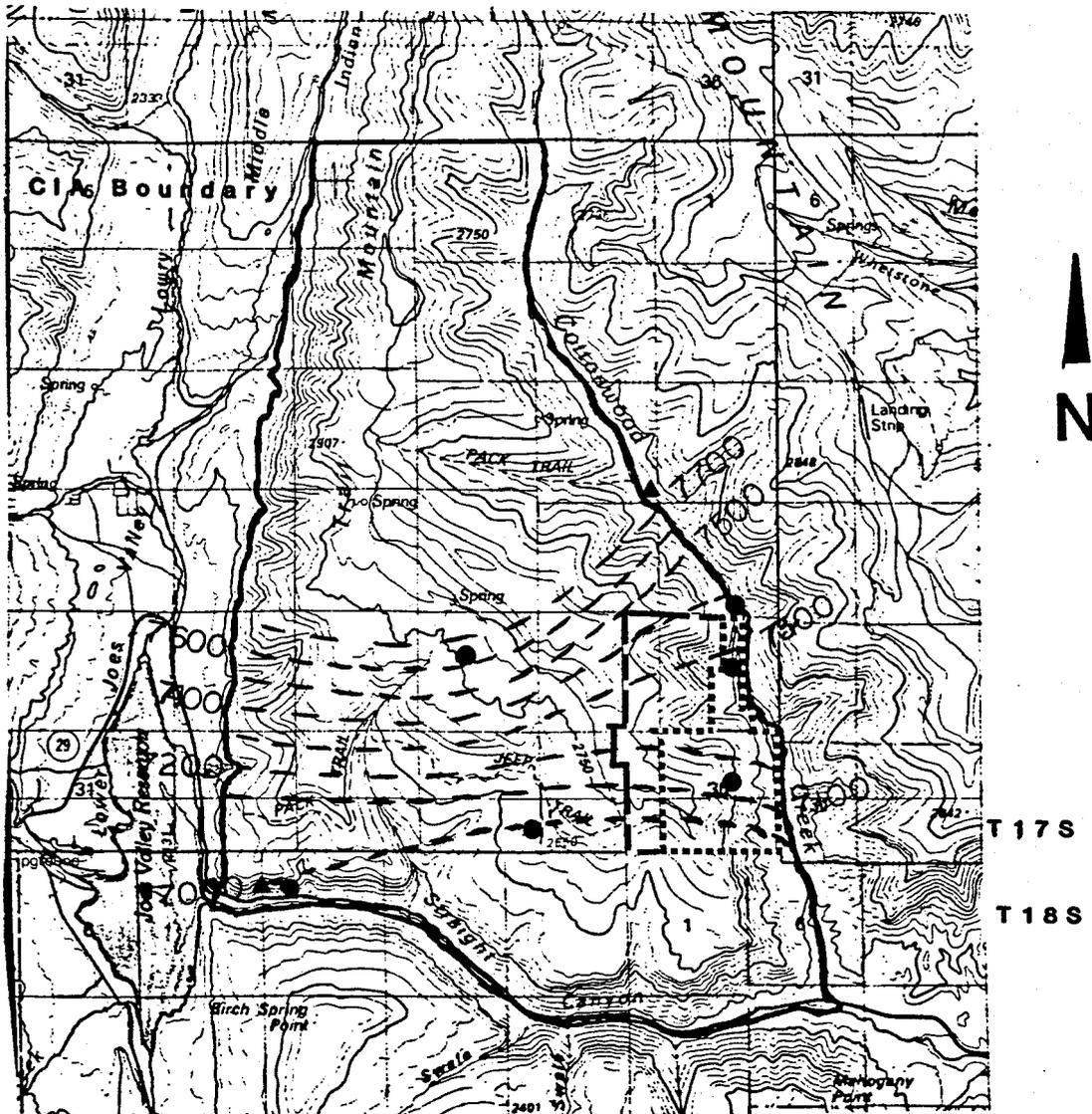


Figure 6. Conceptual Representation of Mining-Induced Impacts to the Ground-Water Regime (Modified from Lines, 1985).

R6E R7E



SCALE 1:100 000

1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND  
CONTOUR INTERVAL 50 METERS  
SUPPLEMENTARY CONTOUR INTERVAL 25 METERS

Tract 1 Permit Area .....

Tract 2 Permit Area - - - - -

● Well-Kb

▲ Spring-Kb

Figure 7. Potentiometric Surface Contour Map for the Blackhawk-Star Point Aquifer (Modified from Lines, 1985).

