PERMIT CHANGE TRACKING FORM

☐ Significant Permit Revision
☒ Permit Amendment
☐ Incidental Boundary Change

DATE RECEIVED 1-11-96	By: [illegible]	PERMIT NUMBER	ACT/007/035
Title of Proposal: Silt Fence on Permit		PERMIT CHANGE #	96A
Description: boundary North of crushing facility		PERMITTEE	SUNNYSIDE COGENERATION ASSOCIATES
		MINE NAME	SUNNYSIDE REFUSE & SLURRY

	DATE DUE	DATE DONE	RESULT	
☐ 15 DAY INITIAL RESPONSE TO PERMIT CHANGE APPLICATION	1/26/96	1/12/96	☒ ACCEPTED	☐ REJECTED
☐ Notice of Review Status of proposed permit change sent to the Permittee.			COMMENTS	
☐ Responses Received.				
☐ Notice of Affidavit of Publication. (If change is a Significant Revision.)	NA			

REVIEW TRACKING	INITIAL REVIEW		MODIFIED REVIEW		FINAL REVIEW AND FINDINGS	
DOGM REVIEWER	DUE	DONE	DUE	DONE	DUE	DONE
☐ Lead WJM		1/12/96	N/A	N/A		1/12/96
☐ TA (See Attached) Findings Attached		1/12/96				
☐ Reviewers N/A						
☐ Administrative (AVS) N/A						
☐ Biology N/A			N/A	N/A		N/A
☐ Engineering N/A						
☐ Geology N/A						
☐ Soils N/A						
☐ Hydrology N/A						

1/12/96 COORDINATED REVIEWS Phone	SENT	DUE	RECEIVED	SENT	DUE	DONE
☐ OSMRE N/A						
☐ US Forest Service ✓						
☐ Bureau of Land Management ✓						
☐ US Fish and Wildlife Service NA					N/A	N/A
☐ US National Parks Service NA			NA	N/A		
☐ UT Environmental Quality ✓						
☐ UT Water Resources ✓						
☐ UT Water Rights						
☐ UT Wildlife Resources ✓						
☐ UT State History (SHPO) N.A						
☐ State Trust Lands N.A						

☐ Public Notice / Comment / Hearing Complete. (If the permit change is a Significant Revision)	N/A	☒ Permit Change Approval Form signed and approved effective as of this date. ☐ Permit Change Denied.	1/12/96
☐ Copies of permit change marked and ready for MRP. Followup flyer		☐ Notice of ☒ Approval ☐ Denial to Permittee.	1/12/96
☐ Special Conditions/Stipulations written for approval.	N/A	☐ Copy of Approved Permit Change to File.	1/18/96
☐ TA and CHIA modified as required. Findings Included		☐ Copy of Approved Permit Change to Permittee.	1/18/96
☐ Permit Change Approval Form ready for approval.	Yes	☐ Copies to Other Agencies and Price Field Office.	1/18/96

742.300 Diversions

742.310 thru 742.311 General Requirements

All diversions located within the SCA Permit Area, which are shown in Plate 7-6, have been designed to minimize adverse impacts to the hydrologic balance of the permit and adjacent areas, to prevent material damage outside the SCA Permit Area and to assure the safety of the public. No diversions have been designed or are planned to divert water into underground mines. Any underground mining is significantly upstream from the SCA Permit Area.

742.312 thru 742.333 Diversion Design

See Section 732.

742.400 thru 742.423.5 Road Drainage

The roads in the SCA Permit Area are used primarily for refuse hauling and area maintenance. The road drainage control system utilized at the SCA Permit Area was discussed earlier in section 732. The collector ditches for this purpose are shown on Plate 7-6. The drainage system has been designed to safely convey surface runoff away from road surfaces through a network of collector ditches and culverts. The system has been designed to collect all runoff waters thereby protecting downstream water quality and reducing potential for flooding. The fact that the road system does not cross local stream channels helps protect downstream water quality.

Ditches have been designed according to methodology discussed previously. The design is to safely pass a 10-year, 6-hour storm as required for miscellaneous flows. Culvert sizes have been selected to ensure design capacity and structural integrity. The capacity of the road drainage system will be maintained. If the system is ever damaged reducing capacity of a ditch or culvert, repairs will be implemented immediately.

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743 IMPOUNDMENTS

See Section 732.

744 DISCHARGE STRUCTURES

Discharge from sedimentation ponds and impoundments is controlled by riprap channels and other devices where necessary to reduce erosion to prevent deepening or enlargement of stream channels, and to minimize disturbance of the hydrologic balance. Detailed designs of the spillways from each pond are provided in Appendix 7-3. Cross-sections are provided on the plate corresponding to each pond.

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745 DISPOSAL OF EXCESS SPOIL

30 L.F. installed prior to SCA	Below the outlet of the Coarse Refuse Toe Pond.
40 L.F. installed 1993	Outer southwest bank of the Coarse Refuse Toe Pond.
2100 L.F. installed 1994	In the drainages along the toe of the area reclaimed in connection with the final reclamation of the Old Coarse Refuse Road. Silt fences below areas treated with erosion matting will not be maintained. These will be removed when field conditions indicate that they are no longer of significant value.
6 L.F. installed 1995	At the permit boundary crossing the outlet ditch from the Pasture Pond and Coal Pile Sediment Pond
10 L.F. installed 1995	In front of the inlet to the above ground culvert OCRR-C1 which flows to the Old Coarse Refuse Road Sediment Pond

Straw Bales	Location
30 L.F. installed in 1989	Along the Permit boundary northwest of the Clear Water Pond.
15 L.F. installed in 1994	Seep Flow. Along the Permit boundary, Below the railroad culvert. These are left to deteriorate - not to be removed or replaced.
20+/- L.F. proposed in 1995	Seep Flow. Additional straw bales proposed to be installed prior to conducting sediment cleanout behind the existing weirs.

Surface Treatments	Location
Surface Roughening - 1994 Five acres +/-	In connection with the final reclamation of the Old Coarse Refuse Road, the surface was roughened by digging small holes or indentions. This is expected to help control sediment by reducing surface runoff while the vegetation is established.
12,000 S.Y. Straw Matting installed in 1994.	In connection with the final reclamation of the Old Coarse Refuse Road, slopes steeper than 2:1 were treated with straw matting. As the matting degrades, vegetation is expected to increase.

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2/28/96
Act/015/009

PacifiCorp
Trail Mountain Mine

Longwall Mining System

The predominant mining method at the Trail Mountain Mine will be LONGWALL RETREAT MINING. This method, as practiced by PacifiCorp, presents the safest and most efficient underground resource recovery mining method available.

As referenced above, the two-entry gate road system is developed with 20 ft. wide entries and crosscuts on nominal 50 ft. x 100 ft. pillar centers. This type of "yield pillar" configuration is designed so that the gate road support pillars will gradually yield as longwall retreat proceeds from panel to panel. The purpose of this design is to prevent the buildup of unrelieved stresses within the pillar; stresses which, in the past have resulted in pillar failure and the accompanying danger to personnel and property.

Figure 3-5 illustrates the basic configuration of a retreating longwall system. After gate road entries are driven to the extent of the longwall panel length, on both sides of the longwall face, setup and bleeder entries are driven to connect the gate roads. A solid coal barrier is left between the setup and bleeder entries, sized based on geologic parameters, to insure long term bleeder stability.

Long wall face width, depending on geologic parameters of the coal deposit, varies from 500 ft. to 1000 ft. wide. Standard face width is 750 ft., from center-line of headgate entry to center-line setup entry, the longwall begins retreat mining; from the setup entry, "outby" toward the mainline entries. A protection barrier is left between the mined out longwall panel (extraction face) and the mainline entries; sized to insure long term mainline entry stability.

