0012

007/005 #2
cc mike

Canyon Fuel Company, LLC
Skyline Mines
P.O. Box 719
Helper, Utah 84526
(801) 637-7925 Fax: (801) 636-2632

November 10, 1997

Mr. Mike Suflita
Coal Regulatory Program
Utah Division of Oil, Gas and Mining

RE: Slurry System Permit Amendment

Dear Mr. Suflita:

Enclosed is an updated version of the slurry system amendment based on our discussions over the last few weeks. Also attached is a Mayo & Associates summary of the hydrological impacts of the slurry system. Mayo concludes that the water discharged from the slurry system will not adversely impact the hydrological balance of the mine area. Furthermore, tests of the crushed rock and source water used in the slurry system have shown that both media are non-toxic and do not generate acid. Copies of the test results are attached.

Steve Demczak has indicated that the original submittal of the slurry system amendment satisfied the Division's engineering requirements. Therefore, the hydrology review is the last hurdle to clear in successfully permitting the slurry system. Hopefully, Mayo's analysis provides the Division hydrologists with the information needed to meet the November 24, 1997 approval deadline. Also I would appreciate it if you could forward a copy of the permit amendment and the Mayo letter to Mr. Dale Harber (USFS).

Thank you for your assistance, and please call me if you have any questions.

Sincerely,

Dan Ferriter

Attachment

cc: Steve Demczak

Traditionally waste rock at Skyline Mine has been either stowed in underground working areas or hauled to the surface for disposal at a permitted waste rock disposal site. During the Fall of 1996, Skyline formulated plans on how to handle a large sandstone channel that had displaced the upper portion of the coal seam in Mine 2. About 100,000 tons of the sandstone had to be removed to allow mining to continue. Conventional disposal methods were either uneconomical (i.e. hauling to the waste rock site) or not feasible (i.e. stowing in underground working areas). Therefore, Skyline chose an alternative method of disposal which consisted of crushing the rock, mixing it with water, and disposing of the resulting slurry in abandoned mine workings.

A flow diagram for the slurry system is attached (see Slurry System Flow Diagram). The slurry system consists of four main parts: 1) waste rock feed; 2) water supply 3) crushing and mixing; and 4) slurry disposal. Each component of the slurry system is described below.

Waste Rock Feed: The sandstone channel is located in the West Mains of Mine 2. The continuous miner in the West Mains has two conveyor belts. One belt transports coal when the miner is in the lower portion of the seam. The other belt is used to transport waste rock when the sandstone channel is being removed at the top of the seam. The rock belt typically transports 100 tons/hour of rock to the slurry system crusher.

Water Supply: The portal yard sediment pond is the primary water source for the slurry system. Typically about 300,000 gallons per day of water are pumped from Mine 2 to the sediment pond. During storm events, the sediment pond also collects a small amount of surface runoff from the disturbed area around the Skyline facilities. The sediment pond usually contains more than 95% mine water.

The portal yard sediment pond normally discharges on a continuous basis to Eccles Creek. However, when the slurry system is operating approximately 500 gallons per minute of water are pumped from the sediment pond preventing any discharges to the creek.

Crushing and Mixing: A schematic of the slurry system crushing and mixing components is attached (see Slurry System Profile). Waste rock is initially dumped onto a feeder breaker which reduces the rock to a nominal 6 inches. Once the waste rock has passed through the feeder breaker it is conveyed to an impact crusher. The crusher reduces the waste rock to minus 1 inch. The crushed rock is then dumped into a rock hopper where it is mixed with water producing a slurry which is 30-40% solids by weight.

Slurry Disposal: The slurry is pumped from the crusher to a sealed-off area in Mine 3. (See the attached Slurry Pipe Line Layout diagram.) The 4% grade at this location allows the slurry to drain down dip from the seals.

