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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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February 8, 1999

Kenneth E. May, General Manager
Canyon Fuel Company, LLC
SUFCO Mine
397 South 8th West
Salina, Utah 84564

Re: Decision to Not Approve Application to Undermine Box Canyon, Canyon Fuel Company, LLC, SUFCO Mine, ACT/041/002-98D, Folder #2, Sevier County, Utah

Dear Mr. May:

The Division has completed our review of your application which proposed to allow undermining of Box Canyon. Enclosed is our technical analysis regarding the hydrology which Mr. Darby has reviewed with Mr. Sorensen of your staff. However, at this time we are unable to approve your application. You are no doubt aware of the recent decision issued by the Manti-LaSal National Forest regarding the Pines Tract Project. According to our Cooperative Agreement with the Department of Interior to regulate Utah coal mining, the Forest Service must concur if we are to approve an action affecting their lands. We would be happy to review any alternate plans that you may consider for this area that would be consistent with the Forest Service Record of Decision (ROD).

For your information, we are continuing to review your application to add the 150 acre Incidental Boundary Change. However, it appears that the Pines Tract Project Decision may also affect this application since your proposed panel layout may no longer be feasible. Please contact us regarding this proposal so that we may discuss how to proceed and what changes may need to be made.

If you have any questions please call me or Daron Haddock at (801) 538-5325.

Sincerely,

Mary Ann Wright
Associate Director, Mining

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Enclosure
cc: Richard Manus, BLM
Janette Kaiser, USFS
Daron Haddock
Price Field Office
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January 20, 1999

TO: File

THRU: Daron Haddock, Permit Supervisor

FROM: David Darby, Reclamation Specialist

RE: Undermining Box Canyon, Canyon Fuel Company, LLC, SUFCO Mine, ACT/041/002-98D, File #2, Sevier County, Utah.

SYNOPSIS

Canyon Fuel Company submitted Amendment 98D on May 18, 1998. Field visits, reviews and meeting on the submittal has delayed final recommendations. The amendment presents a change to the current Mining and Reclamation Plan to development longwall panels beneath Box Canyon. The approved Mining and Reclamation Plan (MRP) provides a mining buffer under the Box Canyon which limits full extraction mining. In the amendment SUFCO proposes to extend longwall panels 12 Left 4 East and 13 Left 4 East to the limits of the current mine permit boundary. Mining which is proposed to take place consists of full extraction longwall mining. The amendment also changes the sequence of the current mine plan.

BASELINE ENVIRONMENTAL RESOURCE INFORMATION

Regulatory Reference: R645-301-721, 722

Box Canyon contains a perennial stream and is considered by the Forest Service and cattlemen as a significant source of flow for sustaining wildlife and cattle. Box Canyon also exhibits a unique ecosystem of plants and ancient cultural resources. Hikers to the canyon find it aesthetically pleasing and important as a resource to the area.

The amendment contained a report by Mayo and Associates, LC. (December 1997) identifying the probable impacts from longwall coal mining at the SUFCO Mine to the hydrologic balance of Box Canyon Creek. Also submitted is a report by Agapito Associates, Inc. (November 1997) describing the potential surface subsidence impacts from longwall mining under Box Canyon. Some hydrologic information was obtained from the U.S. Geological Survey Water-Resources Investigation Report 90-4084, Hydrology and Effects of Mining in the

Quitchupah and Pines Coal Lease Tracts, Central Utah.

A conference was held on January 8,1998 with Division of Oil, Gas and Mining personnel, representatives of SUFCO Mine and Mayo and Associates to discuss geologic, hydrologic and subsidence issues, the studies and methods of analyses used in developing the amended mine plan.

Findings:

The applicant supplied sufficient baseline environmental information to make a findings of the potential impacts to environmental resources.

It is determined from the information presented that a potential for subsidence effects are good to high, and that subsidence can open existing joints and potentially effect groundwater movement in the Castlegate aquifer. Potential impacts to cultural resources are expected to be low to minimal. The following geologic and hydrologic analyses identify the potential and degree of adverse impacts.

GEOLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 784.22; R645-301-623, -301-724.

Analysis:

A description of the geology is found in Chapter 6 in Volume 2 of the SUFCO Mine Plan. The MRP includes a geologic description which identifies the stratigraphic sequence. It also contains the operation plan which describes the monitoring and drilling activities.