100 ft. contour interval

methodologies, the applicant stated that mine inflows would range between 70 and 165 gpm. The resulting cone of depression would extend 2 miles to the north and south of the mine, and 5 miles to the east and west of the mine. The majority of mine inflow would be from aquifer storage (Lines, 1985). Several "perched" aquifer systems, or zones, are present in the CIA, most prevalent in the North Horn Formation. Approximately 80 percent of the identified springs in the CIA issue from the North Horn Formation. Water moves vertically through the permeable sandstone lenses of the North Horn Formation until intersecting less permeable shale lenses, whereupon water will begin to move in the horizontal direction and may discharge to the surface as a spring.

"Perched" aquifer zones and the Blackhawk-Star Point aquifer are separated by 1,000 to 1,700 feet of interburden. Lines (1985) noted that although there was a significant amount of interburden between aquifers, hydraulic connection occurs between aquifers. Most of the exchange of water probably occurs along fractures in perching beds where there is unsaturated flow downward (Lines, 1985). This leakage is a significant source of recharge to the Blackhawk-Star Point aquifer.

Hydraulic and lithologic data presented by Lines (1985) demonstrated large variations in porosity and hydraulic conductivity for the Blackhawk-Star Point aquifer. The Blackhawk Formation consists of interfingering lenses of fine grained sandstone, siltstone, and shale, while the Star Point Sandstone is medium-grained sandstone. Hence, the variation in the hydraulic properties of the aquifer.

Lines (1985) reported that snowmelt and rain are the main sources of recharge to the ground-water system underlying Trail Mountain. Danielson (1981) reported that snowmelt was the major source of recharge to the Blackhawk-Star Point aquifer.

The Blackhawk-Star Point aquifer discharges along Cottonwood Creek Canyon. Spring flows account for 18 percent of the normal annual precipitation on the outcrop. Approximately half of the Cottonwood Creek base flow is derived from aquifer discharge from Trail Mountain, and the other half from East Mountain.

The head of Straight Canyon is a major discharge point for the Blackhawk-Star Point aquifer (Lines, 1985). Prior to the construction of Joes Valley Reservoir, several large springs emanated from the Blackhawk-Star Point aquifer in the dam site area. Streamflow measurements taken during periods of base flow along Straight Canyon detected no ground-water discharge except that coming from the head of the canyon and at an abandoned mine in the canyon.

Danielson et al (1981) and Lines (1985) identify 26 springs on Trail Mountain. Of these, 82 percent (21) occur in the North Horn Formation and the remainder occur in the Blackhawk Formation and Star Point Sandstone. Water quality data indicate that springs associated with the North Horn Formation have slightly elevated calcium, magnesium and sodium levels, whereas springs that issue from the regional aquifer have increased sulfate and TDS. Three North Horn Formation springs occur within the Tract 1 and Tract 2 permit areas and projected area of surface subsidence. Total flow for the three springs is less than three gallons per minute.

At present, mine inflow is estimated to be 57 gpm from roof bolts, wall weeps and channel sands in the Tract 1 permit area. This water is produced from the regional aquifer.

#### B. Surface Water

The Trail Mountain Mine is located immediately adjacent to Cottonwood Creek, one of the major tributaries of the San Rafael River. Cottonwood Creek has had an annual flow near Orangeville of 70,700 acre-feet during the period of record that extends intermittently from 1909 through the present (U.S. Geological Survey, 1984). Approximately 50 to 70 percent of streamflow in the mountain streams of the region occurs during May through July (Waddell et al., 1981). Streamflow during this late spring/early summer period is the result of snowmelt runoff.

The quality of water in Cottonwood Creek and other similar streams in the area varies significantly with distance downstream. Waddell et al. (1981) found that concentrations of dissolved solids varied from 125 to 375 milligrams per liter in major streams in the region in reaches above major diversions to 1,600 to 4,025 milligrams per liter in reaches below major irrigation diversions and population centers. The major ions at the upper sites were found to be calcium, magnesium, and bicarbonate, whereas sodium and sulfate became more dominant at the lower sites. They attributed these changes to (1) diversion of water containing low dissolved solids concentrations, (2) subsequent irrigation and return drainage from moderate to highly saline soils, (3) groundwater seepage, and (4) inflow of sewage and pollutants from population centers.

Average annual sediment yields within the Cottonwood Creek drainage basin range from approximately 0.1 acre-feet per square mile in the headwaters area to about 3.0 acre-feet per square mile near the confluence with the San Rafael River (Waddell et al., 1981).