The slurry system is anticipated to process approximately 100,000 tons of waste rock and use about 45 million gallons of water over an expected 10 month period. The slurry system does not operate continuously and is routinely inactive during the weekends. If the slurry system is successful, it may be used in other applications in the future. In the event that the slurry system is significantly modified or used in a new application, DOGM will be notified.

The preceding information is intended to provide a general understanding of the slurry system. The following information will specifically address each regulation that was cited in the Notice of Violation for the slurry system.

536.520 Underground Disposal

The waste rock disposed from the slurry system is very unlikely to have an adverse impact on groundwater for the following reasons. Groundwater currently flows through the in-place sandstone channel without any adverse impacts; in fact, sandstone channels are a significant source of water discharged from the mine. An analysis of the crushed waste rock verifies that grinding does not cause the material to become toxic or acid-generating. A copy of the analysis is attached and shows that the waste rock is primarily sand (77%) and is alkaline with an acid base potential of about 80 tons of limestone equivalent per 1000 tons of rock. A proposed monitoring program for the waste rock is also attached. The purpose of the monitoring program is to track the quality of the material disposed by the slurry system.

The practice of backfilling the abandoned workings with slurry will not impact the current operations since the slurry discharges into abandoned workings which are located down dip from the current operations. The slurry backfill will enhance ground stability and in turn reduce potential surface subsidence effects. Backfilling underground mines to increase ground stability is a common industry practice in Europe and in the hardrock industry. It is also used to dispose of fine coal waste from preparation plants.

As described previously, the portal yard sediment pond serves as the water source for the slurry system. Although the sediment pond captures small amounts of surface runoff, the vast majority of the water in the pond is from dewatering Mine 2. Once the slurry has discharged into the underground workings, it will pool in the abandoned mine workings. There the solids will settle to the lowest point and the clarified water will rise to the top, analogous to what occurs in a sediment pond. The abandoned workings in Mine 3 have more than ample capacity to hold the 45 million gallons of water and 100,000 tons of rock currently planned to exit the slurry system.

Water pooled in the abandoned workings will eventually infiltrate into the underlying strata and enter the groundwater regime. However, due to the very slow rate of groundwater movement in the underlying aquifer, water decanted from the slurry operation will not reach the surface for thousands of years. A more detailed explanation of the hydrological impacts of the slurry system are discussed below in Section 731.511.1.

Additional groundwater monitoring wells are not planned for the slurry system since the current groundwater monitoring plan and the current Probable Hydrological Consequences (PHC) remain valid. The slurry discharges into abandoned mine workings that are already naturally filling up with water. According to the PHC, all of the underground workings will fill with water when mining ceases. The PHC concludes that the likely impact of the eventual flooding of the underground workings is a higher recharge rate due to the increased porosity of the mine workings versus the pre-mining in-place rock. The slurry system does not alter the conclusions reached in the PHC.

513.300 Underground Development Waste Disposal
The information provided above addresses this provision.

731.511 - 731.520 Discharges

731.511.1 Minimize Disturbance to the Hydrologic Balance
It is unlikely that the slurry system will have any significant impact on the hydrologic balance for the following reasons:

1. The slurry system returns water to its point of origin. In other words, the slurry system returns mine water to the mine and limits the prior practice of discharging to Eccles Creek. Returning the mine water underground keeps the mine water in the groundwater regime instead of artificially and prematurely entering the surface water regime.

2. The mine water is several thousands of years older than the surrounding surface water. The reason for the age disparity is due to the very low hydraulic conductivity of the local aquifer and the subsequent slow rate of groundwater movement. According to the Skyline Probable Hydrological Consequence (PHC), mine water encountered today will not reach the surface for several thousands of years.

3. The long term effect of flooding the entire mine with water at the cessation of mining has been analyzed in the PHC. The PHC states that that the flooded workings pose no significant hydrology impact; and, in fact, the PHC indicates that they may be slightly higher recharge rates since the old workings will effectively increase the porosity of the aquifer.