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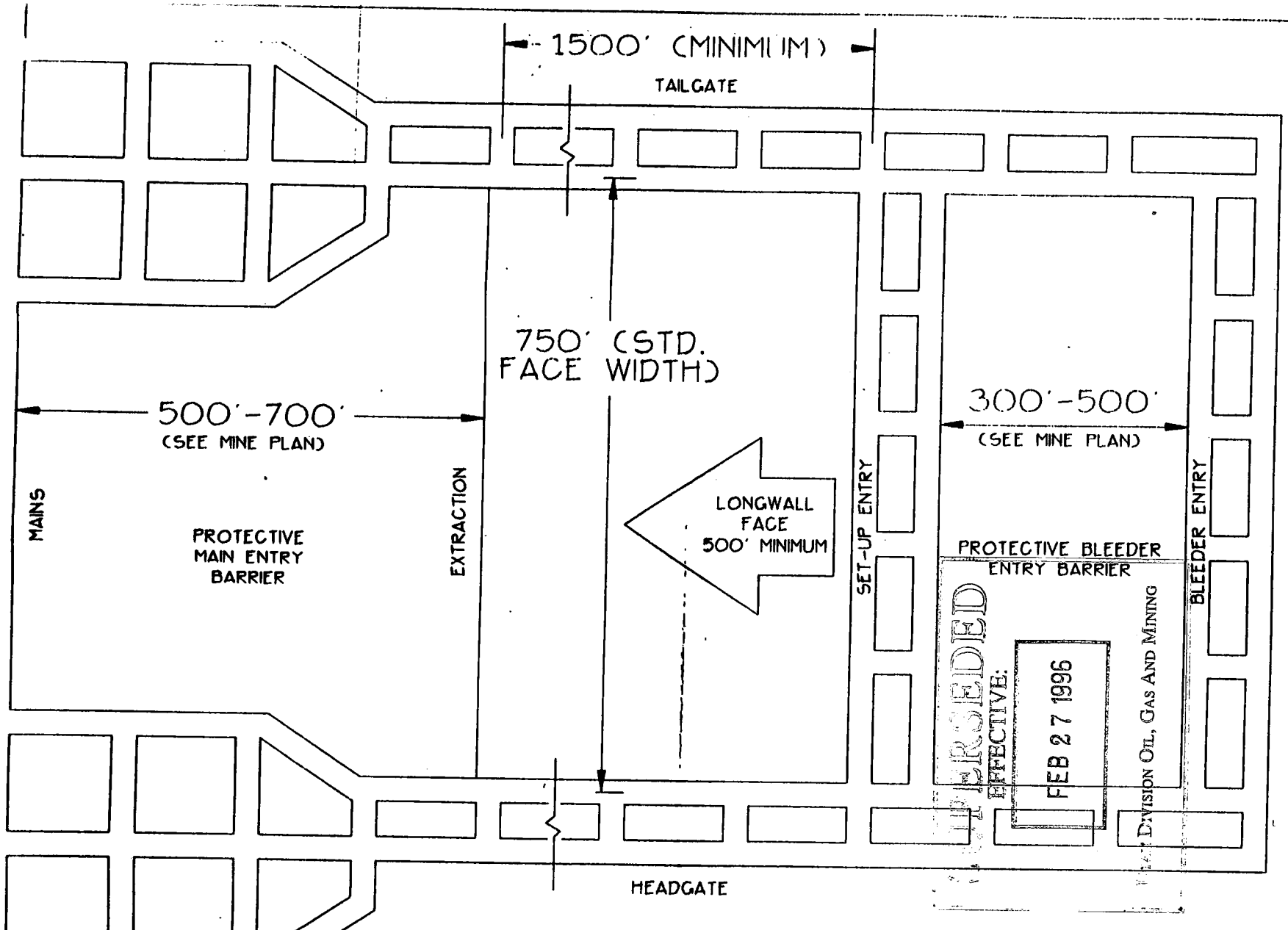

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FIGURE 3-5

TYPICAL LONGWALL PANEL RETREAT AS USED AT THE TRAIL MOUNTAIN MINE

Panels are designed within the mining area, bounded by natural and imposed limits with varying degrees of confidence as to location and extent. Lease boundaries are definitely located and invariable in the short term. Faults may vary somewhat from currently assumed locations. Geologic limitations; such as seam splits, channel scours, spars, stratigraphic thinning, etc. may affect the mining limits by varying hundreds of feet as information becomes available and as mining recovery economics and practicality are further refined. Underground burned areas, from a practical point of view, are indeterminate prior to mining. Regulatory mining restrictions, such as escarpment protection barriers and perennial stream buffer zones further confine the mining extent.

Within the limitation of the above boundaries, longwall panel length and width are maximized to the extent possible due to the economic cost and production loss associated with longwall moves. The minimum panel length, currently considered economical, is 1500 ft. of recoverable reserves. The minimum panel width, currently considered economical, is 500 ft. of recoverable reserve.

3.3.1.4 PROJECTED MINE DEVELOPMENT - MAINS, SUBMAINS, PANELS, ETC.

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The plan of mine development projected for the Trail Mountain Mine is shown in Plate 3-2.

Development of the fifth left mains and third west mains will continue. The panels east of fifth left main will be driven west to east and the panels west off the fifth left mains will be driven east to west. Panel sequence for extraction will be second east to fifth east and thirteenth right to first right.

3.3.1.5 RETREAT MINING

Panel extraction will commence once the fifth left mains are developed below the second east panel and the second east tailgate, headgate are bleeders are completed.

3.3.1.6 ROOF CONTROL, VENTILATION, WATER SYSTEMS, DUST SUPPRESSION, DEWATERING, ELECTRICAL ETC.

Plans for roof control, ventilation, water system, dust suppression, etc., have been submitted to MSHA and are on file at the MSHA district office; Mine Safety and health Administration, P.O. Box 25367, Denver Colorado 80225.

3.3.2 BARRIER PILLARS

PacifiCorp will be leaving barrier pillars around oil and gas wells, surface structures and streams, property boundaries, and outcrops. These barriers will protect the recovery of the resource and the environment. A complete discussion of barrier pillars is presented in Chapter 12, Geotechnical.

3.3.2.1 PROTECTION OF OIL AND GAS WELLS

Presently no oil or gas wells exist on the property. However, should any well be drilled, a barrier of 300 feet in diameter will be left unless a variance from MSHA is obtained to leave a smaller barrier.

3.3.2.2 PROTECTION OF SURFACE STRUCTURES AND STREAMS

No surface structures or perennial stream beds will be undermined during the life of the mine.

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3.3.2.3 PROPERTY BOUNDARIES

Property boundaries are designated in accordance with both State and Federal mining regulations.

3.3.2.4 OUTCROP PROTECTION

Outcrop protection is provided by leaving a minimum barrier of 200' between mine workings and the coal outcrop. One exception to the above is the eastern most entry of the 3-entry system driven north and northeast to the ventilation portal. The eastern entry is located within the 200' barrier for a distance of approximately 240' and at no time comes closer than 160' from the outcrop. The 3-entries were necessary to meet MSHA regulations and provide adequate ventilation. The location of this variance is in the side canyon approximately 1700' south of the forth portal, and is shown on Figure A-3-7-2, Appendix 3-7. Outcrop protection is further addressed in the geotechnical chapter of this permit.

3.3.3 CONSERVATION OF COAL RESOURCES

3.3.3.1 PROJECTED MAXIMUM RECOVERY

Maximum amount of coal recoverable from the Trail Mountain property is approximately 20,167,382 tons. Table 3-1 shows the breakdown of coal recovery. Plate 3-3 shows the areas of coal recovery.

3.3.3.2 JUSTIFICATION OF NON-RECOVERY

It is estimated that resource recovery rate of 80% or better can be obtained within the proposed longwall panels. Overall minable reserve recovery for the Trail Mountain Mine is estimated at 60%.

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The maximum amount of economically recoverable coal will be extracted with the exception of protective coal, which must be left in place to ensure the integrity of the mine. This protective coal falls into two categories. The two categories are barrier coal and strata control coal. (See appendix 12-1).