The Tract 2 area is drained entirely by ephemeral and intermittent watersheds. These watersheds are steep (with average slopes often exceeding 50 percent) and well vegetated (with cover also often exceeding 50 percent). Because of the near ridgetop location of the Tract 2 area, channels in the mine plan area are not generally deeply incised.

Surface water-quality data collected from Cottonwood Creek by Trail Mountain Coal Company indicate that the dominant ions in Cottonwood Creek near the mine are calcium, magnesium, and bicarbonate. Total dissolved solids concentrations in the stream vary from about 250 to 470 milligrams per liter in the mine area, with the lower concentrations normally occurring during September through January. Total dissolved solid concentrations were plotted for a period of five years (Figure 8). Data were derived at three stations on Cottonwood Creek, SW-1, SW-2, and SW-3 (Figure 5).

Total dissolved solid concentrations (TDS) show consistent variation during base flow periods. During the runoff months (Mar-Jun) TDS concentrations at the three stations diverge to extreme values (Figure 8).

Total suspended solids concentrations in Cottonwood Creek tend to vary inversely with the flow rate, as expected. Concentrations have varied during the period of record from less than 1 milligram per liter to greater than 1,000 milligrams per liter.

Additional discussions concerning the surface water regime of the Cottonwood Creek drainage basin are contained in the Cottonwood CHIA.

## VI. POTENTIAL HYDROLOGIC IMPACTS

### A. Ground Water

Dewatering and subsidence related to mining have the greatest potential for impacting ground-water resources in the CIA.

Dewatering. Mine inflow is currently estimated to be 57 gpm. Most of the inflow is utilized underground for dust suppression. Trail Mountain Coal Company must divert water from Cottonwood Creek on occasion to meet mining equipment requirements.

Mine inflows are expected to increase as mining progresses downdip to the west. The regional aquifer fully saturates the coal seam (Figure 6) in the Tract 2 permit area and future development of Tract 2 may result in additional inflow of 70 to 165 gpm for a total inflow of 130 to 220 gpm. A mining-induced cone of depression which could develop and extend, from the center of the mine, 2 miles to