731.511.2 - Not Violate Water Quality Standards or Effluent Limitations - Skyline has proposed a monitoring program for the slurry system supply water. The monitoring program mimics the current UPDES permit limitations for Skyline except that TSS will not be monitored.

731.511.3 - Do Not Exceed pH and TSS Limitations Unless Approved by the Division - The slurry system will use approximately 500 gpm of water. The quality of the water will be determined by the monitoring program which is attached. Skyline is specifically asking to not monitor for TSS since the water in the pond may not meet the design retention time when it is utilized in the slurry system. Moreover, Skyline feels that a TSS measurement is inappropriate since the water will be used to produce a 30-40% solids slurry, and in essence will be discharging to an underground sediment pond.

731.511.4 Meet with the Approval of MSHA - Skyline requested MSHA approval for the slurry system in January 1997. MSHA responded that the project did not require specific approval; however, MSHA stated that the project was adequate and addressed all the specific safety concerns that they had. Skyline submitted a second letter to MSHA regarding the slurry system in September, 1997. The follow-up letter described the source and quantity of water used in the slurry system. MSHA once again stated that their concerns regarding the slurry system had been had been addressed in their January response. They also recommended that DOGM contact them if there are any concerns regarding the potential safety hazards associated with the slurry system. All of the written correspondence between MSHA and Skyline regarding the slurry system is attached.

731.512 Limit the Type of Discharges - Discharges from the slurry system are limited to water and underground mine development waste.

731.513 - Water from Underground Workings .... may be Diverted to other Underground Workings According to the Requirements of R645-3010731.100 through R645-301-731.522 and R645-301-731.800. -
This provision requires addressing the following issues:

- hydrologic-balance protection;
- water monitoring;
- acid- and toxic-forming materials;
- transfer of wells;
- discharges; and
- water rights and replacement.

These issues have already been addressed with the exception of transferring water wells and water rights and replacement. Transferring wells does not apply to the slurry system. Water rights also do not apply since the water used in the slurry system is unclaimed water that has not been allocated to a downstream user.

731.520 Gravity Discharges- The slurry system will not result in any type of gravity discharge from the mine.

300.142 & 143 Follow Approved Permit- Approval of this amendment will allow the operator to satisfy these requirements.

Mayo and Associates, LC
Consultants in Hydrogeology

710 East 100 North • Lindon UT 84042 • (801) 796-0211 • (801) 785-2387 (Fax)

November 5, 1997

Mr. Dan Ferriter
Utah Fuel Company
Skyline Mines
P.O. Box 719
Helper, Utah 84

Re: Evaluation of the potential impacts from slurry disposal into abandoned working in Mine 3 to the hydrologic balance

Dear Dan,

This letter report is a supplement to the document *Investigation of Surface and Groundwater Systems in the Vicinity of the Skyline Mines, Carbon, Emery, and Sanpete Counties, Utah: Probable Hydrologic Consequences of Coal Mining at the Skyline Mines and Recommendations for Surface and Groundwater Monitoring* (PHC), prepared by Mayo and Associates, LC, 3 September 1996.

The purpose of this supplement is to document our findings regarding the potential impacts of the proposed slurry disposal into closed workings of Mine 3 to the hydrologic balance in the vicinity of Skyline Mines.

It is our understanding that sandstone waste rock derived from development work in the West Mains will be crushed underground and mixed with approximately 500 gpm of water pumped from the surface settling pond. This slurry of crushed rock and water will be pumped into the 7 Right Tailgate area of Mine 3. This portion of Mine 3 is closed.

Based on our analysis of the data we conclude that the proposed disposal of slurry in Mine 3 will not adversely impact the hydrologic balance of the mine area. This conclusion is based on two lines of evidence: 1) an extrapolation of our findings and conclusions in the PHC regarding the character of groundwater systems and 2) the combined influence of topographic and geologic factors.