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3.4.7.3 Air Quality Monitoring Plans

Plans to monitor the air quality in the vicinity of the Trail Mountain Mine have not been considered or incorporated in the mining and reclamation plan. The affect on air quality by the mine will be minimal due to the limited area and the mitigation measures incorporated in the operation.

3.4.8 SUBSIDENCE CONTROL PLAN

The subsidence monitoring requirements were first imposed by the 211 US Geological Survey regulations. Later with the formation of the Office of Surface Mining and the realignment of the USGS responsibilities subsidence monitoring became the authority of OSM. Chapter 12 describes in detail the Applicant's plan to ensure minimal environmental impacts from mine induced subsidence.

3.4.8.1 PROJECTED SUBSIDENCE EFFECTS

Several surveys have been conducted over the area presently controlled by PacifiCorp which may be affected by mining operations. Timber, wildlife, grazing areas, water seeps and springs are the renewable resources occurring within the permit area. There are no oil and gas wells, pipelines, utility structures or high power lines that will be affected by any surface subsidence within the permit boundary. No buildings or dwellings have been constructed on any surface that will be subject to subsidence within the mine plan area. Timber growth and wildlife should not be affected as regional subsidence is anticipated rather than cracking the surface due to the thickness of overburden. Seeps and springs within and adjacent to the mine permit area have been surveyed and are

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No where did monitoring identify subsidence greater than a few tenths of feet. PacifiCorp will use aerial photogrammetric survey methods and annual helicopter reconnaissance flights to monitor subsidence. Baseline photography was conducted August 6, 1993 including color infrared (See Chapter 12 for details on subsidence monitoring.)

3.4.8.4 SLIDES AND OTHER DAMAGE

At any time a slide occurs which may have a potential adverse effect on public property, health, safety or the environment, PacifiCorp shall notify the Division by the fastest available means and comply with remedial measures required by the Division.

3.4.9 WASTE DISPOSAL

PacifiCorp has contracted with local firms to handle and remove all non-coal wastes from the mine site. Non-coal wastes and materials that constitute a potential fire hazard are hauled by a licensed contractor to a state approved waste disposal area.

Waste oil is collected in drums in a designated storage area at the site. A licensed contractor will pick up this material on a regular basis and remove it for recycling purposes.

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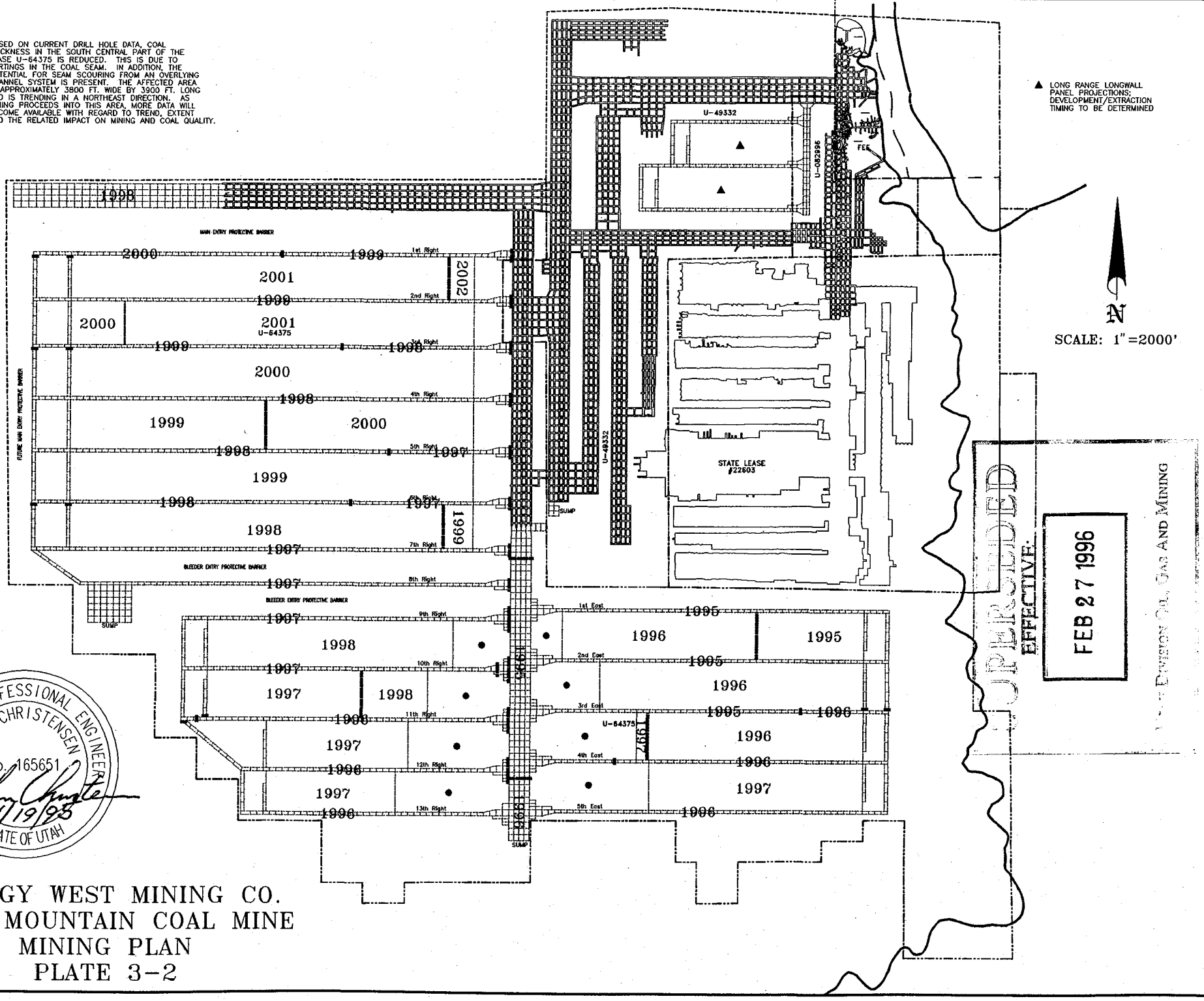
It should be noted that during a spoils survey, it was pointed out that there was no evidence of toxic materials at this mine site (Mr. George Cook, SCS). Prior to reclamation, all spoil material will be re-sampled in a comprehensive random method and retested in accordance to UDOGM guidelines for acid and/or toxic forming potential. Sampling will be conducted per Appendix 9-1, Attachment C.

Sediment pond waste is removed from the site and disposed of in the Cottonwood/Wilberg Waste Rock Site in accordance with the Division's "Sediment Pond

● BASED ON CURRENT DRILL HOLE DATA, COAL THICKNESS IN THE SOUTH CENTRAL PART OF THE LEASE U-64375 IS REDUCED. THIS IS DUE TO PARTINGS IN THE COAL SEAM. IN ADDITION, THE POTENTIAL FOR SEAM SCOURING FROM AN OVERLYING CHANNEL SYSTEM IS PRESENT. THE AFFECTED AREA IS APPROXIMATELY 3800 FT. WIDE BY 3900 FT. LONG AND IS TRENDING IN A NORTHEAST DIRECTION. AS MINING PROCEEDS INTO THIS AREA, MORE DATA WILL BECOME AVAILABLE WITH REGARD TO TREND, EXTENT AND THE RELATED IMPACT ON MINING AND COAL QUALITY.