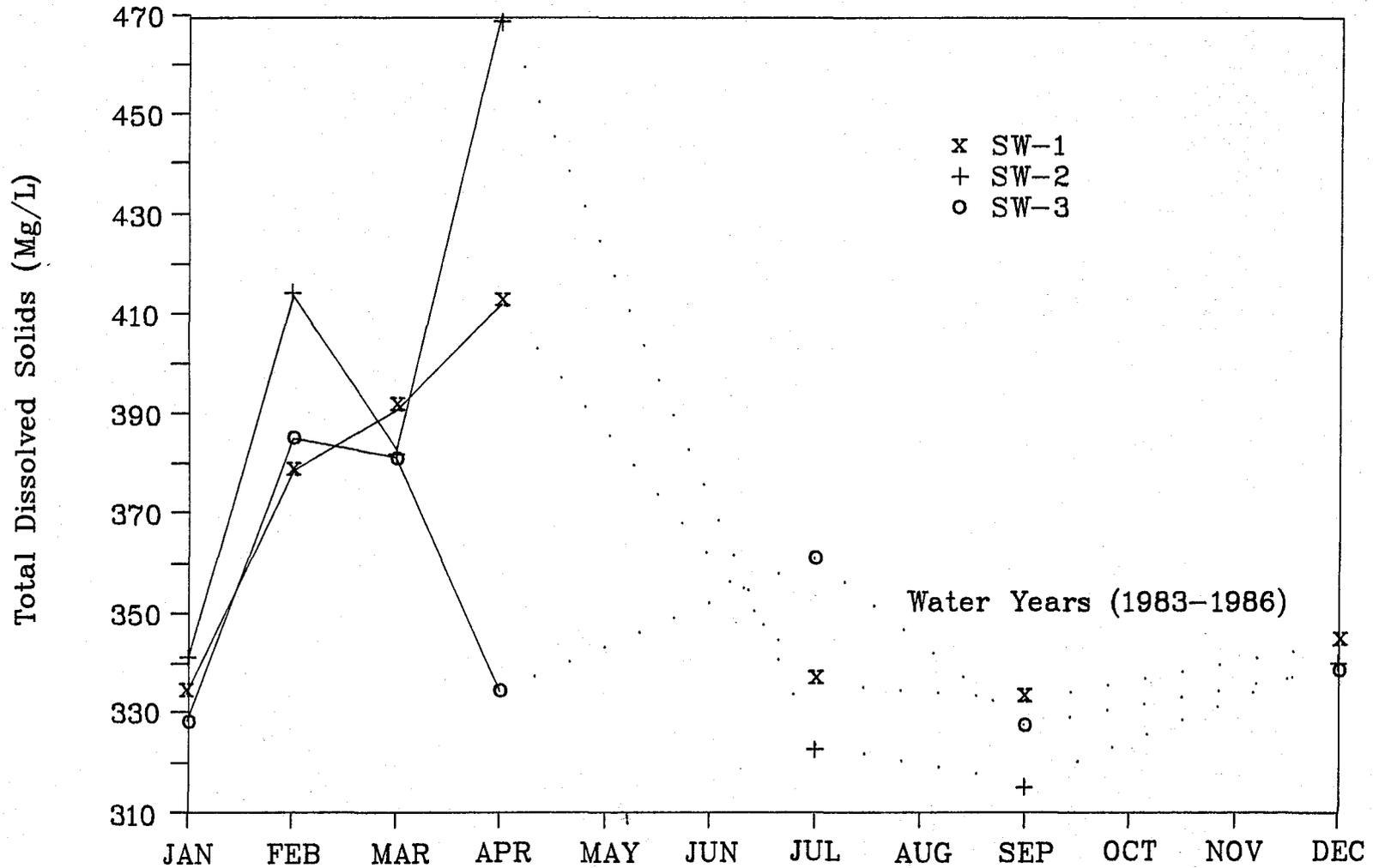


Figure 8. Monthly Mean Values of Total Dissolved Solids from Monitor Stations on Cottonwood Creek. Water Years 1982-1986.

the north and south and 5 miles to the east and west. The drawdown of the potentiometric surface would be most detrimental to the north, south, and west, where the bedrock is saturated.

Upon termination of mining operations, the workings will begin to flood. Total recovery of the intercepted recharge to Cottonwood Creek will begin when the head elevation in the abandoned workings exceeds the water level in the stream adjacent to the Tract 1 permit area. Lines (1985) indicated that most (80 percent) of the mine inflow water would come from storage in the aquifer, whereas 20 percent would be water intercepted from aquifer discharge. Mine inflows would gradually decrease and aquifer discharge would increase as the head in the mine equilibrates. Mine inflows over the equilibrium time would average 0.5 cfs; of this amount Lines estimated that aquifer discharge would be reduced by 0.1 cfs. This would result in an impact of 72 acre-feet of depleted contribution to Cottonwood Creek.

### Subsidence

Subsidence impacts are related to extension and expansion of the existing fracture system and upward propagation of new fractures. Inasmuch as vertical and lateral migration of water appears to be partially controlled by fracture conduits, readjustment or realignment in the conduit system will inevitably produce changes in the configuration of ground-water flow. Potential changes include increased flow rates along fractures that have "opened" and diverting flow along new fractures or permeable lithologies.. Subsurface flow diversions may cause the depletion of water in certain localized or "perched" aquifers, whereas increased flow rates along fractures would reduce ground-water residence time and potentially improve water quality.

Subsidence associated with Tract 1 and Tract 2 development is projected to encompass limited vertical movement and be largely confined to the approved permit areas. Accordingly, the ground-water regime within the CIA is considered to be at low risk to mining-induced subsidence impacts.

### B. Surface Water

Cottonwood Creek. Since the Tract 2 permit area will not require the addition of surface facilities beyond those already utilized in the Tract 1 permit area, Tract 2 operations will not increase sediment loads to Cottonwood Creek. Recent improvements to the surface facilities (paved access road, curb and gutter to sediment pond) should negate impacts to the surface water.

Water is infrequently discharged from Trail Mountain Mine. Water has been discharged from the mine during periods of low mining activity. The NPDES permit for mine water discharge ensures that the effluent meets the applicable standards.

Future development on Trail Mountain would occur along Cottonwood Creek. Straight Canyon is a Forest Service Withdrawal Area which precludes mining from occurring in Straight Canyon. Trail Mountain Coal Company holds the only federal lease on Trail Mountain requiring diligence. Leasing of federal coal could conceivably occur north of the Trail Mountain Mine, impact from future operations would be dewatering of the aquifer system and minimal surface disturbances. The permitting process will require implementation of sediment control measures and impacts to surface water should be minimized.

The operational design implemented at the Trail Mountain Mine is herein determined to be consistent with preventing damage to the hydrologic balance outside the mine plan area.

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