The two lines of evidence are summarized as follows and are discussed below:

1) First, the nature of the groundwater systems encountered by mine workings does not facilitate the rapid movement of groundwater, either vertically or horizontally. The

mass transfer of groundwater over significant distances is impeded because of the low permeability of the rocks and the lenticular, discontinuous nature of permeable horizons

2) Second, the predicted maximum elevation of the impounded water (7660 feet) is significantly below that of the surrounding ground surface for a radius of at least 3 miles, and the dip of the bedrock is away from the only surface elevation in the vicinity that is below 7660 feet.

Character of Groundwater Systems

Most of the water encountered historically in the mine workings comes from sandstone paleochannels which overly the coal seams. In the PHC Mayo and Associates (1996) demonstrated that the water in these channels is very old. Carbon-14 dating results indicate mean groundwater residence times between 2,500 and 18,500 years. These groundwaters are not part of active groundwater flow regimes. The Blackhawk Formation, which surrounds the mine workings, consists of interbedded sandstones and shales that are lenticular in nature and are discontinuous. Because individual sandstone layers are discontinuous and encased in relatively impermeable shales, groundwater within these sandstones is not able to move laterally over significant distances.

Mayo and Associates (1996) also demonstrated that groundwater encountered in the mines is not in hydraulic communication with shallow, near-surface groundwater systems or with surface waters. This conclusion is based on several factors including:

1) groundwater discharge into the mine does not respond to seasonal variations in precipitation as do spring discharges at the surface,

2) the ^{3}H (tritium) concentrations of groundwaters within the mine, which indicate whether groundwater has recharged in the last 50 years, are essentially zero. Creek water and groundwater discharging from springs at the surface (not related to the Pleasant Valley Fault) have ^{3}H concentrations greater than 10.

The relationship between flooded and non-flooded mine workings in Mine 3 also suggests that water from flooded mine workings do not migrate down dip. Closed workings adjacent to the 7 Right Tailgate area have impounded water to an elevation of 7940 feet. Only 200 feet of unmined coal separate this impounded water from the open and downdip workings to the west. No signs of impounded water leaking through the barrier and downdip into the mine openings has been observed.

The data and analysis presented above indicate that water impounded in mine workings will not migrate to discharge points at the surface.

Topography

In addition to the data and analysis presented above, the topographic relationship between the proposed impoundment of the slurry and surface elevations show that water from the slurry cannot discharge to the surface.

Based on the projected volume of groundwater inflow under natural conditions (without the addition of the slurry), Skyline Mines personnel calculated the predicted elevation of the water body in the 7 Right Tailgate area of Mine 3. These calculations are based on the water inflows into the old North Mains area which lies directly east of the new area. As in other areas of the mine, the water flowing into the North Mains area came primarily from overlying sandstone channels. As mining progressed it was necessary to pump water from the area to prevent it from flooding. After mining in the North Mains area ceased, groundwater inflow continued to flood the old workings. After some time, the groundwater inflow into the area ceased and the water level of the impounded body of water stabilized at 7940 feet. Assuming that the geometry of the sandstone channels above the northwestern region of Mine 3 is similar to that in the adjacent North Mains area, it is possible to calculate a predicted stable water level. Using these methods a predicted water level of 7550 feet was calculated, making corrections for the relative size differences of the two areas. When an additional 45 million gallons of water from the rock-slurry system is added to the calculation, a stable level of 7660 feet is determined.

Using a USGS digital elevation model (DEM) and computer rendering software, we found that there are no surface locations within approximately 4 miles of the 7 Right Tailgate area of Mine 3 which are topographically below the predicted water level in Mine 3. In the western, down-dip direction, the distance to ground which lies below 7660 feet is considerably greater. The closest area where the ground surface is at or below 7660 feet is located in Pleasant Valley near the town of Scofield, which is approximately 4 miles away and stratigraphically up-dip of Mine 3.

Using 1:24,000 topographic maps, the elevations of important hydrologic features within approximately 5 miles of the Skyline Mines were determined. These are listed in Table 1 below.