▲ LONG RANGE LONGWALL PANEL PROJECTIONS; DEVELOPMENT/EXTRACTION TIMING TO BE DETERMINED



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CENSED PROFESSIONAL ENGINEER
JOHN CHRISTENSEN
No. 165651
1/19/95
STATE OF UTAH

ENERGY WEST MINING CO.
TRAIL MOUNTAIN COAL MINE
MINING PLAN
PLATE 3-2

APPENDIX 7-10

PROBABLE HYDROLOGICAL

CONSEQUENCE DETERMINATION (PHC)

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PROBABLE HYDROLOGIC CONSEQUENCES OF MINING AT THE TRAIL MOUNTAIN MINE, EMERY COUNTY, UTAH

Prepared for

TRAIL MOUNTAIN COAL COMPANY
Orangeville, Utah

Prepared by

EARTHFAX ENGINEERING, INC.
Salt Lake City, Utah

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FEB 27 1996
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January 1987

TABLE OF CONTENTS

	Page
1.0 INTRODUCTION	1-1
2.0 GROUNDWATER	2-1
2.1 Probable Impacts	2-1
2.1.1 Background Information	2-1
2.1.2 Potential Dewatering Impacts	2-3
2.1.3 Potential Subsidence Impacts	2-9
2.2 Groundwater Monitoring Plan	2-10
3.0 SURFACE WATER	3-1
3.1 Probable Impacts	3-1
3.1.1 Background Information	3-1
3.1.2 Potential Water-Quality Impacts	3-1
3.1.3 Potential Water-Quantity Impacts	3-1
3.2 Surface-Water Monitoring Plan	3-1
4.0 CONCLUSIONS	4-1
5.0 REFERENCES	5-1

SUPERSEDED
EFFECTIVE:
FEB 27 1996
UTAH DIVISION OIL, GAS AND MINING

LIST OF FIGURES

Figure		Page
2-1	Effect of mine size and premining hydraulic gradient on mine inflow (from Lines, 1985).	2-5
2-2	Effect of mine width on steady-state inflow for a mine length of 9000 feet.	2-6
2-3	Effect of mine size and time on drawdown in the Blackhawk-Satr Point aquifer (from Lines, 1985).	2-8

SUPERSEDED
EFFECTIVE:
FEB 27 1996
UTAH DIVISION OIL, GAS AND MINING

LIST OF TABLES

Table		Page
2-1	Results of laboratory analyses of selected core samples (from Lines, 1985).	2-2

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FEB 27 1996
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PROBABLE HYDROLOGIC CONSEQUENCES OF MINING AT THE TRAIL MOUNTAIN MINE, EMERY COUNTY, UTAH

1.0 INTRODUCTION

Trail Mountain Coal Company recently submitted a Permit Application Package (PAP) to the Utah Division of Oil, Gas & Mining (the Division) to expand their underground mining operations to the west. This expansion area was termed in the PAP as Tract 2.

The purpose of this document is to present an assessment of the probable hydrologic consequences of the Tract 2 mining operation. Where appropriate, the potential cumulative impacts of both the Tract 2 and the existing Tract 1 operations will be addressed, along with impacts from potential future expansions of the Trail Mountain Mine.

This document is divided into five sections, including this introduction. Section 2.0 presents probable groundwater impacts and proposed groundwater monitoring plans. A similar discussion of surface water is provided in Section 3.0. Conclusions and references are listed in Sections 4.0 and 5.0, respectively.

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2.0 GROUNDWATER

2.1 Probable Impacts

2.1.1 Background Information. Information presented in Chapters 6 and 7 of the PAP indicate that groundwater in the mine plan and adjacent areas occurs within the Blackhawk Formation (the coal-bearing formation) and the underlying Star Point Sandstone. These two formations are jointly considered an aquifer in the region (Lines, 1985).

According the Doelling (1972), the Blackhawk Formation consists of interbedded layers of sandstone, siltstone, shale, and coal, all of marine origin. The Star Point Sandstone consists of massive medium- to fine-grained sandstone with minor interbedded layers of shale and siltstone near its base. The Star Point also interfingers locally with the Blackhawk in the vicinity of the mine (Lines, 1985).

Lines (1985) tested core samples of the Blackhawk Formation and the Star Point Sandstone taken from a drill hole located approximately 1.5 miles west of the western Tract 2 boundary. Results of these analyses are presented in Table 2-1. According to these results, the sandstone units within the Blackhawk Formation are five to six orders of magnitude more permeable than the shale and siltstone units. The Star Point Sandstone is one to two times more permeable than the sandstone units of the Blackhawk Formation.

Aquifer tests were conducted by Lines (1985) on selected wells in the vicinity of the Trail Canyon Mine. Due to the low yield of most bedrock in the area, these tests could be performed only as recovery tests following pumping at rates of 5 to 10 gallons per minute for periods less than 5 hours. Nonetheless, the data are useful in determining approximate hydraulic characteristics of bedrock in the mine vicinity.

Based on the transmissivity and thickness data presented by Lines (1985), a hydraulic conductivity of 1.1x10-2 foot per day was calculated for a well completed in the Blackhawk Formation and the Star Point Sandstone in Section 24, T. 17 S., R. 6 E., approximately one-quarter mile north of the Tract 1 permit area. Another test was conducted in a well completed in the Blackhawk-Star Point aquifer in Section 27, T. 17 S., R. 6 E., about 1.5 miles west of the Tract 2 area (the same well from which core was obtained to determine the laboratory hydraulic conductivities provided in Table 2-1). Results of this test indicated a hydraulic conductivity of 1.4x10-2 foot per day. Both of these values compare favorably with the laboratory results reported in Table 2-1.

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Table 2-1. Results of laboratory analyses of selected core samples (from Lines, 1985).

[Determinations by Core Laboratories, Inc., Dallas, Texas]

Lithology: Sh, shale; Slt, siltstone; Ss, sandstone; f, fine grained; m, medium grained.
Hydraulic conductivity: I, impermeable to water even at a pressure of 5,000 pounds per square inch.

Geologic unit	Lithology	Depth below land surface (feet)	Porosity (percent)	Hydraulic conductivity (feet per day)	
				Horizontal	Vertical
Blackhawk Formation	Ss, f	1,521	14	1.5×10^{-2}	3.7×10^{-3}
	Slt	1,545	3	9.3×10^{-8}	1.2×10^{-7}
	Sh	1,786	2	I	I
	Ss, f	1,792	14	1.1×10^{-2}	3.9×10^{-3}
	Sh	2,170	4	1.1×10^{-8}	---
	Slt	2,265	2	2.0×10^{-7}	2.2×10^{-6}
Star Point Sandstone	Ss, m	2,466	17	3.1×10^{-2}	1.1×10^{-2}
	Ss, m	2,493	11	1.5×10^{-2}	6.6×10^{-3}

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Lines (1985) also reported the results of a constant-drawdown and recovery test conducted in a since-abandoned flowing well located in Straight Canyon (Section 4, T. 18 S, R. 6 E.) approximately 2.5 miles east-southeast of the southeast corner of the proposed Tract 2 permit area. This well was located near the center of the Straight Canyon Syncline immediately east of the Joes Valley Fault in an area of suspected fracturing (Lines, 1985). The hydraulic conductivity of the Blackhawk-Star Point aquifer at this location (as determined from the measured transmissivity and the thickness) was calculated to be 1.6x10-1 foot per day, approximately one order of magnitude more permeable than the unfractured Blackhawk-Star Point aquifer as determined from previously mentioned laboratory and field tests. Lines (1985) attributed the relatively high value to fracturing.

No major fractures are known to exist within the mine plan and adjacent areas (see Section 6.4.2) that might increase the permeability of the Blackhawk-Star Point aquifer. Thus, based on the remaining laboratory and field tests, this aquifer is assumed to have a hydraulic conductivity ranging from about 0.01 to 0.03 foot per day.

Data presented in the PAP (as developed initially by Lines, 1985 and modified using local data from the mine area) indicate that the flow of groundwater in the Blackhawk-Star Point aquifer is primarily to the south-southwest toward Straight Canyon. The hydraulic gradient within this aquifer varies in the eastern portion of the permit area from about 0.029 to 0.055 foot per foot, averaging 0.039 foot per foot. In the western portion of the permit area, the hydraulic gradient ranges from about 0.046 to 0.061 foot per foot, averaging 0.048 foot per foot.

2.1.2 Potential Dewatering Impacts. Potential inflows to underground workings at the Trail Canyon Mine were determined from modeling studies conducted by Lines (1985) using a three-dimensional finite-difference model developed by McDonald and Harbaugh (1984). Lines (1985) considered the mine inflow and drawdown estimates determined as a result of these modeling studies to be "more reliable than those that could be made with other more simplified analytical techniques." In light of the fact that rigorous analytical techniques that apply to the local conditions are not available (Freeze and Cherry, 1979), the results of Lines' modeling efforts are considered adequate for inflow and drawdown estimation.

Lines assumed that the Blackhawk-Star Point aquifer could be simulated with three layers (two in the Blackhawk and one in the Star Point) and that the aquifer was isotropic and infinite in areal extent. Drawdown effects were modeled for various mine widths, mine lengths, pre-mining hydraulic gradients, and hydraulic conductivities.

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Figure 2-1 shows the effect of mine size on expected inflow rates as determined by Lines (1985). Results presented in this figure are base on hydraulic conductivities of 0.01 foot per day for the Blackhawk Formation and 0.02 foot per day for the Star Point Sandstone. These values are very similar to the laboratory hydraulic conductivities reported by Lines (1985) for sandstone units within the Blackhawk Formation and for the Star Point Sandstone, respectively. They are also similar to the hydraulic conductivities calculated in Section 2.1.1 for the Blackhawk-Star Point aquifer from transmissivity and thickness data reported by Lines (1985) from local aquifer tests. Thus, the results are considered representative of local conditions.

According to Figure 7-3 of the PAP, the Tract 1 and Tract 2 mine workings will have a maximum length of 9000 feet. Figure 2-2 was prepared from Figure 2-1 using this mine length, showing potential mine inflows for various mine widths and two premining hydraulic gradients.

Comparing Figure 7-3 of the PAP with Figure 7-1 of the PAP and Figure 5 of Lines (1985), the maximum width of the potentially saturated Tract 1 and Tract 2 workings will be 6000 feet. Utilizing a premining hydraulic gradient of 0.041 foot per foot as being most representative of local conditions, Figure 2-2 indicates a potential steady-state inflow of approximately 70 gallons per minute. Using a premining hydraulic gradient of 0.065 foot per foot to represent a worst-case scenario, Figure 2-2 indicates a potential steady-state inflow of about 165 gallons per minute. Inflow rates are likely to be more near the lower end of the range except perhaps in the western portion of the permit area where hydraulic gradients are steeper and heads are greater.

If areas of significant fracturing are encountered in the saturated portion of the mine workings, inflows to the mine would increase. However, as noted previously, no significant fracturing is known to exist in the mine area that would result in increased inflows above the predicted range.

Future mining within the Trail Mountain Mine (beyond Tract 2) could conceivably extend approximately 3000 feet to the west of Tract 2 and 4000 feet south of Tracts 1 and 2. Mining to the south should not significantly increase potential inflows to the mine workings since much of this area is unsaturated (based on a comparison of Figure 7-1 of the PAP with Figure 5 of Lines, 1985). However, mining to the west would continue into the saturated zone, thus increasing potential mine inflows. By extrapolation of the curves in Figure 2-2, increasing the width of the mine from 6000 to 9000 feet should increase inflows by less than 10 gallons per minute under either premining hydraulic gradient condition.

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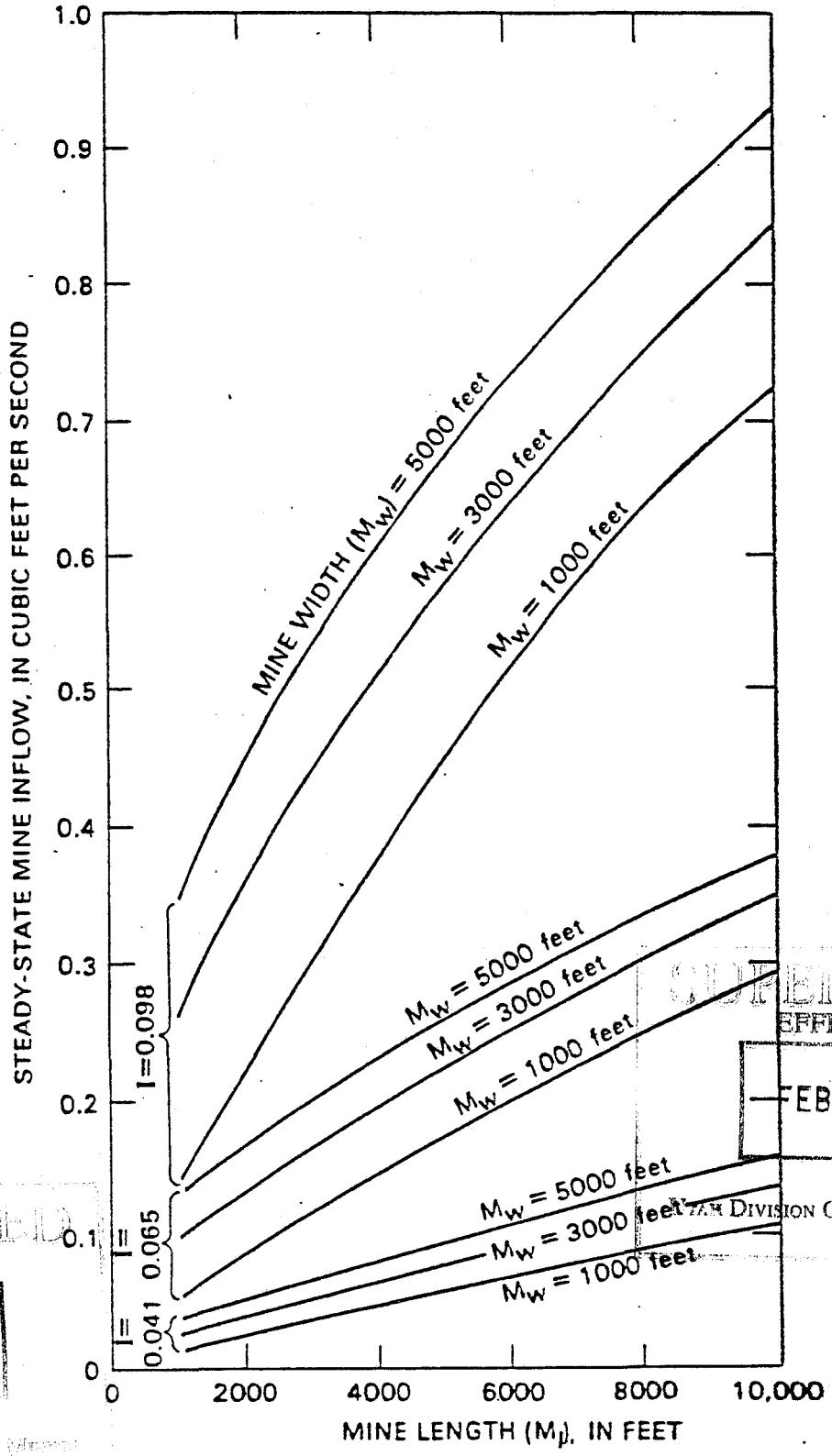

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Figure 2-1. Effect of mine size and premining hydraulic gradient on mine inflow (from Lines, 1985).

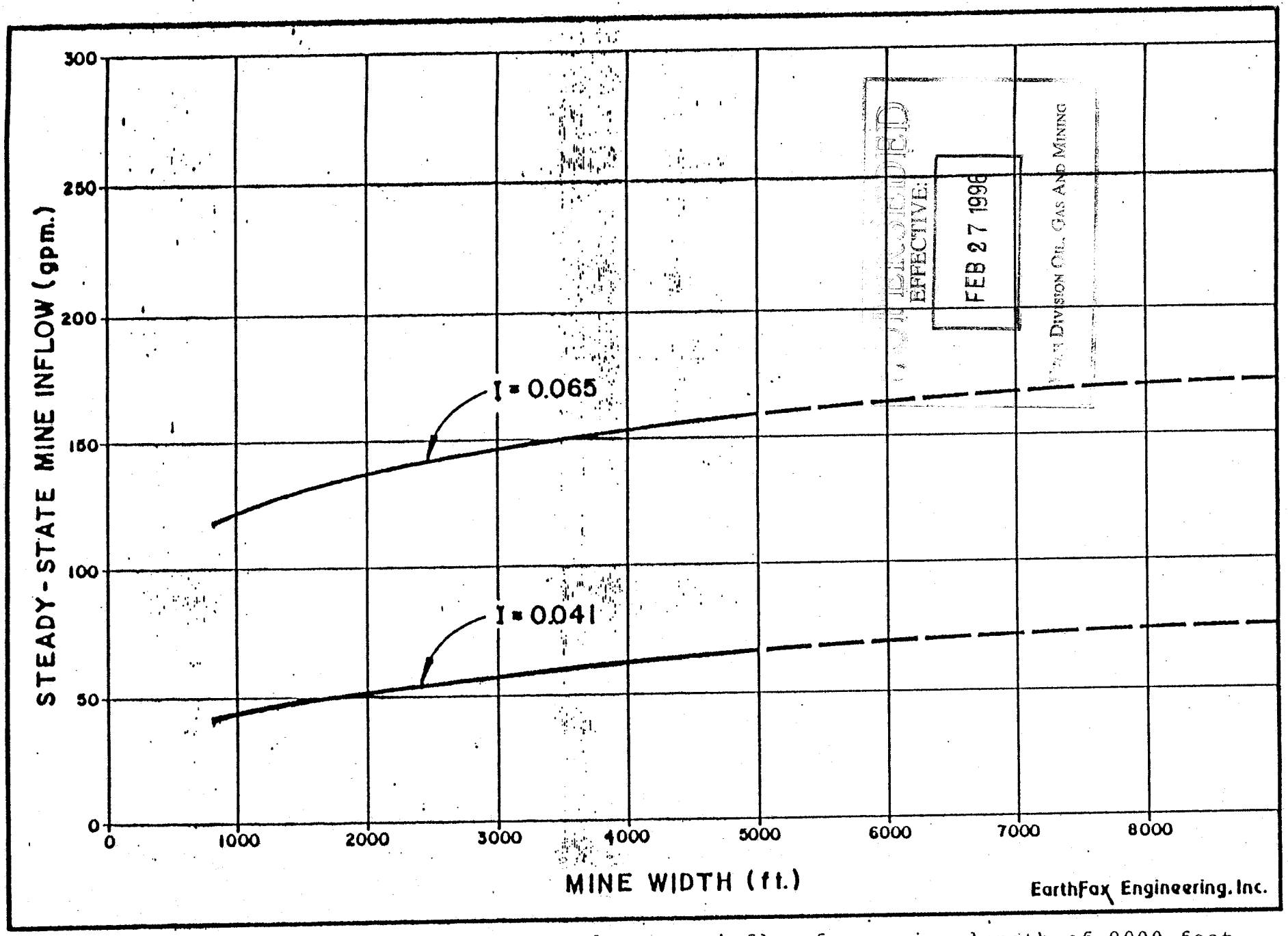

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Figure 2-2. Effect of mine width on steady-state inflow for a mine length of 9000 feet.

As noted in Section 7.1.3.2 of the PAP, in-mine water requirements are projected to amount to approximately 100 gallons per minute. As a result, water that naturally flows into the mine workings will probably all be used underground, except potentially when mine workings are concentrated near the western portion of the permit area. Thus, during most of the mining period, the need for pumping mine water to the surface will be eliminated. Similarly, the use of water that flows into the mine to satisfy underground requirements will preclude the need to pump that quantity of water from Cottonwood Creek (the current source of water for underground use).

Lines (1985) modeled potential drawdown due to mine dewatering for a hypothetical mine with a length of 10,000 feet, a width of 1000 feet, and a premining hydraulic gradient of 0.065 foot per foot. Curves developed from these modeling results are presented in Figure 2-3 for hydraulic conductivities of 0.01 and 0.02 foot per day for the Blackhawk Formation and Star Point Sandstone, respectively. Since the premining hydraulic gradient used to develop these curves is generally greater than the gradient in the mine area, the impacts predicted using these curves will be conservatively high.

Since the Trail Mountain Mine will be wider than 1000 feet, actual drawdowns near the center of the mine will be greater than predicted by Figure 2-3 (due to the law of superposition). However, the curves are reliable in predicting the maximum extent of drawdown effects near the mine (since superposition does not affect the outer limit of the impact). Under a worst-case condition (i.e., all water encountered in the mine is pumped to the surface), data presented in Figure 2-3 indicate that, after 50 years of mining and accompanying dewatering (a probable maximum period of mining), the cone of depression resulting from dewatering can be expected to extend about two miles from the mine in the direction of the mine length (Dy) and five miles from the mine in the direction of the mine width (Dx). These effects will be most notable to the north and west of the mine since the Blackhawk Formation is typically unsaturated to the east and south.

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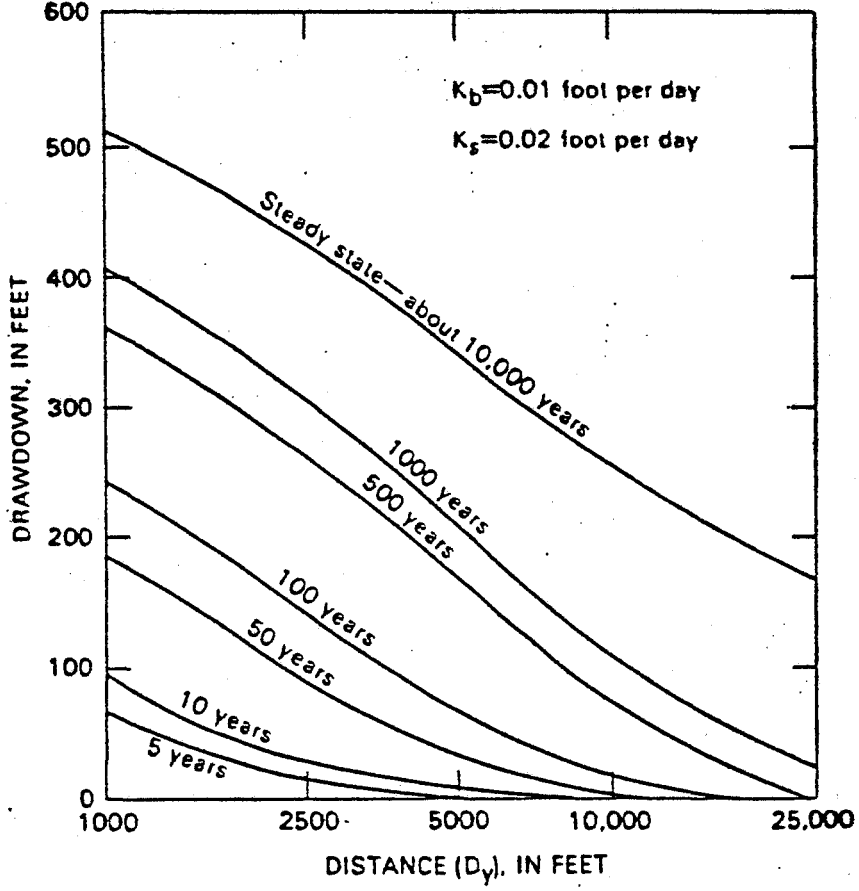
Unless subsidence fractures extend vertically to overlying perched aquifers, inflow to the mine workings will be derived totally from the Blackhawk-Star Point aquifer. According to Lines (1985), only perched groundwater systems exist above the Blackhawk Formation. Thus, springs in overlying formations are not hydraulically connected to the Blackhawk and will not be impacted by mine inflows.

Data presented in Chapter 7 of the PAP (Appendix 7-1) and by Lines (1985) indicate that only three springs issue from the Blackhawk Formation within the zone of potential influence from dewatering. No other seeps or springs issuing from the Blackhawk



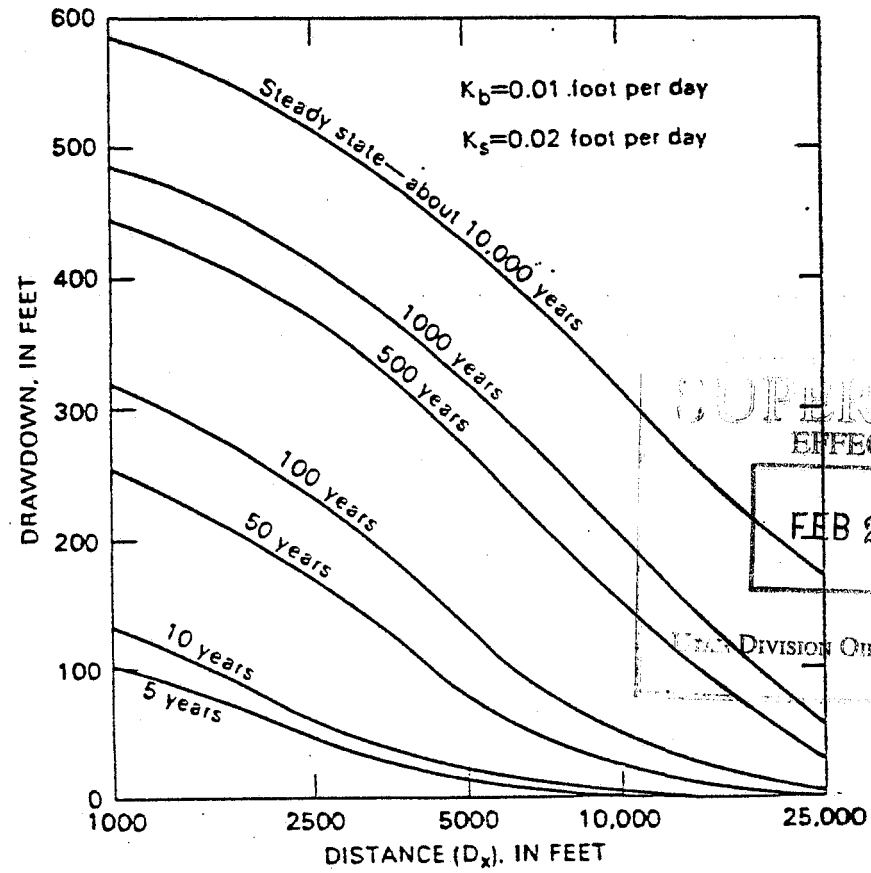


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Figure 2-3. Effect of mine size and time on drawdown in the Blackhawk-Satr Point aquifer (from Lines, 1985).

Formation have been noted in the area adjacent to the mine plan area.

Spring TM-23 (discussed in the PAP) is located immediately adjacent to Cottonwood Creek, with flow from this spring comprising a portion of the baseflow of the stream. Flows from this spring were reported in the PAP as ranging from 4 to 110 gallons per minute during the period of record.

Springs (D-18-6)4bbc-S1 and (D-18-6)5abd-S1 (both discussed by Lines, 1985) issue in the bottom of Straight Canyon, immediately downstream from Joes Valley Reservoir. These springs also contribute to the baseflow of Cottonwood Creek via Straight Canyon. Lines (1985) reported that the flow of the former spring has been less than 2 gallons per minute during the period of observations. The latter spring had measured discharge rates of 180 and 200 gallons per minute during two observations in 1982.

Since other springs in the mine plan and adjacent areas are located above the regional water table, the primary impact from mine dewatering will probably be a decrease in the flow of Cottonwood Creek (diverting water either from one of the indicated springs or from diffuse inflow to Cottonwood Creek and Straight Canyon). Based on an average annual flow of Cottonwood Creek near Orangeville of 70,700 acre-feet (see Section 7.2.2.1 of the PAP), the potential annual flow reduction of Cottonwood Creek (70 to 165 gallons per minute) is approximately 0.2 to 0.4 percent of the average flow (assuming none of the inflowing water is used underground). These flow changes will decrease the amount of water available for downstream irrigation, stockwatering, and wildlife usage.

2.1.3 Potential Subsidence Impacts. The maximum area of potential surface expression of subsidence due to mining in the Tract 1 and Tract 2 areas is presented in Figure 7-3 of the PAP. Only two springs exist within this area. Data presented in Appendix 7-1 of the PAP indicate that spring T-10 issues from the North Horn Formation with a maximum measured flow of 2 gallons per minute. Spring T-14 issues from the Price River Formation with a maximum measured flow of 1.5 gallons per minute. Flows at each spring have been measured only during early autumn, suggesting that flows during the spring and summer period may be higher.

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Subsidence fractures may potentially divert flow from the North Horn and Price River Formations to deeper formations. Such fractures could create a hydraulic connection between the upper perched layers (from which T-10 and T-14 issue) and deeper zones, including the Blackhawk-Star Point aquifer. If this occurred, flow from the perched springs would decrease. Water that is diverted to the Blackhawk-Star Point aquifer may increase inflows to the mine workings beyond that predicted in Section 2.1.2.

If flow from springs T-10 and /or T-14 is decreased as a result of mining, wildlife that currently utilize the springs will be displaced. Displacement would probably be to the west where additional springs exist.

According to data presented by Lines (1985), water quality is similar in all aquifers in the Trail Mountain area. Thus, subsidence should not degrade the quality of ground water. Some improvement of groundwater quality may even occur since flow rates through the bedrock would increase and residence time in the bedrock would decrease. This would decrease dissolution and lower the dissolved concentrations of various constituents below current concentrations.

2.2 Groundwater Monitoring Plan

A ground water monitoring plan has been previously submitted to the Division by Trail Mountain Coal Company. This paln includes monitoring of selected springs, monitoring wells, and an underground drill hole in the permit and adjacent areas. Details of this plan can be found in Section 7.1.7.2 and Appendix 7-1 of the PAP.

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3.0 SURFACE WATER

3.1 Probable Impacts

3.1.1 Background Information. According to Chapter 7 of the PAP, the Trail Mountain Mine is located within the Cottonwood Creek watershed. Cottonwood Creek has had an average annual flow of 70,700 acre-feet, approximately 60 percent of which occurs during the period of May through July as snowmelt runoff. The quality of water in Cottonwood Creek is good near the mine, with total dissolved solids concentrations generally less than 400 milligrams per liter.

The Tract 2 area is drained entirely by ephemeral and intermittent streams. Watersheds tend to be steep and well vegetated.

3.1.2 Potential Water-Quality Impacts. Expansion of the mining operations into Tract 2 will not require the addition of any surface facilities. Existing runoff and sediment-control facilities were designed in accordance with applicable Division regulations and are maintained to minimize sediment concentrations from the surface facilities to Cottonwood Creek. Thus, no increase in impacts will occur to local water quality as a result of the Tract 2 operations.

3.1.3 Potential Water-Quantity Impacts. Water for in-mine use is currently diverted from Cottonwood Creek. As the mine workings expand to the west (into the saturated zone), it is suspected that most water required for underground use will be derived from mine inflows, thus decreasing the need to pump water from the creek.

Under a worst-case scenario, mine inflows would be insufficient to meet underground water requirements. Under this condition, water would be continually diverted from Cottonwood Creek for underground use. As noted in Section 7.1.3.2 of the PAP, expected in-mine water requirements are 100 gallons per minute when the mine is fully developed. Assuming a 250-day work year, this quantity amounts to approximately 110 acre-feet per year. This quantity represents 0.2 percent of the average annual flow of Cottonwood Creek. A reduction in the flow of the stream would decrease the amount of water available for downstream irrigation, stockwatering, and wildlife usage.

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3.2 Surface-Water Monitoring Plan

A surface-water monitoring plan has been previously submitted to the Division by Trail Mountain Coal Company. Details of this plan can be found in Appendix 7-D of the PAP.

4.0 CONCLUSIONS

The following conclusions have been presented in this document in relation to potential hydrologic impacts from mining at the Trail Mountain Mine:

- Inflow of water to the underground workings at the Trail Canyon Mine are expected to range between 70 and 165 gallons per minute. Inflows are predicted to be lowest in the eastern portion of the mine and highest to the west, where hydraulic gradients are steeper and heads are greater. Inflow to the mine workings will be derived primarily from the Blackhawk Formation.

- Expansion of the mine workings 3000 feet west and 4000 feet south of Tract 2 would increase inflows to the mine by less than 10 gallons per minute.

- Most water encountered underground will be used underground during mining.

- The cone of depression resulting from mine dewatering will extend a maximum of two miles north and south of the mine and five miles east and west of the mine. These effects will be most notable to the north and west where the bedrock is saturated.

- The primary potential impact due to a drawdwon of the potentiometric surface near the mine is a decrease in the baseflow of Cottonwood Creek. The maximum potential decrease in the average annual flow of Cottonwood Creek near Orangeville is 0.2 to 0.4 percent.

- Due to the limited number of springs in the immediate vicinity of the mine, subsidence is predicted to have little impact on local spring flow. Springs that are diverted as a result of subsidence will displace wildlife to the west where additional springs exist.

- No adverse impacts to surface or groundwater quality are anticipated as a result of mining at the Trail Mountain Mine.

- If insufficient water is encountered in the mine to meet underground water needs, a maximum of 100 gallons per minute would need to be diverted from Cottonwood Creek for underground use. This quantity represents 0.2 percent of the average annual flow of the stream.

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5.0 REFERENCES

Doelling, H.H. 1972. Central Utah Coal Fields: Sevier-Sanpete, Wasatch Plateau, Book Cliffs, and Emery. Utah Geological and Mineral Survey Monograph Series No. 3. Salt Lake City, Utah.

Freeze, R.A. and J.A. Cherry. 1979. Groundwater. Prentice-Hall, Inc. Englewood Cliffs, New Jersey.

Lines, G.C. 1985. The Ground-Water System and Possible Effects of Underground Coal Mining in the Trail Mountain Area, Central Utah. U.S. Geological Survey Water-Supply Paper 2259. Washington, D.C.

McDonald, M.G. and A.W. Harbaugh. 1984. A Modular Three-Dimensional Finite Difference Ground-Water Flow Model. U.S. Geological Survey Open-File Report 83-875.

SUPERSEDED

FEB 27 1996

UTAH DIVISION OIL, GAS AND MINING

APPLICATION FOR PERMIT CHANGE

Title of Change: SUNNYSIDE COGENERATION ASSOCIATES Permit submittal to add silt fence along the permit boundary north of the crushing facility	Permit Number: ACT/007/035 Mine: Sunnyside Cogen. Assoc. Permittee: Sunnyside Cogen. Assoc.

Description - include reason for change and timing required to implement: Permit submittal to add silt fence along the permit boundary north of the crushing facility

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

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

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

Alane E. Boyd, P.E.
Signed - Name - Position - Date

Subscribed and sworn to before me this 5th day of January 19 96

Marillyn Young
Notary Public

My Commission Expires: 3/8/97

Attest: STATE OF Utah
COUNTY OF Salt Lake

NOTARY PUBLIC
MARILLYN YOUNG
1121 E. 3900 So. #C-100
Salt Lake City, Utah 84124
My Commission Expires
March 8, 1997
STATE OF UTAH

Received by Oil, Gas & Mining

ASSIGNED PERMIT CHANGE NUMBER

Application for Permit Change
Detailed Schedule of Changes to the Permit

Title of Change: SUNNYSIDE COGENERATION ASSOCIATES Permit submittal to add silt fence along the permit boundary north of the crushing facility	Permit Number: ACT/007/035 Mine: Sunnyside Cogen. Assoc. Permittee: Sunnyside Cogen. Assoc.

Provide a detailed listing of all changes to the mining and reclamation plan which will be required as a result of this proposed permit change. Individually list all maps and drawings which are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages or other information as needed to specifically locate, identify and revise the exiting mining and reclamation plan. **Include page, section and drawing numbers as part of the description.**

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
☐ ADD	☑ REPLACE	☐ REMOVE	PERMIT TEXT - Chapter 7 Pages 700-21 and 700-22
☐ ADD	☑ REPLACE	☐ REMOVE	PLATE 7-1A - Pasture and Coal Pile Sediment Ponds Drainage
☐ ADD	☐ REPLACE	☐ REMOVE	
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Any other specific or special instructions required for insertion of this proposal into the Mining and Reclamation Plan?

30 L.F. installed prior to SCA	Below the outlet of the Coarse Refuse Toe Pond.
40 L.F. installed 1993	Outer southwest bank of the Coarse Refuse Toe Pond.
2100 L.F. installed 1994	In the drainages along the toe of the area reclaimed in connection with the final reclamation of the Old Coarse Refuse Road. Silt fences below areas treated with erosion matting will not be maintained. These will be removed when field conditions indicate that they are no longer of significant value.
6 L.F. installed 1995	At the permit boundary crossing the outlet ditch from the Pasture Pond and Coal Pile Sediment Pond
10 L.F. installed 1995	In front of the inlet to the above ground culvert OCRR-C1 which flows to the Old Coarse Refuse Road Sediment Pond
450 L.F. to be installed 1996	Along the permit boundary north and northwest of the crushing facility to assist in reducing the potential for wind transport of fines.

Straw Bales	Location
30 L.F. installed in 1989	Along the Permit boundary northwest of the Clear Water Pond.
15 L.F. installed in 1994	Seep Flow. Along the Permit boundary, Below the railroad culvert. These are left to deteriorate - not to be removed or replaced.
20+/- L.F. proposed in 1995	Seep Flow. Additional straw bales proposed to be installed prior to conducting sediment cleanout behind the existing weirs.

Surface Treatments	Location
Surface Roughening - 1994 Five acres +/-	In connection with the final reclamation of the Old Coarse Refuse Road, the surface was roughened by digging small holes or indentions. This is expected to help control sediment by reducing surface runoff while the vegetation is established.

12,000 S.Y. Straw Matting installed in 1994.	In connection with the final reclamation of the Old Coarse Refuse Road, slopes steeper than 2:1 were treated with straw matting. As the matting degrades, vegetation is expected to increase.

742.300 Diversions

742.310 thru 742.311 General Requirements

All diversions located within the SCA Permit Area, which are shown in Plate 7-6, have been designed to minimize adverse impacts to the hydrologic balance of the permit and adjacent areas, to prevent material damage outside the SCA Permit Area and to assure the safety of the public. No diversions have been designed or are planned to divert water into underground mines. Any underground mining is significantly upstream from the SCA Permit Area.

742.312 thru 742.333 Diversion Design

See Section 732.

742.400 thru 742.423.5 Road Drainage

The roads in the SCA Permit Area are used primarily for refuse hauling and area maintenance. The road drainage control system utilized at the SCA Permit Area was discussed earlier in section 732. The collector ditches for this purpose are shown on Plate 7-6. The drainage system has been designed to safely convey surface runoff away from road surfaces through a network of collector ditches and culverts. The system has been designed to collect all runoff waters thereby protecting downstream water quality and reducing potential for flooding. The fact that the road system does not cross local stream channels helps protect downstream water quality.

Ditches have been designed according to methodology discussed previously. The design is to safely pass a 10-year, 6-hour storm as required for miscellaneous flows. Culvert sizes have been selected to ensure design capacity and structural integrity. The capacity of the road drainage system will be maintained. If the system is ever damaged reducing capacity of a ditch or culvert, repairs will be implemented immediately.

743 IMPOUNDMENTS

See Section 732.

744 DISCHARGE STRUCTURES

Discharge from sedimentation ponds and impoundments is controlled by riprap channels and other devices where necessary to reduce erosion to prevent deepening or enlargement of stream channels, and to minimize disturbance of the hydrologic balance. Detailed designs of the spillways from each pond are provided in Appendix 7-3. Cross-sections are provided on the plate corresponding to each pond.