All rock units within the SUFCO Mine property are sedimentary in origin. The exposed consolidated formations were deposited during the Cretaceous Period. Map 6.1 and Figure 6.1 depict the stratigraphy and extent of the formations on and adjacent to the minesite.

Plate 6-2 depicts a cross-section of the coal units at depth across the property from north to south. Upper Hiawatha and Lower Hiawatha coal seams are the minable coal seams on the permit area. Their extent or thickness over the area (isopach map) is not shown on a map, but identified in drill logs.

Potential subsidence limits are outlined in Chapter 5 in Plate 5-10 (MRP) and in Figure 22 of the Agipito Report for the current mine plan area. Figure 25 (Agipito Report) of the Amendment shows the predicted subsidence contours after mining under Box Canyon.

The Castlegate Sandstone lies above the coal bearing Blackhawk Formation. The thickness of the Castlegate Sandstone is approximately 200 feet at Box Canyon and 30 feet at the

edge of the north boundary of the SUFCO Mine lease.

Coal and overburden isopach maps were not submitted, however the thickness of the coal seam was obtained from drill hole log 89-16-1, west of and adjacent to Box Canyon. The coal height of the upper Hiawatha coal seam is approximately 3 feet. The lower Hiawatha seam is approximately 15 feet high and the overburden depth adjacent to the is creek approximately 900 feet.

A joint system is exposed on the surface of the mine permit and adjacent area. The predominant joint set trends north 23 degrees west, the same direction as Box Canyon. Minor joint sets trend north 15 degrees east and north 69 degrees east. No major faults have been mapped or have been witnessed at the surface in the Box Canyon area.

Findings:

There is sufficient information presented by the applicant to make a finding of the potential effects of mining on Box Canyon.

An overburden and coal isopach map for the lower Hiawatha Coal seam is required for better clarification across the property especially, if additional information has been discovered for the Pines Lease Track.

HYDROLOGIC RESOURCE INFORMATION

Regulatory Reference: R645-301-723 through 726, 728, 731.200

Analysis:

Sampling and Analysis. 723

The applicant established stations along the Box Canyon drainage to monitor surface, groundwater and alluvial parameters. Figure 1, identifies the surface and ground water monitoring sites. Figure 5 and Table 1 of the Amendment portray the alluvial parameters. Table 2 and Figure 6 identify stream flow measurements from 1989 through 1996 at stations FS-109, FS-110 and FS-090.

The applicant indicated the highest points of flow in the channels in Figure 7 for the date of October 9, 1997. At the lowest station on the creek, FS-090, the flows appeared highest and ranged between 9.4 to 40.4 gallons per minute. Whereas, on a field visit August 11, 1998 by DOGM personnel, flows in the creek were observed a couple thousand feet further up the drainage than is marked in Figure 7.

Figures 9 through 12 show views of bedding planes and fractures in the Castlegate

Sandstone (member of the Price River Formation) which supply groundwater (seeps and springs) to the creek. The seeps and springs supply and create an unique environment for ferns and mosses as well as other riparian vegetation in the canyon.

Information provided about monitoring wells concluded no impacts. However, an evaluation of the well information suggests that the well information is inconclusive. In fact, other than US-77-8, which is shallow and stabilized, because it abuts a barrier pillar, the other wells US-80-4 and 89-20-2W show a decline in water levels and the reestablished flows do not necessarily depict the no impact scenario. A better understanding of the groundwater system in the Castlegate Sandstone would be to analyze spring impacts or develop groundwater monitoring wells adjacent to the canyon rims.

Baseline Information, 724

The proposed plans, Plate 5-7, indicate that mining would take place under the main channel of Box Canyon, via Panel 12 Left 4 East, between early May to late July.

There are no designated water rights established in Box Canyon for diversion. Muddy Creek Irrigation Company hold rights to 244 cfs in Muddy Creek. Flows from Box Canyon flow into Muddy Creek. The Forest Service claims the need to sustain flows in Box Canyon for livestock and wildlife watering.

The applicant compared proposed mining under Box Canyon with mining under the Right Fork of Miller Creek and Burnout Creek in Carbon County. Some pertinent factors were pointed out that distinguish Box Canyon from other minesites where impacts occurred as a result of mining. Specifically, there is no extensive faulting in Box Canyon. The applicant also concluded that tension fractures tend to heal over time. Only one coal seam is proposed for mining. Overburden thickness is over 900 feet, whereas overburden at Burnout Creek is about 600 feet and 350 feet under the Right Fork of Miller Creek .

The applicant proposed a disconnection between the groundwater sources of the Castlegate Sandstone and the water generated in the mine. Isotopic information was presented for the basis of this claim. Locations where isotopic samples was not presented.

Some information in the application indicate there could be substantial impacts to the water resources in Box Canyon from subsidence. The highly fractured Castlegate Sandstone has been shown to sustain tension fractures when other areas were mined. The arrangement of longwall panels in the Box Canyon area are parallel with the stream channel. Tension fractures will also run parallel with the creek and have a high potential of intersecting the stream channel in the vicinity of the confluence with Upper Left Fork (See Figure 21 Agipito Report).

The applicant has not proposed an alternate water source, but has identified the low percentage of loss to the flow of Muddy Creek of 15 gpm if flow is lost.

Baseline Cumulative Impact Area Information. 725

Cultural resources, vegetation, subsidence and hydrologic (surface and groundwater flow and chemistry) have been supplied in respective reports for the amendment. There appears to be sufficient information provided to make a determination of potential impacts.

Both annual subsidence reports and the Agipito report identify areas of previous subsidence over longwall panels. Subsidence is highly likely with expansion of the longwall panels beneath Box Canyon. Fracturing is also highly likely due to the pre-existing fracture pattern and the tensional stresses induced above the gateroad by sinking of the panels. The tensional stresses in this situation will run parallel with the canyon and across the end of the panels. A high potential exists that some of the pre-existing fractures will widen.

The applicant identified the probable impacts to the hydrologic balance in Mayo's report beginning on page 34. The report specifies that groundwater interception from mining is not anticipated the response of water monitoring wells Well 89-20-2W and a lack of tritium in the gob water.

The applicant has also identified mitigation measures to restore flows in the event they are lost or diminished. The applicant has proposed to fill cracks with bentonite grout in the event natural sediments do not seal the fractures which may occur as a result of subsidence.

Modeling. 726

Two thoughts of groundwater flow and interception were proposed. Groundwater model has been presented based on solute composition and isotopic data. As stated earlier, the applicant predicts that no interception of surface water or water above the Castlegate Sandstone will be captured and taken into the mine.

During the conference, SUFCO stated they expected fracture apature enhancement over the gateroads and at the end of the panels, but did not expect long continuous fractures which would intercept and transport ground water and change flow patterns. Dr. Mayo proposed that subsidence would move along the surface proportional to mining advancement. Fractures which develop will be offset by the movement of blocks (Castlegate SS) slipping along the secondary joints. SUFCO also stated that there is a potential that fractures will occur and at the end of panel 12 Left 4 East which might intercept streamflow for a short period of time. It was stated that the fractures will fill and overflow from stream flow and eventually fill with sediment.

Mayo's report proposes that subsidence induced fracturing may increase groundwater storage and provide a better recharge source to the groundwater aquifer supplying springs. Surface water that may be intercepted from subsidence fracturing will be transmitted and stored in fractures. The well cemented Castlegate Sandstone will prevent sandstone from receiving or transmitting water increasing the flux of water through the bedrock. The magnitude of flow will

depend on the saturation of rock underneath the canyon and the geometry of the tension cracks.

Probable Hydrologic Consequences Determination, 728

Most of the larger measurable springs issue near the interface of the Blackhawk and Castlegate Sandstone in Box Canyon. Seeps issue from bedding planes along the walls of the canyon. The creek in Box Canyon is a continuous gaining stream throughout the amendment area. The Mayo Report suggests that solute, isotopic and discharge data indicate groundwater recharge to Box Canyon is in hydraulic communication with the surface and not recharged through the overlying Price River Formation.

The Mayo report also suggests that near surface groundwater systems are not in communication with groundwater encountered during mining. Data compiled by Mayo and Associates (1997) demonstrate the composition of in-mine waters have a radiocarbon ages of 7,000 to 20,000 years and contain no tritium, whereas surface waters exhibit isotopic ages far less in age.

Both annual subsidence reports and the Agipito report identify areas of previous subsidence over longwall panels. Subsidence is highly likely with expansion of the longwall panels beneath Box Canyon. Fracturing is also highly likely due to the pre-existing fracture pattern and the tensional stresses induced above the gatesroad by sinking of the panels. The tensional stresses in this situation will run parallel with the canyon and across the end of the panels. A high potential exists that some of the pre-existing fractures will widen.

The layout of the panels over the west fork of Box Canyon Creek reveals that the gateroads align parallel to the creek and the ends are perpendicular to the creek. An evaluation of the hydrologic information leads to the hypothesis that fracturing along the gateroads could intercept the groundwater flow in the Castlegate Sandstone. It is indeterminable whether intercepted flows will fill the apertures of the fractures and continue to follow along the original groundwater flow pattern or be diverted into the fracture down gradient to another location.

Ground-Water Monitoring Plan, 731.210

Some springs in Box Canyon were sampled by the U.S. Geological Survey during a study from June 1986 to September 1987. Continued monitoring of springs in Box Canyon were conducted by Mayo and associates. It is uncertain whether the springs measured by the U.S. Geological Survey and Mayo and Associates were the same source. All spring flows reported for Box Canyon were very low flows at or below 5 gpm. A good portion of flow into the canyon emanate as seeps from bedding plains and are difficult to measure.

Surface-Water Monitoring Plan, 731.220

The applicant has established surface monitoring sites along the stream in Box Canyon to measure flow and water quality. Discharge data was collected and presented in Table 2 and Figure 6 (Mayo Report). Mayo reported the creek in Box Canyon as a gaining stream picking up flow from the small seeps and spring along fractures and canyon walls.

Findings:

The applicant has supplied sufficient information to make a determination of potential hydrologic impacts to the Box Canyon area as a result of proposed longwall mining.

A summary of the subsidence and groundwater information presents a scenerio where aperture widening from subsidence has a high potential. There is a good potential that groundwater flowing to the fractures will be intercepted and a moderate potential that it will be diverted away from the premining path.

A complete determination of impacts from mining and subsidence are difficult to determine. Some of the postulates presented by the applicant are reasonable. The worst case scenerio hypothesis identified by the Division is also undeterminable, but is useful in providing maximum protection to the values of the environment.

It is the findings of this section that changes in the groundwater flow pattern could occur. State R645-301-731 and federal regulations require the applicant to minimize disturbance to hydrologic balance within and adjacent to the permit areas, and prevent material damage outside the permit area. The applicant has proposed summaries of mining methods and mitigation measures, including natural healing processes that show a potential of minimal disturbance and impacts to the hydrologic balance within the permit area.

An assessment of impacts from the Divison's perspective identifies a moderate to good potential that groundwater intercepted would be reintroduced back into the reaches of the canyon. A loss of flow outside the permit area has low potential. Discharges after mining could be more concentrated or relocated in the canyon, but will unlikely be diverted out of the permit area.

RECOMMENDATION

It is recommended that Amendment 041/002-98D be approved with the following conditions.

R645-301-731 General Requirements

The Division may require additional preventative, remedial or monitoring measures to assure that material damage to the hydrologic balance outside the permit area is prevented. Coal mining and reclamation operations that minimize water pollution and changes in flow will be used in preference to water treatment.

It is stipulated that concentrated surface and groundwater monitoring studies be conducted within and adjacent to Box Canyon during the interim of mining under Box Canyon.

1- The applicant will be required to conduct surveys prior to and during mining of Box Canyon amendment area to establish locations of spring flows and seeps in the canyon and on the canyon walls, and determine if flow patterns change in discharge amount and location. New stream flow monitoring stations will be located immediately down stream of locations where stream sections overlies gateroads or ends of panels.

2- The applicant will conduct spring and stream flow monitoring surveys on a bi-weekly basis, beginning when panels or longwalls are started in the amendment area. The applicant will use equipment capable of obtaining accurate information and data. The applicant will measure and monitor precipitation and field parameters of streams and springs (flowing over 3 gpm). Monitoring will continue bi-weekly for a period of two months after mining moves out of the amendment area.

3- The applicant will be required to conduct a surface survey on a monthly basis to identify subsidence fractures . The surveys will begin one month after mining of the amendment area begins and continue until two months after leaving the amendment area.

4- The applicant will establish a precipitation gauge on site prior to mining the amendment area and continue monitoring precipitation amounts on a bi-weekly basis beginning when panels or longwalls are started in the amendment area. Monitoring will continue bi-weekly for a period of two months after mining moves out of the amendment area.