Table 1	**Elevation (feet)**
Huntington Creek (from headwaters to 3 miles below Electric Lake)	9200-8000
Electric Lake	8575
Scofield Reservoir	7618
All springs in the vicinity of the mine (between highway 96 and Skyline drive excluding Pleasant Valley north of Scofield)	>7660
Cleveland Reservoir	8812
Miller flat Reservoir	8462
Huntington Reservoir	9014
Rolfson Reservoir	8843
Fairview Lakes	8972
Boulger Reservoir	8748
Lower Goosberry Reservoir	8424

Respectfully submitted,

Alan L. Mayo by KLP

Alan L. Mayo, Ph.D.
California Registered Geologist #3265

skyline slurry 97.doc

COMMERCIAL TESTING & ENGINEERING CO.

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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HUNTINGTON, UT 84528
TEL: (801) 653-2311
FAX: (801) 653-2436

October 1, 1997

CANYON FUEL CO., SKYLINE MINES
P.O. Box 719
Helper, Utah 84526

Sample identification by
CANYON FUEL

Kind of sample reported to us Water

Sample taken at Skyline Mine

Sample taken by CANYON FUEL

Date sampled September 9, 1997

Date received September 9, 1997

UPDES 001

Rec'd 1200 hr.
Sampled 0734 hr.

FIELD MEASUREMENTS

pH	7.51
Conductivity	976
Flow	0
Temperature	15.0°C

RAW BOTTLE SAMPLED ON 9/10/97 @9:00

Analysis report no. 59-17733

Parameter	Result	MRL	Units	Method	Analyzed Date/Time/Analyst
Boron, Total	0.5	0.1	mg/l	EPA 212.3	09-29-1997 1500 MK
Calcium, Total	106	1	mg/l	EPA 215.1	09-22-1997 0515 MK
Iron, Total	0.4	0.1	mg/l	EPA 236.1	09-22-1997 0630 MK
Iron, Dissolved	<0.1	0.1	mg/l	EPA 236.1	09-22-1997 0630 MK
Magnesium, Total	79	1	mg/l	EPA 242.1	09-22-1997 0600 MK
Oil & Grease	<2	2	mg/l	SM5520-B	09-10-1997 0700 JC
Selenium, Total	<0.01	0.01	mg/l	EPA 270.2	09-24-1997 2145 MK
Solids, Total Dissolved	870	10	mg/l	EPA 160.1	09-15-1997 0700 JC
Solids, Total Suspended	<5	5	mg/l	EPA 160.2	09-11-1997 0700 JC

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Huntington Laboratory

MEMBER ACIL

Canyon Fuel Co.
Helper, Utah
MINE: Skyline Mines
LOCATION: Slurry

DATE SAMPLED: September 30, 1997
DATE REPORTED: October 13, 1997

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Sand %	Silt %	Clay %	Texture	Organic Carbon %
56894	Slurry		7.4	0.87	4.44	4.70	1.94	0.91	77.0	13.0	10.0	SANDY LOAM	1.8

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

Canyon Fuel Co.
Helper, Utah
MINE: Skyline Mines
LOCATION: Slurry

DATE SAMPLED: September 30, 1997
DATE REPORTED: October 13, 1997

Lab No.	Location	Depths	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. t/1000t	T.S. ABP t/1000t	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	PyrS AB t/1000t	PyrS ABP t/1000t
56894	Slurry		0.26	8.25	87.1	78.9					

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential

Canyon Fuel Co.
Helper, Utah
MINS: Skyline Mines
LOCATION: Slurry

DATE SAMPLED: September 30, 1997
DATE REPORTED: October 13, 1997

Lab No.	Location	Depths	Nitrate-Nitrogen ppm	Boron ppm	Total Kjeldahl Nitrogen %	H2O Sol Selenium ppm
56894	Slurry		<0.01	0.36	0.55	0.02

DRAFT

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble,AB-DTPA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate