

June 4, 2003

TO: Internal File

THRU: Daron R. Haddock, Permit Supervisor

FROM: Gregg A. Galecki, Reclamation Hydrologist

RE: Response to Informal Conference – Updating of Chapter 7, Hiawatha Coal Company, Hiawatha Complex, C/007/011-AM02B-3, Carbon County, Utah, Internal File

**SUMMARY:**

The following review addresses changes made within Chapters 5, 6, and 7 of the approved Mine Reclamation Plan (MRP) for the Hiawatha Complex mine. The changes were in response to a Division Order issued May 1, 2002. The Division of Oil, Gas, and Mining (Division) received the original submittal on June 6, 2002, which was returned to the Hiawatha Coal Company (Operator) with deficiencies on August 8, 2002. On October 10, 2002, the Operator asked for an extension to November 30, 2002, to complete the work. The extension was granted and the amendment was received at the Division on December 3, 2002. The submittal was returned to the Operator on January 27, 2003, with additional deficiencies, which was re-submitted to the Division with responses on March 3, 2003. The March 3, 2003, submittal still had deficiencies and was returned to the Operator on March 26, 2003. The following is a review of the information submitted to the Division on May 21, 2003, with additional information being received June 2, 2003.

The primary focus of this review is to evaluate the effects on groundwater associated with the Bear Canyon Fault as water is encountered during mining. Since mining is not currently being conducted, this involved updates/modifications to the Engineering (Ch. 5), Geology (Ch.6), and Hydrology (Ch.7) sections of the MRP. Although engineering information was provided for additional insights related to subsidence, the subsidence information was not evaluated from an engineering perspective; that will be conducted under a different review when an 'official' mine plan is submitted.

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It is important to mention that mining has taken place within the permit and surrounding area for over 100 years. The Hiawatha Mine is currently inactive with all the portals being closed since 1993. All the modifications created by Hiawatha Coal Company (HCC) for this submittal are based on U.S. Fuel Company's data that could be located. All the modifications requested by the Division have been adequately addressed. Adoption of the amendment into the currently approved MRP is recommended.

**TECHNICAL ANALYSIS:**

**GENERAL CONTENTS**

**PERMIT APPLICATION FORMAT AND CONTENTS**

Regulatory Reference: 30 CFR 777.11; R645-301-120.

**Analysis:**

Earlier references in the MRP indicating U.S. Fuel as being the Mine Operator have been corrected. A change order has been submitted to the Division of Water Rights to indicate that water rights previously controlled by U.S. Fuel have been transferred to the current owner. In all instances the MRP now reflects Hiawatha Coal Company (HCC) as the current Mine Operator and uses U.S. Fuel only in the past tense. Also included in the current application is a copy of the Mayo 2001 report, which was requested. Both the amendment and Mayo 2001 report were submitted electronically. When viewing the amendment in that format, citing to the Mayo 2001 report are electronically linked to the exact page (reference) in the report. This has been very helpful when reviewing the amendment electronically.

All the spelling, pagination, and text modifications cited during previous technical analysis have been addressed adequately. When referring to water quality data, reference to the Division database was added on pages 7-30, 7-73 and 7-103. Also, discussions of individual springs and other out-dated references, that are no longer relevant to the MRP, have been omitted from the discussion.

**Findings:**

Information in the proposal adequately addressed the requirements of the General Contents section of the regulations.

## **ENVIRONMENTAL RESOURCE INFORMATION**

### **GEOLOGIC RESOURCE INFORMATION**

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

#### **Analysis:**

To fulfill the requirements of the May 1, 2002, Division Order, additional geologic information was requested to better understand the relationship between mining in the Hiawatha area and impacts to Big Bear Spring. Exhibits 6-4 through 6-12 have been added to the amendment to provide better illustrations of the geology of the permit area. Included in the Exhibits/illustrations are overburden and inter-burden maps, isopach maps of the coal seams, and structural contour maps of all three (3) coal seams to be mined. Included in Ch. 7 is Plate 7-23, which provides a north-south cross section extending from north of the Hiawatha permit boundary to Big Bear Spring in the south.

It is important to note that the mine portals have been sealed since 1993 and no new in-mine geologic data is available. Some of the drill hole information was lost prior to Hiawatha purchasing the mine. All cross-sections created by Hiawatha Coal Company are based on U.S. Fuel Company's drill hole information that could be located.

#### **Findings:**

Information in the proposal adequately addresses the minimum requirements of the Environmental Resource Information – Geologic Resource Information section of the regulations.

### **HYDROLOGIC RESOURCE INFORMATION**

Regulatory Reference: 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-724.

#### **Analysis:**

##### **Ground-water Information**

For a better understanding of the in-mine flows that are likely producing the discharge at the Mohrland portal, Plate 7-22 and additional text have been added to the amendment (Sec. R645-301-724, pg 7-14 – 7-16). The text provides comments from a mine engineer (Mr. Robert Eccli) who worked in the mine in the early 1970's. The comments outline three (3) primary sources of consistent inflow into the mine at that time, which are identified on Plate 7-22 (labeled A, B, C). Accurate flow records were never documented and the areas were

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subsequently abandoned. However, it is believed that once the pipeline servicing the town of Hiawatha from Area C was abandoned these sources were responsible for the flows at the Mohrland portal. The text provides additional narrative suggesting the Hiawatha mine is actually a dry mine relative to surrounding mines when comparing the ratio of discharge to the acreage of mine workings. This additional information adequately addresses the previously cited deficiency.

In Section R645-301-727, Alternative Water Source Information, text (second paragraph) indicates flow could possibly be depleted by approximately 28 gallons per minute based on information supplied Exhibits 7-2 and 7-7 (Seeps and Spring Map, and Overburden Map, respectively). Section R645-301-728, Effects of Mining on Streamflow, references table 7-9 (page 7-70) that compares stream monitoring sites and potential losses to baseflow due to subsidence. The text in the PHC draws a loose comparison using Exhibits 7-2 and 7-7. Modifications made to Exhibits 7-2 and 7-7 of this technical analysis solidifies this discussion.

Within Section R645-301-727 the Operator cites numerous reasons why mining at Hiawatha is not impacting flows at Big Bear Spring: 1) no mining has occurred near the Big Bear fault since 1977; 2) No drop in flows at the spring was noticed for almost 10 years after mining had ceased; and 3) No mining below the Hiawatha seam is planned. However, the plan does identify several options for providing an alternative water supply. The plan indicates the development of an alternative water supply will be done in consultation with the Division. The plan also states, "the settlement of any disputes will be between Hiawatha Coal Company, the user of the affected water right, and the Division of Water Rights. The Division wants the Operator to understand any finding will be based on the 'quantity and quality of water cited in the existing water right.' Also, that the Operator will be responsible for water replacement, due to water loss caused by subsidence, for any mining conducted after October 24, 1992 (effective date of rule).

Section R645-301-728 (PHC Determination) makes numerous references to the King Mines and whether water was encountered in-mine. Modifications have been made to the text on pages 7-15, 7-16, and 7-63. This is important information to correlated in-mine to a specific coal seam. It appears that all the major inflows encountered to date, have been encountered in the 'B seam', or stratigraphically highest seam to be mined.

### **Baseline Cumulative Impact Area Information**

In the second paragraph of Section 724.100, text indicates the region is hydrologically divided into three regions bounded by faults. This has been further defined to indicate the divisions are fault zoned and cliff outcrops, and the middle of the Eastern edge of the Wasatch Plateau.

Since at least 1983, the Mohrland portal has produced an average discharge of approximately 400 gpm. An age-dating survey conducted by Mayo and Associates in 2001

indicates the age of the water discharged at the Morhland portal to be 9,000 years old. Referencing the Mayo 2001 report, section R645-301-724.100 indicates 'groundwater flow is predominantly horizontal with very little vertical movement'. It goes on to say 'vertical movement of groundwater is limited to 100 to 200 feet'. In addition, the report indicates 'fracture-flow groundwater systems...are of limited lateral extent and do not convey large quantities of water over long distances'. Gentry Mountain is hydraulically isolated from other areas of the Wasatch Plateau and is supported in the Mayo report (Fig. 17 pg 99).

To better clarify the hydraulics in the Gentry Mountain area the Operator has provided additional Plates 7-22, 7-23, and an electronic version of the 'Mayo 2001' report. As discussed in the Groundwater Information section, Plate 7-22 illustrates the locations of in mine flows in relationship to previous mining. Plate 7-23 is a north-south cross-section beginning north of the Hiawatha permit area and extends south to Big Bear Spring. The Plate illustrates the stratigraphic location of the mineable coal in the Hiawatha area in comparison to the groundwater reporting at Big Bear Spring. Unfortunately, drill hole information within the Hiawatha permit area is restricted to the coal seams and the rest of the information is interpolated. Plate 7-23 illustrates the lowest coal seam to be mined (Hiawatha seam) is approximately 5 miles away from Big Bear Spring and likely separated from Panther Sandstone (aquifer supplying Big Bear Spring) by two (2) tongues of Mancos shale. When viewing the electronic version of the submittal, and the 'Mayo 2001' report is cited as a reference it is possible to 'click' on the reference and be automatically linked to the referenced page of the report. This additional information adequately addresses the previously cited deficiency.

### **Findings:**

Information provided adequately addressed the requirements of the Environmental Resource Information – Hydrologic Resource Information section of the regulations

## **MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION**

Regulatory Reference: 30 CFR 783.24, 783.25; R645-301-323, -301-411, -301-521, -301-622, -301-722, -301-731.

### **Analysis:**

#### **General**

Section 731.700 of the MRP provides a brief description of the major Exhibits provided in Chapter 7. The section has been updated to include Exhibits 7-5, 7-6, and 7-23 that adequately addresses an earlier cited deficiency.

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### Coal resource and Geologic Information Maps

The current plan provides cross-sections VI-2 (cross-sections A-A', B-B', C-C') that show a distinct break in slope/dip to the west. This break in slope begins west of drill holes DH 75-1 and DH 70-5, respectively. To assist in understanding the Operator was asked to provide an east-west cross section through the proposed future mined areas. The response indicated since no drill holes exist in the areas of proposed mining, only a general diagram could be provided (Figure 13b of the Mayo 2001 report). Figures 13a and 13b (pg. 62-63) from the Mayo 2001 are referenced both in the Geology – Cross-Sections, Maps and Plan, and Hydrology – Baseline Information sections of the MRP. These two figures adequately illustrate the potential restriction of groundwater (in an east-west direction) through similar geologic units due to faulting.

As requested in the 'Contour Maps' section of this technical analysis, Plates 6-4 through 6-12 have been provided to illustrate a much better understanding of the geologic and mining conditions. Contour maps of the Hiawatha and A seams help illustrate how water encountered in these units would naturally flow south, southwest if mine working were not encountered. Plate 6-4 – Hiawatha Overburden map, has been modified to illustrate both the past and projected Hiawatha working. Plate 6-7 – B seam Interburden Isopach map has been modified to include past and projected B seam workings information, and a contour interval.

When addressing 'Areas of Potential Subsidence', the text is somewhat misleading indicating only two areas will be subjected to multiple-seam mining. Although this is accurate for future mining, it neglects to mention that the majority of future mining is in areas that have been previously mined. The text does indicate conventional room-and-pillar mining methods are normally not subjected to surface subsidence. Both in the Geology chapter (pages 6-26 through 6-36) and Hydrology chapter (pages 7-78 through 7-80) the text provides a very definitive explanation mining methods and the potential subsidence caused by mining. Plate 7-2 – Mine Water Map provides a good illustration of all past mining, and Plate 5-2D provides an illustration of all future mining. Due to the amount of past and projected mine-workings, to combine the two maps would not be legible. However, overlaying the two maps indicates a majority of future mining will be conducted in areas previously mined. In some cases, all three (3) seams will be mined. The current minimum economic mining thickness is five (5) feet and the maximum combined thickness of fully extracted coal may amount to as much as 25 feet. On page 6-36 text indicates 'maximum subsidence ranging from 20-feet down to 3-feet' is possible 'in areas where total thickness extracted is 25-feet. The maximum subsidence anticipated by Hiawatha is approximately 10-feet.

In 'Areas of Potential Subsidence', Exhibit 7-7 – Maximum Extent of Potential Subsidence is referenced to illustrate the vertical projections of subsidence. This map was modified to account for subsidence based on future areas to be mined by providing both the vertical projection of fully extracted sections, and the maximum extent of surface subsidence (angle of draw). However, the Division is also concerned with identifying magnitude of the subsidence. Exhibit 7-7 has been modified to identify where potential subsidence could be 0 to

5-ft, 6 to 10-ft. It should be noted that subsidence is being evaluated from a hydrologic prospective only. An additional review involving the engineering prospective will be conducted prior to mining being conducted (i.e. a pre-subsidence survey is necessary). With the areas of potential subsidence projected on the map, it is easy to note that Springs 91-103 and 91-104 have a potential to subside in the range of 6 to 10-ft. Surface water rights that have a potential to be impacted include 93-137 and 93-1440. Springs 91-103 and 91-104 are owned by U.S. Fuel Company and maintained by the Mine Operator. Although there is a potential for subsidence on the surface sites, impacts to surface sites are traditionally minimal.

### **Mine Workings Maps**

To satisfy a request to update the Mine Workings map, Plates 5-2a through 5-2d, and Plate 7-22 have been provided. Plates 5-2a through 5-2c illustrate the individual seams, their respective future areas to be mined, method of mining to be used, and anticipated year to be mined. Plate 5-2d illustrates potential future mining for all three (3) seams. Plate 7-22 illustrates at the old working and their relationship to major mine in-flows. Geologic maps 6-4, 6-7, and 6-10 have also been modified to illustrate overburden and inter-burden of the respective coal seams. For the current review all eight (8) maps were modified again so the B-seam (dark blue), A-seam (light blue), and Hiawatha seam (green) had the same color on all maps. This is very useful information when trying to remember where each seam is stratigraphically located. Also, areas being labeled as being caved/pillared areas are correctly identified in the respective legends. This adequately addresses previously cited deficiencies within this section.

### **Monitoring Sampling Location Maps**

Plate 7-1 – General Surface and Subsurface Water Hydrology has been updated to reflect the current monitoring program. The UPDES monitoring sites (i.e.D004) appear both on the map and in the legend. The UPDES are represented in the legend and identify their status (active/inactive). Also, the Mohrland portal is identified as a UPDES site, and is clearly identified as site 001 and being active. For specific information related to UPDES sites 003 through 009 and 011, the reader is directed to Exhibits 7-8, 7-9, 7-10, 7-11m, 7-12, 7-13, 7-14, and 7-15 respectively. This information adequately addresses earlier cited deficiencies.

### **Subsurface Water Resource Maps**

Plate 7-22 and text provided in the Groundwater Information section of the amendment adequately identifies the known inflows into the Mine. It is stated that once the mine is re-opened, additional monitoring and information will be acquired.

The aquifers located above the coal seams are absent from cross sections 7-5 and 7-6. Exhibit 7-2, in conjunction with Tables 7-1 and 7-2, strongly link the upper aquifers with geology. Exhibit 7-2 has been modified to better illustrate connection between the springs and the geologic units when viewing the map. Within the legend, the six (6) geologic units (as

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outlined in Table 7-2) have been assigned different colors, and the flow associated with the water right is in parentheses. This information better illustrates the distribution of springs and the associated geologic units and the anticipated flows. Also, Table 7-1 has been modified to provide an explanation of the naming convention of the springs.

### **Contour Maps**

As briefly mention above in the 'Coal Resource and Geologic Map' section, Plates 6-4 through 6-12 have been provided to illustrate a much better understanding of the geologic and mining conditions. Isopach maps for the Hiawatha, A seam, and B seam are illustrated in Plates 6-11, 6-8, and 6-5, respectively. Structural maps for the same seams are illustrated in Plates 6-12, 6-9, and 6-6, respectively. Overburden for the Hiawatha seam, Interburden for the Hiawatha-A seam, and Interburden for the A-B seam are illustrated in Plates 6-4, 6-10, and 6-7, respectively. This adequately addressed earlier cited deficiencies, and provides valuable information in determining the hydrogeologic impacts.

### **Findings:**

Information provided adequately addresses the requirements of the Environmental Resource Information – Map, Plans, and Cross Sections of Resource Information section of the regulations. .

## **OPERATION PLAN**

### **HYDROLOGIC INFORMATION**

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

### **Analysis:**

#### **Sampling and Analysis**

The Division wants a better understanding of the source of the water being discharged at the Mohrland portal to help determine how much mixing (if any) of Bear Canyon fault water and other interstitial water is taking place. The 'Mayo 2001' report indicates a more comprehensive water quality analysis (than the required UPDES parameters) of the discharge from Mohrland portal was conducted from 1994 through 1997. A total of three (3) age-dating analysis was also conducted in 1996 and 1998. The Operator has submitted the age-dating analysis for the Mohrland portal, and has fulfilled a Division request to submit the solute chemistry data to the

Division database. The solute sampling analysis will also be collected on the same frequency as the other groundwater monitoring sites (Table 7-17). The Division understands sampling for solute data exceeds the requirements of the UPDES discharge permit. The age-dating analysis conducted in 1996 and 1998 was conducted for C.W. Mining for a comparison to Big Bear Spring, however as stated in Section R645-301-724 the majority of water reporting to the Mohrland portal is generated within the workings on the Hiawatha mine. To fulfill the requirements of the Division Order, the Division feels this continued sampling is necessary to help confirm the water being discharged at the Mohrland portal remains consistent over time. Additional age-dating will be conducted once in 2003 and then when appropriate after the mine is reopened. This will insure the age-dating analysis will represent a specific source and not a mixing of various inflows.

### **Ground-water monitoring**

In both Section R645-301-728 – Probable Hydrologic Consequences (PHC) Determination - Potential Water Bearing Zones, and Section 731.200 - Groundwater Monitoring Plan the Operator commits to monitor all in-mine flow encountered that are greater than 5gpm and last for more than 30 days once the portal seals are breached and mining resumes. The Operator also makes the commitment to ‘consult the Division during the development of the plan’. This in-mine monitoring will help regulate the significance of combined inflows and the effect on the surrounding hydrology.

Section R645-731.200 – Groundwater Monitoring Plan of Chapter 7 has been modified to clearly identify baseline, operational, and mine-water discharge (UPDES) parameters to be sampled in Tables 7-15, 7-12, and 7-13, respectively. Table 7-17 – Water Monitoring Matrix is referenced to readily identify the sample sites and their respective sample frequency.

### **Surface Water Monitoring**

Tables 7-14, 7-15 and 7-16 have been modified to include the recommendations cited in the previous technical analysis. Table 7-17 provides the respective monitoring list and schedule.

### **Water quality standards and effluent limitations**

Section R645-301-750 of the amendment has been modified to accurately reflect the current frequency for sampling, reporting requirements and the recipients of the UPDES discharge information. This is available in Tables 7-17 and 7-13, respectively. This adequately addresses deficiencies cited in the earlier technical analysis.

### **Findings:**

Information provided adequately addresses the requirements of the Operation Plan – Hydrologic Information section of the regulations.

## CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT

Regulatory Reference: 30 CFR Sec. 784.14; R645-301-730.

Hiawatha Coal Company (HCC) has provided sufficient information concerning the Hiawatha Complex permit area for the Division to make a determination of the impacts to the cumulative hydrologic regime and update the Gentry Mountain Cumulative Hydrologic Impact Assessment (CHIA). Through the current amendment, HCC has made significant updates to the MRP to make the available data both useable and understandable. Modifications have also been incorporated into the Water Monitoring program that will enable the Division to better assess any potential future impacts once mining resumes. Based on the information currently available, the Division has determined the continuation of mining in the Hiawatha permit area will have minimal, if any impacts on the Cumulative Hydrologic Impact Area based on the following provided information:

- No mining has been conducted since 1993
- The Operator has provided adequate information indicating subsidence should be limited to the Price River and Castlegate formations, where minimal groundwater flow is present.
- The combination of Table 7-2, Exhibit 7-2, and Exhibit 7-7 illustrate the majority of the upper aquifer springs are located in the North Horn formation (52 %), which is located in areas of extensive cover and unlikely subject to subsidence.
- In-mine water encountered during mining since the 1970's was generated primarily from the B-seam or uppermost coal seam, indicating the water is coming from an interstitial source, and above the regional aquifer of the Starpoint Sandstone
- The majority of future mining is proposed for the A-seam and Hiawatha seams that have been historically dry.
- Proposed mining is a minimum of 1300-ft from the Bear Canyon fault – a potential source of in-mine water.
- Age-dating analysis indicates water discharging from the Mohrland portal has dated the water as 9,000 years old
- Hiawatha Coal Company has adequately updated engineering, geology, and hydrology information as it relates to both past and proposed mining information.
- Detailed study of the Springs in the area as they compare to the Palmer Hydrologic Drought Index (PHDI) suggested no conclusive evidence that selected springs in the area are adversely affected by mining.
- Until the mine is reopened and the source of inflows is determined, it is difficult reasonably assess the primary source of the discharge reporting at the Mohrland portal.
- Hiawatha has committed to continue collecting age-dating of the water discharging from the Mohrland portal and in-mine once open. This continued monitoring should detect any potential changes in the water sources.

Concerns have been made that the water reporting to the Mohrland portal is contributing to apparent depleted flow reporting at Big Bear Spring. The Operator has provided sufficient evidence that the water discharging from the Mohrland portal is not directly related to the water reporting to Big Bear Spring. However, it has not been conclusively determined that there is not a component/percentage of water discharging from the Mohrland portal that would normally report at Big Bear Spring. The basis of the Operator's conclusion is based on two factors:

- 1) The water discharging from the Mohrland portal has been age-dated as being approximately 9,000 years old, while the water flowing from Big Bear Spring has been age-dated as being 'modern' water. However, radiocarbon and tritium analysis indicates both Mohrland portal and Big Bear Spring contain both a modern and 'aged' components. Using a regression analysis and linear mixing model, the Mayo 2001 reports the 'aged' component (radiocarbon) of Big Bear Spring to be 3,500 – 4, 500 years old.
- 2) The combination of geologic offset along the Big Bear fault and fault gouge limit the possibility of direct communication between the two sites.

According to State Regulations R645-301-728.350 and R645-301-731.530 the Operator must provide information for both the PHC and the Water Monitoring program that demonstrates whether mining activities "conducted after October 24, 1992, may result in contamination, diminution or interruption of State-appropriated Water in existence within the proposed permit or adjacent areas at the time the application is submitted." Mining was essentially no longer being conducted after 1992, indicating any interruption potential interruption of flow would have occurred prior to the Water Replacement rules taking effect. The current Operator (Hiawatha Coal Company) officially took control of the mine in December 1997. As stated in the above-cited rules, if a future determination indicates mining activities conducted after October 24, 1992, resulted in diminution of the hydrologic regime, the current Operator would be obligated to water replacement.

### **RECOMMENDATIONS:**

Approval of the application by the Division is recommended.