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

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May 30, 1996

TO: File

THRU: Daron Haddock, Permit Supervisor DRH

FROM: Sharon Falvey, Senior Reclamation Specialist SF

RE: Technical Analysis Round II, Horizon Coal Company, Horizon Mine, Pro/007/020, Folder #2, Carbon County, Utah

## SYNOPSIS

This memo serves as a portion of the Technical Analysis (TA) completed for Round Two of the Horizon Mine permitting action. The Applicant has provided clarification of many issues identified in the December 28, 1996 TA and continues to provide updates to the plan to meet regulatory requirements. This portion of the TA addresses sections where hydrologic and related information is presented.

## ANALYSIS

## CLIMATOLOGICAL RESOURCE INFORMATION

**Regulatory Reference: 30 CFR Sec. 783.18; R645-301-724.**

### Analysis:

Climate is discussed in the following areas within the PHC; Chapter 11, the soils section, the biology section, and in the Cultural and Paleontological Resources Study Addendum (Appendix 5-1).

Climate information presented in the plan was obtained from 3 different surrounding area locations; the Skyline Mine, the town of Price, and the town of Hiawatha. Climate variation at these sites are influenced by elevation and aspect. The Skyline Mine lies in a high mountain canyon at an elevation of 8,710 feet, the town of Price lies in a river valley at an elevation of 5,700 feet, while the town of Hiawatha lies at an elevation of 7,200 feet. The proposed mine site is in a canyon at an elevation of approximately 7,600 feet. Climatic information, therefore, comes from sites which are slightly different from that of the proposed mine site.

In Chapter 11, the respective average annual temperature is presented, based on 1993 data, for the Skyline Mine and for Price, as 37.7°F and 62.1°F. The respective average annual precipitation at Skyline is presented as 27.37 inches and at Price is presented as 10.94 inches. At the Skyline Mine, the coldest month of 1993 was January, with an average temperature of -9°F, while the warmest month was August, with an average temperature of 80°F.

According to the soils section, the average annual temperature at the proposed mine site ranges from 36°F to 45°F and the cumulative annual precipitation ranges from 12 inches to 30 inches. In the biology section, the range of cumulative annual precipitation is presented as 16 inches to 20 inches.

The Cultural and Paleontological Resources Study Addendum, describes the prevailing climate using data from records compiled at Hiawatha, Utah. Hiawatha was used because it's location on the east edge of the Wasatch Plateau is similar to that of the proposed mine site. Hiawatha has a mean annual temperature of 45.5°F and a mean annual precipitation of 14.5 inches for the period of record reported by the U.S. Department of Commerce in 1973. The area receives its highest precipitation in August, with an average precipitation for that month of 2 inches during that period of record.

The plan contains no site-specific climatological data but, an approximate range of data can be determined from the information scattered throughout the plan. The Division finds that this information meets the minimum regulatory requirements. The Division recommends, however, that the Applicant set up a weather station at the site so that precipitation events can be correlated with other monitoring data.

**Findings:**

The Division finds that this information meets the minimum regulatory requirements.

## ALLUVIAL VALLEY FLOORS

**Regulatory Reference: 30 CFR Sec. 785.19; R645-302-320.**

**Analysis:**

The Applicant provides a discussion on Alluvial Valley Floors (AVF's) in Section 7.4. In Appendix 7-6, a memo dated June 13. 1980 from the Soil Conservation Service State Soil Scientist, T. B. Hutchings addresses AVF's. According to the memo no AVF's,

as defined in the Permanent Regulatory Program Office of Surface Mining Department of Interior, exists in Section 17, T 13S. R. 8.E. SLBM. This location is specific to the proposed disturbed area and does not mention the adjacent areas.

According to the reconnaissance map completed by the Office of Surface Mining in June 1985, Gordon Creek, downstream of the mine site, is a "Potential" Alluvial Valley Floor. Mining is not expected to materially damage the water supply of these potential alluvial valley floors because the mine site is contained in a relatively small contributing section of the watershed.

Information on Plate 6-1 indicates alluvial deposits exist in the permit and adjacent areas along Beaver Creek, the North Fork of Gordon Creek, and Jewkes Creek, as well as short distances into the tributaries above the drainages. Alluvial deposits were also identified at the mouth of Jewkes Creek and along the North Fork of Gordon Creek. Alluvial deposits at the mouth of Jewkes Creek and North Fork Gordon Creek are below the coal outcrop and therefore could not be directly impacted by mine subsidence. Soils in the valley exhibit localized signs of being flooded or water logged.

According to the Applicant agricultural developments are not found along the North Fork of Gordon Creek or along Beaver Creek and their tributaries. The agricultural value in these areas is limited by the soil capability and short growing season. If these areas would be developed for agriculture, development would be restricted to grasses and pasture, however, because of the high elevation, short growing season and narrow valleys the development of meadow or pasture is not practical. Grazing on undeveloped rangelands can be found on Plate 4-1: the Land Use map.

Based on the information presented in the plan, the Division makes the following findings, in accordance with R645-302-321.310:

1) Unconsolidated stream-laid deposits holding stream channels are found in the area of the proposed mine site.

2) There is sufficient water to support agricultural activities, as evidenced by subirrigation of the lands in question.

3) The undeveloped rangelands found in the permit and adjacent area on alluvial materials are not significant to farming and therefore are exempt to prohibition of mining according to the Alluvial Valley Floor Identification and Study Guidelines provided by the U. S. Department of the Interior Office of Surface Mining Reclamation and Enforcement, 1983.

**Findings:**

The Applicant has met the requirements of this section.

## HYDROLOGIC RESOURCE INFORMATION

**Regulatory Reference: 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-720.**

**Analysis:**

**Sampling and Analysis.**

The Applicant is required to perform all sampling and analysis in a manner that meets the requirements of R645-301-723. Sampling times dates and methods are not available for all samples, however, recent data has included sample date, time, and method of analysis beginning in December, 1993.

**Baseline Information.**

*Water Rights and Points of Diversion*

The Applicant has provided information on water rights included in Appendix 3-5. The point of diversion for water rights near the mine operations are presented on Plate 7-3. Designated uses and season of use for some water rights are not included in the water rights table provided. The Applicant has indicated that the area is almost exclusively used for stock watering. A use description and timing of use should be provided for the water rights. However, this information can be obtained from the Division of Water Rights.

The Applicant presented a duplicate of a five year water right lease agreement, dated May 1, 1995. The agreement between Horizon and Florence A. Sweet includes water rights, 91-94, 91-353 and, 91-330. Also, a duplicate application for permit change filed at the Division of Water Rights is included in the MRP. The water rights are associated with two unnamed springs and an underground water tunnel. The point of use associated with the spring(s) are proposed to be changed to Sweets Pond. Domestic and Industrial uses are proposed in association with the Horizon Mine operations. The Applicant must have received the right to use the described water and, must include in the plan information which demonstrates the right to the proposed water use(s) related to mining activities was granted.

Table (?)
Water Rights Used in Mining

| Water Right # | Season of Use | Quantity of Use (cfs) | Potential Total for Season of Use (AF) |
|---|---|---|---|
| 91-94 | 9/1 to 5/1 | 0.1500 | 72.00 |
| 91-353 | 5/1 to 9/1 | 0.0150 | 3.66 |
| 91-330 | 1/1 to 12/31 | 0.5570 | 2565.00 |

***General Baseline Water Quality***

Baseline information was collected according to the 1986 Division guidelines. In early baseline data acquisition the Applicant collected data according to the 1986 guideline. The Division has a new guideline, effective April 1995. The major difference between the data collected through 1996 and the data required by the new guidelines is the acquisition of certain dissolved constituents, total alkalinity, and phosphates as orthophospates. Although older data acquisition will provide useful information, new data should be collected according to the new guidelines. The baseline data analysis for the parameters obtained according to each guideline should be discussed in the plan. Baseline information is being collected in accordance with the new guidelines starting in 1996. The Applicant should provide a table of the baseline parameters. Division guidelines request that baseline parameters be collected at low flow for monitored sites every fifth year prior to permit renewal.

**Groundwater Information.**

Section 6.4.1 discusses site stratigraphy and provides information relative to groundwater in relation to the mine operations. Section 7.1.2 discusses the groundwater resources.

The Gordon Creek area is considered a regional recharge area to groundwater, although locally in the permit area it is not a region with potential for large scale groundwater development. Snowmelt and rainfall are the main sources of recharge to the groundwater system in the permit and adjacent areas. The Applicant provides Figure 7-4 to delineate potential recharge areas and shows a limited recharge potential except in the northern portion of the permit area and in canyon bottoms downstream. The "small" number of springs in the area is described to demonstrate the result of relatively low area permeabilities by the Applicant. The Applicant has not clearly developed what the relationship to "small number" of springs is, relative to the local area aquifers.

The regional area aquifers are the Emery and Ferron Sandstone of the Mancos shale,

which probably do not extend to Gordon Creek (thus, the mine area), and the Star Point Sandstone and Blackhawk formations which are located in the mine area.

The area is also heavily faulted by major fault zones. The North Gordon and Fish Creek fault zones trend North and South, and North 60 degrees West , respectively. The faulting appears to have influenced the development of Gordon Creek and the locations of springs and seeps in the permit area. Faulting and fracturing provide conduits for surface water to enter the groundwater and allows movement between aquifers. Another major structural feature controlling groundwater occurrence is the Beaver Creek Syncline trending NE-SW with dip at approximately 3.5 degrees.

Locally, potential water bearing members below the Hiawatha coal seam includes the Blackhawk and the Blackhawk-Star Point aquifer. Both the Blackhawk and Star Point Formations serve as sources of spring and seep flows. According to Price and Arnow, 1974, the upper cretaceous sediments of the area have a low hydraulic conductivities and specific yields of 0.2 to 0.7%. Two pump tests from wells drilled in the Blackhawk formation in Eccles Canyon indicate transmissivities of 21 and 16.3 gallons per day per foot. The Blackhawk aquifers are generally laterally discontinuous perched aquifers and fluvial channel sandstones

The Hiawatha Coal Seam in the Blackhawk Formation directly overlies the Star Point Sandstone. The Star Point Sandstone consists of the Panther, Storrs and Spring Canyon Sandstone members from the stratigraphically lowest to highest member respectively. The Spring Canyon Member is composed of fluvial shales siltstone and channel sandstones (Section 6.5.2.1). The Star Point is approximately 900 feet thick in the Gordon Creek area. The recharge to the Star Point occurs primarily from vertical movement thorough the Blackhawk. The Applicant suggest that due to the low vertical permeability the magnitude of the recharge is limited. However, the vertical permeability from fractures in the area may be relatively significant.

Above the Hiawatha, the Castle Gate "A" coal seam overlies the Aberdeen Sandstone. Drill logs indicate this sandstone member thins near the mine and is discontinuous over the permit area pinching out on the east west stratigraphic section between LMC-4 and the Arco section. The sandstone is interbedded with siltstones and shales. The Applicant indicates this sandstone is not anticipated to be a significant aquifer because it has a thin interbedded lithology and no springs in the permit or adjacent area issue from the formation (Section 6). The Applicant has determined it is not practical to mine this seam in the permit area.

The floor of the Castle Gate "A" seam is carbonaceous silty shale to fine grained fluvial sandstone. Water production was not observed from the floor in previously mined areas according to the Applicant. The roof consists of carbonaceous silty shales over 80 %

of the permit area and the remaining 20% consists of fluvial channel sandstones that initially produce water then tend to dry up. The general channel trend is NE-SW and the channels tend to increase in frequency to the West. If these channels connect with a Fault, water may be diverted to the mine workings and directed/redirected based on the prominent ground water control mechanisms. The flow rate would be dependent on the fault/channel systems transmissivity. Whether or not this connection exists is unknown

Other members containing aquifers above the coal to be mined include the Castle Gate Sandstone, the Price River Formation and unconsolidated alluvial sediment deposits. The Castle Gate Sandstone is exposed in the central and northeastern section of the lease block and is approximately 300 feet thick in the Gordon Creek area. The Price River formation overlies the Castlegate Sandstone and occurs in the north eastern portion of the permit area. Additionally, unconsolidated deposits occur along valley floors and at the base of steep slopes. Some of these deposits are recharged from the Blackhawk and Star Point aquifers. The thickest alluvial deposits in the permit area occur along Beaver Creek.

### *Local Drilling Information and Occurrence of Ground Water*

The information regarding baseline groundwater data collection is discussed in Chapter 7, Section 7.1.2.2. Four exploratory holes drilled in 1970's and 1980's were recently monitored for water occurrence in 1995. Drill logs of Holes LMC 1, LMC 2, LMC 3, and LMC 4 are found in Appendix 3 A. Also, three wells were drilled and completed in the Star Point Spring Canyon Sandstone in 1995 and are discussed below.

Tables 1A and Table 1B were generated to present information gathered from the LMC drill holes and the HZ wells to present data used in determining ground-water occurrence in the permit and adjacent areas.

Table 1A
LMC Drill Hole Information

| HOLE ID | DATE DRILLED | DEPTH DRILLED | DEPTH OF PLUG | 1992 Drill Hole Depth ft msl (depth) | CASTLEGATE Elevation ft msl (depth) | HIAWATHA DEPTH* |
|---|---|---|---|---|---|---|
| LMC-1 | Sept. 1976 | 900 ft. | 600 ft. | 7,852 (599 ft) | 7,658 (793 ft) | Unknown* |
| LMC-2 | Oct. 1976 | 568 ft. | 50 ft. | None | 518 ft. | Unknown* |
| LMC-3 | Nov. 1976 | 836 ft. | 665 ft. | 7,556 (664 ft) | 7,590 (630 ft) | 791 ft. |
| LMC-4 | Jan. 1980 | 430 ft. | 220 ft. | 7,587 (217 ft) | 7,698.8 (105.2 ft) | 7,588.7 ft. |

* Drilling completed before reaching the Hiawatha Seam.

The data presented indicate that groundwater occurrence above, within, and immediately below the Castlegate 'A' seam is not continuous and may be inconsequential in the strata above the mine. Documentation of the LMC drilling procedure was provided in a notarized letter from Mr. Joseph A. Harvey to Rich White, Engineering Consultant for Horizon Mine, on March 24, 1992 (Appendix 7-1). As stated in Mr. Harvey's letter, all these holes were drilled with air rotary, monitored for water occurrence, and found to be dry (during drilling). Thus, no water quality data was collected Following drilling the drill holes were injected with compressed air and then mud for geophysical logging. The drill holes were abandoned by injecting cement. Mr. Harvey indicated there was an inability to cement the full length of the drill holes because there were large voids connected to the drill hole annulus, thus, resulting in the existing hole depths as measured in the 1995 monitoring.

If one can assume the drill holes would seep water during drilling, and given there were no noted water occurrences in the cuttings, then these drill holes indicate the stratigraphic members above, within, and below the Castlegate 'A' seam are probably dry. LMC 1 was originally drilled to 200 feet above the Castlegate 'A' seam. LMC 2 was originally drilled through the Castle Gate "A" seam. LMC 3 was originally drilled through the Hiawatha Seam and 32.8 feet into the Upper Spring Canyon Sandstone. LMC-3 is located north east of old workings developed from the Blue Blaze No.3, Castlegate "A" Seam. Drill hole LMC-4 extended through the Hiawatha Seam, ending 213 feet into the Storrs Sandstone. LMC-4 penetrates old workings in the Hiawatha coal seam and is located in an area that is possibly hydrologically disconnected from the majority of the area to be mined due to the surrounding faults (see Plate 6-1). Therefore, LMC-4 probably does not represent information on groundwater occurrences for the unmined portions of the lease outside of the surrounding faults.

Section 6.5.1.1 states that Drill holes LMC-1, LMC-2 and LMC-3 will be plugged and abandoned following State approved methods. Of the LMC drill holes, it seems as though well LMC-4 could provide information for the mined out area should it flood during or after mining. However, it appears to provide little useful information on aquifers in the baseline/operational phases for the proposed mining area. These wells should be capped now unless they are considered necessary for further monitoring purposes.

Table ?B
HZ Drill Hole and Well Completion Information

| Hole ID | Date Drilled | Drilled Depth ft msl (Depth from surface ft) | Completed Formation | Base of Hiawatha Coal Seam ( ft msl) | Screen Completion | Water Elevation Dec. 1995 |
|---|---|---|---|---|---|---|
| HZ-95-1 | 12/13/95 | 7,272.6 (1080) | Star Point Spring Canyon | 7331.6 | 7,277.6-7,287.6 | 7570.7 |
| HZ-95-1S | 12/5/95 | 8132.6 (220) | Blackhawk | NA | 8,101.6-8,110.6 | 8221.5 |
| HZ-95-2 | 12/5/95 | 7,146.3 (1200). | Star Point Spring Canyon | 7189.3 | 7,151.3-7161.3 | 7519.3 |
| HZ-95-3 | 10/28/95 | 7,427.6 (470) | Star Point Spring Canyon | 7477.6 | 7,432.6-7,442.6 | 7522.7 |

With the information provided from the HZ wells, the Applicant has constructed a piezometric map for the Spring Canyon Sandstone. The presented information suggests the Spring Canyon aquifer has a hydraulic gradient of 0.014 and an east southeast direction. The overlay of the potentiometric surface and elevation of the Spring Canyon Tongue was used to estimate the saturated portion of the coal formation. The Applicant indicates the Hiawatha coal may be saturated very soon in the mining operations. It should be noted that the coal itself may not be saturated and water that may occur in mine could be produced from the floor.

In building the potentiometric surface map, the Applicant has assumed maximum water level fluctuations of + or - 30 feet based on Skyline Mine well data from 1982 to the present. The intent in using this data for this purpose is not clear since mining has occurred at Skyline and the change in water levels may not be considered "baseline" information, therefore the use of this data may not be appropriate for the comparison presented.

The HZ wells all appear to be drilled near associated fracture systems. The location of these wells near fractures may influence the assumptions used in the potentiometric surface presented in Figure 7-2. Each well, if fracture influenced, may respond according to the behavior of the fracture feature and not the overall piezometric surface of the Starpoint.

For instance the piezometric surface elevation varies by 51 feet over approximately 4,000 aerial feet between HZ95-2 and HZ95-1, having an approximate 0.0128 feet/foot water surface gradient between those wells. If one looks further into the structural geology of the area it would be noted that the permit area sits between a WNW-ESE trending fault. A gentle NW-NE dip is associated with the Beaver Creek Syncline. The Beaver Creek Syncline axis trends and plunges to the north. Rocks dip 3-5 degrees on both limbs of the fold except where steepened by fault drag or fault displacement. The fold follows Beaver Creek drainage up to Section 8, T13 S R8 E where Beaver Creek diverges from the axis to the north east along a suspected fault zone. HZ95-1 appears to be located on the other side of the Beaver Creek Fault Zone. If the structural geology controls the piezometric surface such that the south side of the Beaver Creek Fault Zone has a piezometric surface somewhat separate from the north side, a gradient for the piezometric surface may occur on the south side of Beaver Creek in a north west direction.

Except for the HZ-95-1S well, the majority of the springs issue above the presented Piezometric surface of the Starpoint wells. This may indicate the Starpoint is not in connection with the fractures. However, the Applicant has not completed this well fully through the formation and there is some question as to whether lower sandstone tongues may have a greater connection with the fractures. Additionally, no lithologic or geologic logs are presented and the initial occurrence of water was not presented in the MRP. Water levels, other than the December value, could not be located in the MRP. Because many of the formations in this region are fairly slow to transmit water it is unknown if the well has reached equilibrium. Additional water level information should be presented to substantiate that the wells are at equilibrium. No pumping test data or drill logs are presented for these wells. Pump testing or other methods of determining the hydraulic conductivity of these wells would provide a great deal of necessary information on whether these wells were influenced by the nearby fracture zones. Logs of these wells should verify whether aquifers exist above the coal seam as identified by the presented LMC holes. Unfortunately it appears these wells are all completed in the upper tongue of the Starpoint and are not completed through the formation. The Applicant must provide the geophysical and lithologic logs and hydrologic conductivity (pump test data) for these wells.

The advantage to the location of these wells becomes critical should the mining operations intercept the related fracture system. These wells will be useful in determining the first year mining impacts. However, the Applicant's five year mine plan proposes to mine through the Beaver Creek Fault Zone and will also mine through well HZ95-1 eliminating the third point used to monitor the Starpoint piezometric surface. The Applicant will, therefore, need to supply an additional well for the proposed five year lease area. Since mining this area is not approved in this permit this request is a consideration for future baseline needs. There is a possibility the information would be necessary to complete the CHIA if additional information does not adequately describe the groundwater system. It is recommended that the additional well be placed on the north side of Beaver Creek and outside of the proposed mining area, within the graben but, away from a local fracture and be completed through the formation, in each sandstone tongue: not just the first tongue of the Starpoint. It should be noted that the Deficiency from the previous Blue Blaze mine proposal required the well be drilled through the formation in order to mine into the Hiawatha coal seam.

### *Previous Mining History*

According to the Applicant the Gordon Creek #2 Mine operated by BCCC in the Castlegate A seam received sporadic occurrences of groundwater inflow which dried in a short time period. The Gordon Creek #3 Mine operated by BCCC in the Hiawatha Seam (located east and down gradient of the permit area) received approximately 400 g.p.m. inflow when a 12 foot graben was encountered in the northeast section of the mine. Water was produced from the floor. When retreat mined later the area was dry as a result of previous dewatering or elevation differences upgradient of the mine. It was also deemed possible that groundwater stored in the fault zone did not have a significant recharge rate that maintained the flow.

The location and extent of all known abandoned underground mine workings within the permit area and adjacent area are not shown on Plate 3-3. This information is critical to the development of the PHC and the CHIA.

### *Springs*

The PAP indicates baseline reconnaissance information was gathered in the field with an Oil, Gas and Mining employee named Darin Woden from 1988 to 1990. Other information was derived from state and federal published open file reports. A complete spring and seep survey in the proposed permit and adjacent area was not conducted. Currently the PAP does not contain a map showing spring locations in the permit and adjacent area.

The baseline sampling information is gathered form springs which issue from the Blackhawk Formation and were characterized as Calcium Bicarbonate type waters.

Table ?
Baseline Spring Sampling Summary

(Summary of information from Plate 7-1, Figure 7-3 and Sections 7.1.3, 7.1.5 and 7.2.6)

| Sampling Point | Monitoring History | Location (Formation) | Water Quality | Water Quantity | Comments |
|---|---|---|---|---|---|
| SP-1<br><br>1989 to present | Station #1<br>1989 through 1993 | Issues from Hillside and flows into Jewkes Creek (Blackhawk Sandstone unit above coal seams 8195 ft msl.) | TDS 230-330 mg/l<br><br>pH 7.5 - 8.5 | Late Spring 10-15 gpm<br>High flow on 5/89 was 45 gpm<br>Late Summer/Fall 5 to 6 gpm | |
| SP-2<br><br>1989 to present | Station #2 1989 through 1993 (This description matches the station number 1 previously; Channel in North Fork of Gordon Creek.) | Issues from Hillside and usually flows approximately 100 feet (Blackhawk, 8005 ft msl) | TDS 480-540 mg/l<br><br>pH 7.5 - 8.5 | Flow in Late Spring 1-2.5 gpm<br>Flow in Late Summer/Fall <1 gpm Dry 7/1991, 8/1991, through 12/1992 | Spring flows through alluvium below the point of origin. |
| SP-4<br><br>1989 to present | #4<br>1989 through 1993 | Jewkes Creek Drainage flows along road empties into Jewkes Creek (Blackhawk, 8102 ft msl) | TDS 350-480 mg/l<br><br>pH 7.5 - 8.5 | Flow in Late Spring 1-2.25 gpm<br>Flow in Late Summer/Fall <1 gpm | Location not clearly mapped |
| SP-6<br><br>1989 to 1995 | #6<br>1989 to 1995 | Upstream from the proposed mine portal (Blackhawk) | N/A | dry from 1989 through 1995 | This location is not a spring and will not be included in future monitoring |
| not found | Gunnison Homestead Spring/Tributary to Beaver Creek near confluence of spring discharge channel and Beaver Creek | (Blackhawk) | not discussed | 3-136 gpm the 136 gpm included snowmelt runoff. | Location removed from Figure 7-3 |
| SP9 | Jewkes Spring U.S.G.S. 1979-1983 Station 2-5-W Beaver Creek Coal Company 1985-1995 | Near Beaver Creek Channel, south west corner of proposed LOM permit area. (Blackhawk, 8550 ft msl) | TDS 240-300 mg/l<br><br>pH 7.5 - 8.5 | Typical Late Spring flow 20 to 60 gpm decreasing late fall 1.10 to 38 gpm (Maximum flow on 7/85 was 1372 gpm considered inaccurate) | Location mapped on Figure 7-3 Information on flow discussion in Section 7.2.2.2 varies from Section 7.1.2.2 |

In Section 6.4.2 the Applicant has indicated a series of springs in the North Fork of Gordon Creek in the north west corner of Section 18 T13S R8 E may be related to faults bisecting the area. The North Fork drainage may have formed subsequent or contemporaneously with the movement along the Gordon Creek Fault Zone.

The Applicant has stated the Homestead Spring is one of the main contributing springs to Beaver Creek. However, the Applicant has not included this spring in the baseline or operational monitoring regime. The Applicant has identified this spring as important to Beaver Creek flows, but has not indicated why the spring should not be part of a sampling point (i.e.; why is this spring considered outside the zone of potential impact?).

*Groundwater Quality*

Two water quality samples were collected in the Blue Blaze No. 1 Mine workings, one in May 1992 and one in November 1995. The water was determined to be a calcium bicarbonate type with TDS ranging from 414 to 452 mg/l and pH from 6.8 to 7.66.

Groundwater collected from the HZ wells in December 1995, November 1996, and January 1996 may have been somewhat affected from the foam drilling fluid used during installation. Data analyses indicate TDS ranged from 380 to 680 mg/l. Due to the potential effects from the foam drilling additional water quality data is necessary.

**Surface-Water Information.**

The Horizon Mine lies within the headwater streams of the Price River Basin. Major drainages within the permit and adjacent area are; Beaver Creek north of the mine site, and the North Fork of Gordon Creek and Gordon Creek south of the mine site. The disturbed area drains into the North Fork of Gordon Creek. The State Division of Water Quality classifies Gordon Creek as Class 3C and Class 4 waters. These classifications are designated as; non-game and aquatic life, and agricultural uses, respectively. Beaver Creak, located over the future proposed mine workings, is classified as 1C and 3A, designated as domestic and agricultural uses respectively. Down stream of the proposed disturbed area in Gordon Creek there are fisheries. Information on the fisheries is lacking in the plan. For further discussions see the **Fish and Wildlife** sections in this TA.

Drainages adjacent to the proposed disturbed area are named for referencing purposes as shown on Plate 7-4. The following designated names are assigned for the drainages flowing through the proposed disturbed area:

1) Jewkes Creek - the main drainage through the site which joins the North Fork of Gordon Creek's main stem at the southern boundary of the permit area.

2) Portal Canyon - this drainage is the first drainage entering from the west after crossing the permit area boundary and joins Jewkes Creek. The portal entries are located in this drainage.

3) Spring Two Canyon - is the second drainage entering from the west after crossing the permit area boundary and joins Jewkes Creek. This

drainage is upstream of the disturbed area.

Streams within the permit area receive their maximum flows in late spring and early summer as a result of snowmelt runoff. Flows decrease significantly during the autumn and winter months. Jewkes Creek has experienced no flow during the winter and late summer months.

Beaver Creek is a perennial stream with base flow maintained by seeps and springs. Beaver ponds are common in Beaver Creek and also play a part in providing perennial flows. Springs contributing to base flow include the Gunnison Homestead Spring, within one mile west of the proposed additional lease area, and Jewkes Springs one mile west of the permit area near the north west corner. Discharges from these springs vary between 3 to 136 gpm and 1.1 to 38 gpm respectively.

The USGS maintains a gauging station (09312700) near the mouth of Beaver Creek several miles northeast of the permit area with a period of record from 1960 through 1989. The minimum annual discharge for this period was 338 acre feet in 1961. The maximum annual discharge of 1,610 occurred in 1973. The average annual discharge for the 29 year period of record was 3,310 acre feet. Decreases in downstream flow are observed in Beaver Creek between monitoring stations SS-7 and SS-8. The decrease is most prevalent during the low flow season. This loosing stream section may occur due to either alluvium, fracture and fault systems or other unknown factors.

The Applicant discusses the annual variability of flow in Beaver Creek. Although there is annual variability, the variability in base flow related to snowfall and possibly spring run off would provide more significant information. Snowmelt survey and precipitation information, where available, should be used to compare annual base flow changes with the precipitation rates.

Jewkes Creek drains a watershed area slightly greater than 1 square mile and discharges to the North Fork of Gordon Creek. The Applicant has referred to this stream as intermittent. The flow data submitted indicate that normally the creek flows all year at Sampling Point 5, but becomes intermittent at Sampling Point 3. The flow diminishes in a downstream direction beyond sampling point SS-5, infiltrates into the alluvium and does not reappear immediately downstream according to information in the PAP. Water may reappear one half mile down stream in the North Fork Gordon Creek where the Mancos shale outcrops. A potential reason for the diminished flows in this area may be due to recharge of subsurface soils in the riparian area near this monitoring site. Characterization, by collecting water quantity data and by observation in the North Fork of Gordon Creek, to determine whether this stream re-emerges as constant flow downstream should be made.

The North Fork of Gordon Creek flows along County Road 290 southeast of the permit

area. The elevation of the creek is lower than the Hiawatha coal seam. The Applicant suggests the mining of the Hiawatha would not affect the quantity or quality of flow in the North Fork of Gordon Creek. However, the Applicant has shown the Spring Canyon Aquifer below the Hiawatha coal seam contains water and mining might reduce the piezometric water elevation potentially affecting the surface water in this stream. Discharge from the Starpoint aquifer to this stream section should be determined. Loosing and gaining reaches in this section of the stream should be identified.

The proposed Five Year Mine Plan as shown on Plate 3-3, illustrates a proposed lease area to the north and east of the currently designated permit area. The surface water descriptions and baseline information for the permits adjacent area have not been presented. The Applicant's future mining operations are proposed to take place under Sand Gulch and an unnamed drainage to the north. No baseline information was collected for this area. In addition, Plate 3-3 shows the major fault systems which run northeast and southwest of the proposed mine operations. This fault system should be used to describe the geologically defined adjacent area. The graben and fault system appears to extend all the way up to Jump Creek. Additional baseline information will be necessary to permit this site in the future and may be necessary to complete the CHIA. Further baseline sampling should focus on the springs and surface waters potentially impacted through intercepting water from faults and fractures and diverting. Baseline information should extend to Jump Creek until adequate information is supplied to the Division to consider Jump Creek outside of the adjacent area.

Table (?)
Baseline Surface Water Sampling

| Sampling Point | Location | Flow | Water Quality | Comments |
|---|---|---|---|---|
| #3<br>1993 through 1995 | Channel in Jewkes Creek /below disturbed area upstream of the intersection with the North Fork of Gordon Creek and below the surface facilities. | Intermittent | TDS 388 to 799 mg/l.<br>Total Fe <0.02 to 8.7 mg/l<br>Total Mn <0.01 to 0.05 mg/l<br>TSS <1 to 72 mg/l<br>pH 6.25 to 9.5 | Information presented in the text does not match the data in appendices |
| #5<br>1993 through 1995 | Jewkes Creek upstream of disturbed area but downstream of the confluence with Spring Two Canyon. | Perennial | TDS 198 to 550 mg/l.<br>Total Fe .05 to 3.9 mg/l<br>Total Mn 0.05 to 1.0 mg/l<br>TSS 1 to 245 mg/l<br>pH 6.7 to 8.99 | Information presented in the text does not match the data in appendices |

| Sampling Point | Location | Flow | Water Quality | Comments |
|---|---|---|---|---|
| #6 1991 through present | Right Fork North Fork Gordon Creek In the east Drainage above proposed portals and disturbed area | Ephemeral | Removed from proposed monitoring schedule. Samples were never obtained. | This should be monitored on the same day as sites 3 and 7 when sampling during a precipitation event or snowmelt period |
| #7 1991 through present | Beaver Creek above pond upstream of the proposed future permit area outside of potential subsidence zone?. | Perennial | TDS 216 to 353 mg/l. Total Fe 0.05 to 5.19 mg/l Total Mn <0.1 to 0.19 mg/l TSS <1 to 297 mg/l pH 6.0 to 8.54 | Beaver Creek tends to have a lower TDS than Jewkes Creek. |
| #8 1991 through present | Beaver Creek station downstream, does not appear to be downstream of potential impact area for future mine plan.(see Plate 3-3 and 7-1). | Perennial | TDS 192 to 357 mg/l. Total Fe <0.02 to 1.3 mg/l Total Mn <0.01 to 0.078 mg/l TSS 4.0 to 52 mg/l pH 6.6 to 8.69 | Flows tend to be lower than the upstream Beaver Creek station. Located near the Fault system. |
| 2-2-W | Gordon Creek above confluence of North Fork Gordon Creek below the Hiawatha | Perennial | Not discussed. | Impact more likely to be below confluence because of fracture system. |
| 2-3-W | Beaver Creek | Perennial | Not discussed | Monitored by Beaver Creek Coal . Not found on any map |
| 2-4-W 1982- | Beaver Creek 1 -1/2 mile west of permit area | Perennial | Not discussed | Monitored by Beaver Creek Coal |

The Applicant has not adequately discussed the variation in the data presented as baseline information. Data presented in the text does not reflect data presented in the appendices.

**Baseline Cumulative Impact Area Information.**

A cumulative impact area assessment is being conducted by the Division. Currently there is not enough information in the plan to definitively determine the adjacent area associated with proposed surface mining activities.

**Modeling.**

No specific modeling was presented.

**Alternative Water Source Information.**

In Section 7.1.6 the Applicant purports no significant impacts are foreseen to ground water as a result of mining in the permit area. In Section 3.4.3, page 3-18, the Applicant states, "As noted in Section 7.1.6, alternative sources will be developed and provided if water rights or uses are affected by mining operations", however, no discussion on alternative sources were presented in this section. Section 3.4.3 states, "Should Horizon's mining activities cause an adverse impact on the areas water supply, the Applicant intends to mitigate the effects. The mitigation will be negotiated between Horizon and the injured party".

Because "Alternative Water Source Information" applies to Surface Mining and Reclamation activities under R645-301-727 there are no requirements under this regulation as it applies to underground mining. However, the Applicant is required to notify the Division of Oil Gas and Mining when analysis of any ground-water or surface water sample indicates non compliance with the permit conditions, which include the performance standards under 752.220 through 752.250. The Division of Water Rights and other agencies may also request notification should a water use be disrupted.

Information provided in the PAP indicate the water rights applied for are a leased right and not an acquired right. Therefore, the Applicant would not be able to replace a right with these sources should diminution or quality of a water right be impacted through mining activities.

In the MRP, Section 3.4.3, the Applicant should remove the reference to discussions found in Section 7.1.6, regarding replacement of water rights, since there are no such discussions. The Applicant should cross reference Section 3.4.3, which describes the actions to be taken should loss of a water right use result from mining activities under Section 7.1.6 in order to provide a clear plan. The requirements under R645-301- 731.223 and 731.212, should be addressed. The Applicant should provide a plan which clarifies who will be notified should it be known that a water resource has been impacted by mining activities

**Probable Hydrologic Consequences Determination.**

*Acid- and Toxic-Forming Material*

*Operational Monitoring and Identification of Acid and Toxic Forming Materials*

The Applicant has not provided a specific discussion for the potential for acid and toxic forming materials under the Probable Hydrologic impacts. However, the Applicant provided the following in other sections of the plan:

1) Disposal of waste rock from partings and splits will be in underground workings. No acid or toxic forming materials are present in the overburden or

underburden for samples analyzed (Section 6.5.7.1), suggesting no acid or toxic forming materials will be in the partings. The waste rock will be backfilled and compacted after second mining subsidence occurs and the waste rock will not be saturated, thus, water quality would not be impacted (Section 3.3).

2) If underground waste cannot be blended, sold, or gobbed, arrangements will be made to dispose of this material in permitted refuse piles at a nearby mine.

3) Noncoal waste rock from initial development will be incorporated as fill in the mine yard (Section 3.3).

Table 6-5 summarizes the quality of the Hiawatha Coal seam. The acid base potential of each of the three coal samples collected from the HZ-series holes indicate the coal has a potential to be acid-forming (Section 6.5.6). Coal will be stored on the surface for short periods and run off from the coal stockpile will be routed through the sedimentation pond where it will mix with run off water that is more alkaline.

Tests for acid and toxic forming materials were conducted on roof and floor samples in LMC-4 and HZ drill holes. One sample contained a high pyritic sulfur content of 0.24 percent. The Applicant suggests this pyritic sulfur content is likely of limited areal extent. This information conflicts with the statement in Section 6.5.7.1.

In Section 6.5.6, the Applicant has presented analysis from a core sample of the coal obtained from the Hiawatha Seam, drill hole LMC-4. The presented analyses has a sulfur content of 0.47% of which 0.04% is Pyrite Sulfur with Marcasite, 0.038% Pyrite and 0.002% is Marcasite.

All of the coal will not be removed from underground. Much of this coal will be in contact with air and water during the mining operations and may cause a lowering in the pH of those waters. Currently water from the old Blue Blaze No.1 Mine workings are shown to have a pH of 6.8 to 7.66. In general, these are lower than the surrounding area pH values.

Acid forming discharges have been uncommon and are generally not regionally extensive. Should the presence of pyrite in the mine area cause a decreased pH locally the mixing with higher pH waters in the system would result in localized affects due to downstream buffering.

Where material is trucked to permitted refuse piles at a nearby mine, the acid and toxic characteristic of this material should be known at the permitted mine receiving the waste.

***Potential Groundwater Impacts***

The Applicant indicates inter basin transfer out of the Price River drainage cannot occur

in this region. However, inter basin transfer between Beaver Creek and Gordon Creek could occur. Because the coal seams dip away from the portal entrance, flow is likely to be sumped underground and could be directed toward the fault systems to the northwest, however, the Applicants information indicates the Piezometric surface for the Starpoint regional aquifer is to the east southeast. Flow will occur in the direction influenced by the prevailing geologic controls which are not definitively known at this time.

The control of faulting on groundwater flow can be seen by comparing the potentiometric surface map to the geologic structure. The Applicant indicates that due to low permeability, and due to the plan to avoid mining into faulted zones, in flow to the mine from faulted zones is projected to be minimal (Section 7.1.2.2). Discussions on how the faults will be avoided were not presented.

The Applicant has concluded that the Hiawatha coal seam will be saturated from the beginning of mining operations. The rate of inflow will depend primarily on whether a faulted zone is encountered that contains groundwater in storage or that is in connection with an overlying perched aquifer. Although the possibility of a significant sustained inflow occurring is probably low to moderate, the actual potential impact from intercepting a fracture reservoir and depleting or intercepting the flow is moderate to high. A resulting loss of head could disrupt stream and spring flows and possibly recharge the fracture zone down dip to the north east or in the direction of regional flow to the east southeast. Changes in quantity and quality to spring and surface water discharges associated with the faults could be the result.

Waste rock from the mining procedure is proposed to be gobbed underground and backfilled. Because the materials will have an increased surface area due to removal the potential impacts, should water and air come in contact with the materials, would be increased TDS (ions in solution) and potential acid and toxic formation. Data from a recent underground mine water sample from the No. 1 Mine is found in Chapter 7 and may be indicative of some potential water quality changes. See the section above on **Acid and Toxic Forming Materials** in this TA.

Section 3.3.1, Plate 3-3, does not show all known and existing mine workings in the permit and adjacent area. These areas are critical to supporting documentation regarding the Probable Hydrologic Consequences of mining as it might relate to other mines v.s. the proposed Horizon Mine. The operator must include this information in the plan for all seams and mining in the permit adjacent area.

The Applicant states, "It is not anticipated that large quantities of ground water will be encountered throughout the duration of mining". The Division believes the potential for impact increases, if water is intercepted by mining through paleochannels associated with fractures, or a water bearing fault/fracture system is intercepted by mining activities. The potential for impact appears to be highest if fracture associated flows in the Hiawatha Seam are intercepted

as occurred in the Beaver Creek Coal Mine.

The Applicant has estimated the "worst case" potential inflow through a porous formation (exclusive of fracture flows) to be 2.6 $X10^{-4}$ and to have an average potential inflow of $1.5X10^{-4}$. Or, a flow rate of 9 and 5 gpm per section. Assuming six sections the total potential inflow would vary between 30 and 54 gpm. This information assumes a worst case scenario between 270 to 130 feet of head. Therefore, the potential is that a decrease of head in the Starpoint aquifer of between 270 and 130 feet could occur over time. The extent to which this affects the adjacent area is limited to the interaction of the members along the fault zones and determination of discharge areas. The aquifer may be dewatered within the graben with out interaction with the fracture/fault related waters or, may affect the waters associated with the fault system.

***Potential Surface Water Impacts***

On page 7-22, the Applicant states that proposed mining operations will occur north of Gordon Creek and should not effect the quantity or quality of water in this drainage. However, it was noted that approximately 400 g.p.m. inflow was produced from the floor when mining the Hiawatha Seam. This information, along with the dewatering estimates discussed above under the *Potential Groundwater Impacts* of this T.A., indicate there may be a potential to intercept groundwater flow from below the Star Point below the Hiawatha Seam. This flow interception could impact base flow to Gordon Creek, or relocate the source of the flow. Supporting information can be determined by assuming the control point for the piezometric surface would likely be at the elevation related to the dip. With a dip of 5.3% to the northwest an outcrop elevation of approximately 7,600 and a maximum linear distance down dip of 5,000 feet the zone of influence most likely to be impacted below the Hiawatha Seam would be from approximately 7,600 ft to 7,335 ft. This is also within the range of the piezometric surface of 7,500 and is in the general direction of the assumed groundwater flow. Water quantity, water quality, and loosing and gaining sections for reach segments should be determined for Gordon Creek above and below this section. A continuous recording flume is recommended for operational monitoring if the characteristic of the stream is determined to be potentially impacted.

The Applicant indicates the water associated with the Beaver Creek Coal Company No. 3 Mine is believed to be in communication with Beaver Creek and will be avoided when mining the proposed Horizon No. 1 Mine. Avoidance will occur by closely monitoring the activities in the fault area. The Applicant has not demonstrated why they believe the communication with Beaver exists and has not provided a monitoring plan which addresses this potential impact.

***Subsidence Control and Renewable Resource Protection***

The Stream Buffer Zones will be maintained beneath Beaver Creek and the North Fork of Gordon Creek should mining proceed beneath either creek (Section 3.3.2.2).

The proposed stream channel buffer zone is shown on Plates 3-1 and 3-3. Retreat mining will not occur under those areas shown to be within the buffer zone. A discussion on the width of the buffer zone was not found. The Applicant has stated that mining is designed to preclude subsidence of perennial and intermittent steam reaches. Specifics to the statements regarding these buffer zone areas could not be located. However, comments made by the Applicant suggest that massive sandstone units make it unlikely that subsidence will reach the surface, and swelling shales in the overburden would have a tendency to heal fractures.

According to the Applicants subsidence plan a measurable subsidence effect would include a marked decrease in flow of 30%. In order to determine whether a marked decrease in flow occurred frequent monitoring would be required. The Applicant should describe how the monitoring plan monitors for this potential impact.

The Applicant suggests the following reasons indicate potential for damage due to subsidence will be low because no noticeable mining subsidence has occurred in the Gordon Creek #2 area (mined over 40 years ago) and in the Consumers No. 3 Mine, Section 3.2.3. The following areas were previously mined beneath Beaver Creek

- Swisher Coal Company mined under Beaver Creek in the northern most west panel of the Castle Gate "A" seam in January 1978. Overburden is approximately 650 ft.

- Beaver Creek Coal company mined under Beaver Creek in the "A" panel in September 1981. Overburden was approximately 425 feet.

The Division has received a Public Complaint that suggests subsidence has occurred in areas of Beaver Creek. This concern is under further investigation. The Applicant states that during previous mining in the area no documented indications of significant mining related flow depletions were evident. No data reference supported this statement.

Although longwall mining subsidence occurs immediately following mining, room and pillar subsidence may not occur for a long period of time. The proposal to monitor subsidence annually for two years following cessation of mining is probably adequate for determining immediate subsidence response. However, prior to bond release the lack of, or presence of, subsidence should be confirmed.

Statements in the PAP indicate that if significant inflow of groundwater occurs mitigation measures may include; attempts to seal the inflow, increased monitoring program, lining the stream bed through an effected area, and replacement of water, should it be indicated through monitoring to be mining related (Section 3.4.8.2). In Section 3.4.8.4, the Applicant

commits to notify the Division in writing and begin implementation of the approved mitigation plan if adverse impacts to Beaver Creek are noted as a result of mining. The Applicant will be encouraged to complete short term mitigation measures such as sealing the flow from in the mine. However, Division notification should occur as soon as possible and coordination with concerned parties may be necessary prior to approval of a site specific mitigation plan.

### *Water Use*

"Water will be pumped from the North Fork of Gordon Creek into the mine for use in dust abatement". Based on the predicted inflow information the Applicant has estimated approximately 31 acre feet per year will need to be pumped into the mine, while it is estimated that 41 acre feet will be removed with the coal each year. The water rights applied for by the Applicant exceeds the predicted water needs.

### *Sediment Yield*

The potential for increased suspended solids and sediment loading to Gordon Creek is probably highest during the construction phase of operation and reclamation. The Applicant has committed to monitor for turbidity of the water upstream and downstream of the site during the construction phases. A criteria for Class 3C allows a turbidity increase of 15 (NTU).

Increases in sediment during the operational period will be minimized through the use of a sedimentation pond and drainage controls. The Applicant has also committed to store snow in sites that will directly drain to the sedimentation pond (Section 3.3). During the reclamation period it is not clear whether alternate sediment control measures or sedimentation pond measures will be used.

### *Surface Water Quality*

Currently coal mining waste may exist near Test Pit No. 8. This waste (potentially 9,718 cubic yards) is proposed to be stockpiled adjacent to the coal stockpile and blended (Section 3.3.2.7). The Applicant has stated that if acid and toxic materials remain on site they will be buried by 4 feet of cover. Currently water moves through the fill and seeps toward Jewkes Creek. The water quality of this site is likely to be improved with the proposed reclamation measures.

The Applicant should provide a discussion on potential changes in water quality based on data obtained from the Blue Blaze in mine waters. Based on impacts from other mining operations the potential for increased TDS is likely in the permit area. The Applicant sites downstream increases in TDS when flowing over Mancos as a factor in considering impact as minimal. Because downstream waters are naturally degraded the use and quality of the upstream waters retains its importance. However, impacts to downstream waters would probably not be notable.

The road to the mine is maintained as a gravel road therefore the use of road salting is not likely to affect water quality.

*Hydrocarbons*

Horizon Coal indicates Diesel fuel, oils, greases and hydrocarbon products will be stored above-ground and may be spilled in the mine and on the surface during mining operations. An above ground 5,000 gallon diesel fuel tank will be located between the coal stockpile and the truck turn around as indicated on Plate 3-1 (review plate for proximity to surface water). A shop maintenance area will be located next to the mine office area.

The Applicant proposes the berm surrounding the tank will be adequate to contain the total volume of the tank, in the event water needs to be drained from the berm. The Applicant indicates spills will be handled in accordance with the Spill Prevention and Contamination Control (SPCC) Plan. This plan is provided in draft form without a certified signature in the PAP under Appendix 7-8. Elements of the plan include:

- Visual inspection of all tanks, associated valves piping and containment areas
- Notification to the Mine Manager and containment of the spill
  Reporting requirements for spills
- Procedures for preventing spills during filling tanks.
- A copy will be maintained on file in the Mine Manager's Office and the Mine Engineer's office.

The Applicant's proposal uses accepted practices for their SPCC plan. The Applicant should include clean up procedures for small scale spills, commit to retain absorbent materials on site and, should provide either a concrete containment structure with a drain or provide for disposal and sampling of the earth material below the fuel tanks and areas of hydrocarbon use.

The Applicant can provide additional reasonable operation measures to minimize hydrologic impacts on and off the permit area.

*Flooding or Streamflow Alteration.*

The Applicant discusses the potential for flooding as being diminished due to the sedimentation pond reducing peak flows. In addition to the Applicants comments, it is likely that the water flowing through the culvert will have increased flow velocity over the natural velocities for the same discharge rates. A potential impact includes downstream erosion. The Applicant has provided riprap channel designs for the velocities than may occur from a 100 year- 6 hour event which meets the minimum regulatory requirements. Other potentials for streamflow alteration are discussed under Potential Surface Water Impacts and Potential

Groundwater Impacts.

**Findings:**

The plan does not fulfill the requirements of this section.

The Applicant must provide the following, prior to approval, in accordance with the requirements of:

**R645-301-114.100**

The Applicant must: 1) include in the plan information which demonstrates the right to the proposed water use(s) related to mining activities is granted prior to their use.

**R645-301-724**

The Applicant must: 1) provide a table of the baseline parameters monitored; 2) commit to collect baseline parameters every fifth year prior to permit renewal, at low flow, as indicated in the Division water monitoring guidelines; 3) Include in the plan a summary which gives the starting and termination dates of all actions taken pursuant to baseline accusation, (this summary should include a discussion of the changes made in baseline acquisition and the time period in which baseline data was gathered according to those parameters); and, 4) identify the adjacent area for the hydrologic balance based on potential surface and ground water impacts which include geologic controls on groundwater.

**R645-301-724.100**

The Applicant must: 1) provide additional water level information to substantiate that the HZ wells are at equilibrium; 2) provide the geophysical and lithologic logs and hydrologic conductivity (pump test information) for these wells and include applicable discussions in the text; 3) provide additional water quality information, without the affects of the drilling fluid, to characterize the baseline water quality of the HZ wells; 4) provide a map showing spring locations in the permit and adjacent area; and, 5) describe why the Gunnison Homestead Spring is considered a source spring for Beaver Creek but, is not included as a monitoring site, or describe why the spring is not within the potential impact area,

**R645-301-724.200**

The Applicant must: 1) demonstrate, to the satisfaction of the Division, that the North Fork of Gordon Creek, Sand Gulch, the "Unnamed Tributary" to Beaver Creek and Jump Creek will not be affected, in the quantity or quality of flow, by mining operations or provide baseline and operational water monitoring plans for these surface waters; 2) clarify by observation and quantitative monitoring whether the intermittent flow at surface station number 3 reemerges as perennial flow downstream; and, 3) provide for the installation of additional

baseline surface water stations with continuous recording flumes on the North Fork of Gordon Creek, Jewkes Creek and Beaver Creek unless it can be demonstrated to the Divisions satisfaction that the proposed monitoring is adequate to determine impacts to these streams.

**R645-301-728**

The Applicant must: 1) provide a finding in the PHC or reference applicable portions of the text to address whether acid- and toxic-forming materials could result in the contamination of surface or groundwater, and whether adverse impacts may occur to the hydrologic balance; 2) correct the statement contained in Section 6.5.7.1. to reflect the information regarding roof and floor material where a sample contained a high pyritic sulfur content; and, 3) provide the location and extent of all known abandoned underground mine workings within the permit area and adjacent area.

**R645-301-731**

The Applicant must: 1) correct Section 3.4.3 of the PAP, there is no discussion found in Section 7.1.6 regarding replacement of water rights; 2) provide a cross reference to Section 3.4.3 under Section 7.1.6, so the plan is clear and accurate in describing the actions to be taken should loss of use of a water right result from mining activities; 3) provide a plan which clarifies whom will be notified should it be known that a water resource has been impacted by mining activities as required under, R645-301- 731.223 and 731.212 (specifically R645-301-145); 4) provide a discussion in the PHC on potential changes in water quality based on data obtained from the Blue Blaze in mine waters; 5) provide a certified copy of the SPCC Plan and include clean up procedures for small scale spills, a commit to retain absorbent materials on site, and provide either a concrete containment structure or provide or other methods for disposal and sampling of the earth material below areas of hydrocarbon use that prevents surface and ground water impacts; 6) provide a discussion on the width of the buffer zone for perennial and intermittent streams that may be mined under and provide specifics on how mining is designed to preclude subsidence of perennial and intermittent steam reaches; 7) provide data to support the statement that indications of significant mining related flow depletions were not evident for previously mined areas; and, 8) commit to immediately notify the Division and other concerned parties, and obtain approval for site specific mitigation plans prior to completing final mitigation measures if impacts occur to perennial or intermittent streams due to mining activities.

**R645-301-731.200**

The Applicant must: 1) clarify how groundwater and surface water monitoring will be used to determine the impacts of mining operations on the hydrologic balance; 2) include a description indicating how water monitoring of Beaver Creek will be used to determine whether a marked decrease in flow occurred due to subsidence or intercepted flows from fracture/fault

systems; and, 3) provide the description on how operations will be conducted to minimize interception of water bearing faults/fractures, based on the potential to mine into faults/fractures.

**R645-301-731.220**

The Applicant must: 1) clarify the purpose of proposed monitoring sites identified in Sections 7.2.2.2 and 7.2.2.3 which conflict; and, 2) provide the location of the NPDES pond discharge monitoring point on the monitoring map.

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

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

**Analysis:**

### Mine Workings Maps

Add to Engineer's analysis

The location and extent of all known abandoned underground mine workings within the permit area and adjacent area are not shown on Plate 3-3. This information is critical to the development of the PHC and the CHIA. See the discussions under the **Environmental Description** under the **Hydrology** heading in this T.A.

### Monitoring Sampling Location Maps

Add to Engineer's analysis

Surface water monitoring stations are included on Plate 7-1. However, the Applicant has not included the UPDES monitoring station. See the discussions under the **Environmental Description** under the **Hydrology** heading in this T.A.

### Ground Water Resource Maps

Add to Engineer's analysis

Surface water resource information on the locations of springs in the permit and adjacent area are missing. See the discussions under the **Environmental Description** under the **Hydrology** heading in this T.A.

# OPERATION PLAN

## MINING OPERATIONS AND FACILITIES

**Regulatory Reference: 30 CFR Sec. 784.2, 784.11; R645-301-231, -301-526, -301-528.**

**Analysis:**

Replace in engineers analysis if not updated.

g) Diversions - Undisturbed diversions will be placed on the boundaries of the main pad area. A bypass culvert will take undisturbed drainage from the main drainages upstream of the disturbed area, and empties it into the Jewkes Creek. Disturbed drainage ditches pass water to the Sedimentation Pond

k) Sedimentation Pond - Runoff from the entire Horizon site will go to a single sediment pond. This pond will be located just east of the Main Access Road about 800 feet from the mouth of the canyon.

The sediment pond will be of combined incised/embankment construction, with approximately 2H:1V side inslopes, and is designed to contain the runoff from a 10-year, 24-hour storm. The total design capacity is 2.3 acre-feet, which consists of a minimum runoff capacity of 0.82 acre-feet and a maximum sediment capacity of 1.45 acre-feet. The 60% sediment cleanout volume of the pond, the level of which will be marked on a post placed permanently in the pond, is 0.88 acre-feet at 7,574.0 feet.

The pond inlets and the emergency spillway will be designed as nonerodible open channels lined with riprap. No designs for filter blanket is included the pond inlets and will channel design. The emergency spillway will be 2.3 feet deep and 10 feet wide, with 2h:1v side slopes, the discharge capacity is 131 cfs and will pass the 7.73 cfs peak flow from a 25-year, 6-hour storm with 2 feet of freeboard, measured between the peak flow elevation and the pond embankment.

The pond decant line will consist of 2-inch pipe with a lockable inlet valve. The inlet valve will located at 7,576.0 feet, a point 2 feet above the level of the 60% sediment cleanout volume and 5 feet below the elevation of the emergency spillway. The inlet valve will be opened to decant the pond 24 hours after a storm and will remain locked at all other times.

The Applicant has analyzed the pond embankment designs for stability, and this analysis is found in Appendix 3-3--Static Safety Factor Calculations. Using a standard, circular failure model and the Hoeck Circular Failure Charts, the Applicant has found that the pond embankments, which will have a maximum slope of 2h:1v, will have a static safety factor of 4.81 for dry conditions and 4.44 for saturated conditions.

The sediment pond will be inspected at the end of construction and yearly thereafter by a professional engineer. The professional engineer will promptly, after each inspection, provide to the Division a certified report indicating that the sediment pond has been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules, as required by R645-301-514.310. The annual pond inspection report will be submitted to the Division with the full Annual Report.

In addition to the certified inspections, the pond will also be inspected quarterly by a registered professional engineer. A copy of the report on these quarterly inspections will be complied, recognizing any appearance of structural instability or other hazardous condition, as required by R645-301-514.330.

## 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:

Soils at the site tend to be silty clay loam to loam within the Shupert-Winetti Complex and gravelly loam to loam within the Brycan, Rabbitex, Senchert and Curecanti Series. The SCS information the use of hydrologic groups B and C (undisturbed soils) are considered adequate. In cases where the soil phases were in group B or C the Applicant used group B.

The Applicant has used a CN of 89 for the undisturbed areas. This number is adequate at this time. However, should the Applicant propose additional buildings, road surfacing or pad surfacing the design CN would require re-analysis. The Applicant used a CN of 70 for the additional areas draining to the pond considered "undisturbed" by the Applicant. Some of these areas are disturbed from previous mining operations.

### Water Rights/Water Use

Water for non-culinary use will be obtained primarily from Sweet's Pond. Culinary water will be obtained from the Price River Water Improvement District, hauled to the site and stored in an above ground storage tank designed in accordance with applicable Utah Department of Health regulations. Plans will be submitted for approval prior to construction.

Sweets Pond and the pump facilities at Sweets Pond are the only existing structures used in connection with or to facilitate the proposed coal mining and reclamation operation at this site. Pump facilities associated with Sweets Pond and the pond itself may be considered leased rights and may be excluded from bonding requirements. The Applicant must clarify whether it

is intended to be part of the permit area or not.

Sumps will be provided underground to store water during periods of excess availability.

**Groundwater Monitoring.**

Table 4
Operational Spring Water Sampling

| Sampling Point | Location | Formation | Monitored Frequency | Water Parameters | Comments |
|---|---|---|---|---|---|
| SP-1 | Channel in North Fork of Gordon Creek/Marakis spring | Blackhawk sandstone unit above coal seams | Quarterly (when accessible) | Flow/ Parameters Table 7-2 | Spring sampling should be done at source when at base flow. Location relative to numerous springs in area is not identifiable on map. |
| SP-2 1989 through 1993 | Right Middle Fork North Fork Gordon Creek Hillside out of Creek Bottom | Blackhawk | Quarterly (when accessible) | Flow/ Parameters Table 7-2 | Spring flows through alluvium below the point of origin. |
| SP-4 1989 through 1993 | North Fork Gordon Creek Drainage bottom | Not presented | Quarterly (when accessible) | | |
| SP-9 | | | Not discussed | | |

Table 5
Operational Groundwater Sampling

| Sampling Point | Location | Frequency | Water Quality Parameters | Water Quantity | Comments |
|---|---|---|---|---|---|
| Sustained in mine flows as close to point of issuance as possible | where exceeding 1 gpm for at least 30 days | Quarterly while accessible | Identified in Table 7-2 | yes Table 7-1 | 2 year review period |
| Discharged mine water | If necessary treated in underground sumps or the Sedimentation Pond. Currently not expected and not a permitted activity. Will need permit approval if it occurs. | In accordance with permit. | In accordance with permit. | In accordance with permit. | Should be conducted in accordance with UPDES permit according to emergency discharge clause. |

| Sampling Point | Location | Frequency | Water Quality Parameters | Water Quantity | Comments |
|---|---|---|---|---|---|
| Well<br>HZ-1<br>HZ-1S<br>HZ-2<br>HZ-3 | Completed into the Star Point Sandstone | Quarterly while accessible | none proposed | Water level corrected to depth from ground surface | |

The Applicant committed to submit quarterly and annual reports. However, the annual report is indicated to be resubmittal of the results received during the year. These reports should be in the format required by the Division memo regarding annual report submittals, as is forwarded to the operators under R645-301-742.420. The Applicant is required to provide the information requested by the Division. The Applicant includes a commitment to notify the Division if data indicate non compliance with permit conditions.

The Applicant has not adequately described how these surface data sites will be used to determine the PHC of mining. The Applicant has stated that springs will provide information on impacts to localized perched aquifers within the Blackhawk Formation. However, I believe it is established that these aquifers are associated with fault systems. The description of monitoring based on hydrologic impacts should be further expanded upon. Similar information will be obtained by monitoring inflows. The HZ monitoring wells will assist in evaluation potential losses of ground water from the Blackhawk Star Point Aquifer. See discussions under **Environmental Resource Description, Hydrology** heading.

**Surface-Water Monitoring.**

Specifics in monitoring during the construction period were included and the Applicant has committed to collect weekly samples during the operational and reclamation construction period up stream and downstream of construction. The parameter is to be analyzed in the field is turbidity.

Proposed operational surface water monitoring is summarized in the following table:

Table 6
Operational Surface Water Monitoring

| Sampling Point | Location | Flow | Water Quantity and Water Quality | Water Quantity | Comments |
|---|---|---|---|---|---|
| #3 | Channel in Jewkes Creek /below disturbed area upstream of the intersection with the North Fork Gordon Creek and below the bypass culvert | Intermittent | Quarterly According to Table 7-5 | Quarterly | |

| | | | | | |
|---|---|---|---|---|---|
| #5 | Jewkes Creek upstream of disturbed area but downstream of the confluence with Spring Two Canyon. | Perennial | Quarterly According to Table 7-5 | Monthly | |
| #6 | Portal Canyon Drainage and Spring Two Canyon Drainage | Ephemeral | Not proposed | Not proposed | These sites should be monitored on the same day as sites 3 and 7 when sampling during a precipitation event or snowmelt period |
| #7 | Beaver Creek above pond upstream of the permit area outside of potential subsidence zone. | Perennial Monthly | Quarterly According to Table 7-5 | Late Spring gpm Late Summer/Fall gpm | |
| #8 | Beaver Creek downstream north east of permit area. Out of potential subsidence zone. | Perennial Monthly | Quarterly According to Table 7-5 | | Bear Creek is dry below surface water monitoring point 8 as shown in Appendix 7-5 "Historic Mine Development" map 8. This section of the stream is affected by the Fish Creek Fault and Graben. |
| 2-2-W | Gordon Creek above confluence of North Fork Gordon Creek below the Hiawatha | Perennial Monthly | not proposed | | Impact more likely to be below confluence because of fracture system. |
| 2-3-W | Beaver Creek | Perennial Monthly | not proposed | | Currently monitored by Beaver Creek Coal previously proposed to be monitored by Horizon. Not found on any map |
| 2-4-W | Beaver Creek 1 -1/2 mile west of permit area | Perennial Monthly | not proposed | Flume installed | Currently monitored by Beaver Creek Coal previously proposed to be monitored by Horizon. |

**Acid and Toxic-Forming Materials.**

The Applicant has indicated that overburden and underburden samples will be gathered at 2,000 foot intervals throughout the mine and tested according to the Division requirements (Section 6.5.7.1). The Division understands this statement to mean the Applicant will test the materials according to current division guidelines for acid and toxic forming materials. See further discussions under **Acid and Toxic** headings of this T.A.

**Transfer of Wells.**

No transfer of wells are requested or approved at this time.

**Discharges into an Underground Mine.**

The Applicant has not addressed this regulation. No discharges into an underground mine are approved. The underground water tunnel has a use of 0.557 cfs. This water source, rate of use by the Horizon mining operations, and water quality should be included as part of the operational monitoring plan.

**Gravity Discharges.**

The dip of the coal is away from the portal faceups. Therefore no gravity discharges are anticipated.

**Water Quality Standards and Effluent Limitations.**

The Applicant provided a copy of the UPDES permit for the Horizon Coal Corporation in Appendix 3-6. The permit is effective March 1, 1996 and expires at midnight on April 30, 1998. The permit no. UTG040019 is authorized for discharge at outfall 001 at latitude 39°41'37" and longitude 111°02'58", to the North Fork of Gordon Creek. The Applicant provided a commitment to monitor the sediment pond according to the requirements of UPDES Permit UT-0023761 until bond release, or until the revegetation is adequate to permit removal of the sediment pond.

If underground water is encountered in excess of the amount required for mining, the water will be settled in underground sumps and discharges will be monitored to ensure that effluent limitations are met (Sections 3.4.3 and 3.4.3.2). The Applicant also states that dewatering plans will be developed should it become necessary. (Section 3.3.1.6.). The permit however, allows only one discharge point. Therefore, the Applicant must either obtain an additional mine water discharge point or, adequately design the sedimentation pond to treat mine water discharge. The limits of the discharge that may be handled by the pond should be identified. It should also be noted that the submitted copy of the UPDES permit is missing the even numbered pages. The total amount of TDS discharged from all mine water and decant operations is limited to one ton per day.

Discussions of water quality standards are presented in Section 7.2.2.2, Tables 7-3, and 7-4. Other water requirements and plans needing submittal and approval from the Utah Department of Health include: culinary water facility and sewage facility plans. The Applicant has committed to construct the sewage facility upon plan approval.

**Diversions.**

Undisturbed diversions are described in the following table. All undisturbed and disturbed diversions are designed to carry the flow from a 10-year, 6-hour event. Culverts UC-4 and UC-5 receive drainage coming from the Jewkes Creek, an intermittent stream, designed to carry the flow from a 100 year - 6 hour event. The Applicant provided culvert sizes that may carry greater flows than the designed flow for the 10-year, 6-hour event.

Table 7
Undisturbed Drainage Diversions

| Diversion | Ditch (D) or Culvert © | Diameter (culvert) | Function |
|---|---|---|---|
| UC-1 | C | 24" | Collects flow from UD-4 and UD-5 and Portal Canyon and routes it into UC-3. |
| UC-2 | C | 36" | Collects flow from UD-3 and routes it into UC-3. |
| UC-3 | C | 36" | Collects flow from UC-1 and UC-2 and routes it into UC-5. |
| UC-4 | C | 24" | Collects flow from UD-2 and from Left Fork North Fork and routes it into UC-5. |
| UC-5 | C | 24" | Collects all undisturbed flow from UC-3 and UC-4, bypasses sediment pond, and discharges it into main drainage. |
| UC-6 | C | 42" | Carries flow of main drainage (all undisturbed flow) beneath haul road and into Gordon Creek drainage. |
| UD-1 | D | -- | Collects runoff from area above topsoil stockpile and routes it into road ditch of Carbon County Road 290. |
| UD-2 | D | -- | Collects runoff from above coal stockpile and handling area and routes it into Jewkes Creek above UC-2. |
| UD-3 | D | -- | Collects runoff from area above the portal area on south east side of Portal canyon and routes it along the south and east side to a natural channel below the operations then to Jewkes Creek. |
| UD-4 | D | -- | Collects runoff from area above the portal area on the north side of Portal Canyon to the disturbed area below the operations. |
| UD-5 | D | -- | Collects flow from above the disturbed area in Portal Canyon and routes it into bypass culvert UC-1. |

Disturbed diversions are designed to handle the 10-year, 6-hour event and are described in Table 7. Many of the undisturbed drainage ditches are proposed to be designed with an elevated berm. Most of these berms are located where undisturbed drainage is routed around

the mine site. While most disturbed area diversions built with a berm are less likely to be an environmental problem, because drainage would sill reach the pond if there was a failure, failure of a bermed undisturbed area ditches would send water to the sedimentation pond which is not designed to receive and treat those waters. More prudent designs, including improved grading plans, could be conducted to meet the design requirements rather than building elevated berms for water control. Since the pond is designed to contain or treat the 10 year - 24 hour event, it would be prudent to design the undisturbed bermed diversion drainages to safely handle the flow velocity and volume from a 10 year -24 hour event. If the ditches fail with a peak flow smaller than the 10 year - 24 hour event the Applicant would have failed to adequately treat the run off from the disturbed area 10 year- 24 hour event through their pond.

The Applicant has provided a general channel configuration in Figure 7-7. The Applicant has stated that channel configuration may vary but the minimum cross sectional area will remain the same. While the channel may continue to meet design volume requirements with this statement, the stability of the design may not be prudent for slopes greater than 2:1 for certain geologic materials under certain conditions. It would be more prudent for the Applicant to provide a range of acceptable configurations through specific types of geologic materials and commit to maintain these ditches should they fall out of the acceptable range. Additionally, the typical designs do not match the descriptions provided for the ditches. The proposed designs are likely to require high maintenance. However, the Applicant has met minimum design requirements.

The Applicant has provided a berm as the water diversion control at the north east end of Portal Canyon. Drainage area UD-5 is a small drainage area on the north end of the site. According to the map, this area would naturally flow over the pad area. The Applicant is recommended to consider other alternatives for this area such as: grading a small [emphasis added] outslope pad area to allow drainage to reach the culvert and then contemporaneously reclaim the disturbed area, or allow the drainage to flow over the site and be treated in the pond.

The Applicant has considered any flow velocities less than 5 feet per second (fps) as non erosive flows. However, in the literature there are values which indicate velocities less than 5 feet per second are erosive with earthen ditches that have erosive soil types. The Applicant has not considered soil type in the determination of erosive velocities. However, in some cases vegetation will be adequate to control erosion. Degradation and additional erosion control needs for drainages within the pad area draining to the sedimentation pond will be determined through site inspection. Where velocities exceed 5 fps designs must be implemented to minimize erosion.

Drainages are developed by the operator to route undisturbed drainage around the site channels. Drainages with slopes up to 0.5 feet/foot have failed when riprapped. Riprap design procedures were not based on slopes of this steepness. Adequate grading, fill and angular

riprap and filter blanket designs are necessary. The Applicant has provided sizing for graded riprap but no filter blanket designs. It is the opinion of the division that the Applicant has not minimized potential impacts to the adjacent area and undisturbed drainage slopes should be reduced where possible.

The proposed topsoil pile directs drainage from DD-3 to DC-2 into the sedimentation pond. No drainage designs specific to road drainage could be located.

Table 8
Disturbed Drainage Diversions

| Diversion | Ditch (D) or Culvert © | Diameter (culvert) | Function |
|---|---|---|---|
| D-1 | D | -- | Collects runoff from entire No. 1 and No. 2 Mine areas and routes it into the sediment pond. according to Appendix 3-3 the portal bench will drain to D1 |
| DC-1 | C | 12" | Collects runoff from area below the facilities pad and routes it beneath the haul road and into the sediment pond. |
| DC-2 | C | 12" | Collects runoff from the topsoil stockpile area and routes it beneath the haul road and into the sediment pond. |

**Stream Buffer Zones.**

The Applicant must demonstrate that all requirements of 742.300 have been met prior to approval and findings of this section. (See R645-301-742.322.) The Applicant is required to provide the stream buffer zones and assure they are adequately marked during the channel construction. Plate 3-1 shows a buffer zone sign location. The text indicates buffer zone signs will be placed adjacent to Jewkes Creek; however, Plate 3-1 does not show a sign located upstream from the disturbance. A sign must be placed at the upstream boundary of the buffer zone.

The Applicant has submitted a stream alteration permit to the Division of Water Rights. The submittal proposes a 3 foot and 2 foot culvert respectively in Jewkes and Portal Canyon. Comments on the proposal were due by May 19, 1996.

**Sediment Control Measures.**

The Applicant proposes to begin site construction prior to installation of the sediment pond. During this period alternative sediment control measures are proposed to be used. Straw bales and silt fences are proposed to be placed in the stream channels of Portal and Spring Two Canyon Fork to capture sediment. Berms Strawbale dikes and Silt fences will be located between stream channels and areas being disturbed. The Applicant has committed to

cleaning these structures once construction is completed using backhoes and shovels.

The culvert is proposed to be installed from the lower end of the pad in an upstream direction. Horizon Coal Company has committed to limit construction to periods when the stream is not flowing to the extent possible. Stream flow will be bypassed around construction activities using a diversion dike and flexible culvert. The Applicant has committed to construct the sedimentation pond as soon as possible following construction of the downstream culvert sections and must obtain a stream alteration permit prior to approval.

The proposed measures for culvert construction are acceptable practices. The ability of these proposed measures to control sediment can only be judged in the field by inspection and technical staff and will be determined adequate based on the ability to meet the performance standards and requirements of R645-301-745.111.

Roads are proposed to be surfaced with 12 inches of crushed gravel road base. These roads are proposed to be crowned and therefore the east portion of the road from the crown at the south end to the limit of the sedimentation pond will drain toward the creek. The main access road will be 20 feet wide not to exceed a 6% vertical grade. Highwalls near the first bend will be 0.33H:1V degrees and 1.2H:1V following removal. Maximum embankment height is 100 feet at 40 degrees and maximum slope height is 50 feet at 32 degrees. Appendix 3.3 indicates the road will be sloped toward the disturbed drainage ditches. This conflicts with the road surfacing designs.

Ditch UD-2 receives extensive drainage from cut slopes as shown in Plate 3-7A, cross sections E, F, and G. These slopes are steep and can be significant sources of sediment. The Applicant has committed to provide erosion control matting and seeding according to Table 3-2, for all cut slopes which will drain directly to an undisturbed area diversion. As presented in Section 3.3.5.3 mulching and roughening will occur on areas before seeding where slopes are 2½:1 or less. The matting will be applied on slopes 2½:1 or steeper. It should be noted that where competent bedrock is exposed matting may not be practicable.

Currently this road is located on the east side of the stream and outside the permit area, and therefore is a potential source of additional sediment to the stream flow. The fan portal road is to be considered an ancillary road and will be cut into native materials without an engineered surface.

The topsoil is also proposed to be vegetated with interim cover as discussed in Sections 3.4.4.1, page 3-19 and Section 3.5.2. The piles will be contoured, fertilized and seeded. A berm will be placed around each topsoil pile to minimize soil transport. Prior to achieving adequate vegetation establishment other measures are necessary to control erosion.

**Siltation Structures.**

Sediment ponds and all other treatment facilities are defined as siltation structures. The two siltation structure at this site include Sweets Pond, a pond developed for water rights use, and the sedimentation pond. For a discussion of the mine site sedimentation pond, see the **Sedimentation Ponds** heading below.

Sweets Pond currently is associated with the Gordon Creek Mines 2, 7, and 8. This site would be double permitted until Gordon Creek has obtained bond release. Because this is an impoundment to be associated with the Horizon Mine appropriate regulatory requirements must be addressed.

Sweets Pond also has an existing pumphouse and a water gate to control inlet flows. The Applicant has proposed to build a water line from the pond to the mine. This should be included in the permit area as part of the disturbed area. The pond itself need not be part of the permit area for which bonding is required as described under the "Disturbed Area" and "Permit Area" definition in R645-100, as long as the structures are constructed and maintained in accordance with R645-301 and R645-302.

**Sedimentation Ponds.**

There will be only one sediment pond. The sediment pond will be a non-MSHA structure. The sediment pond will be inspected during and after construction by a qualified, registered, professional engineer. The pond will be inspected after each storm and cleaned as necessary. Its embankments will be vegetated, to control erosion, with a temporary seed mix as described in Section 3.5.5.2.

The Applicant has analyzed the pond embankment designs for stability. Using a standard, circular failure model and the Hoeck Circular Failure Charts, the Applicant has found that the pond embankments have a static safety factor of 4.81 for dry conditions and 4.44 for saturated conditions (Appendix 3).

The Applicant proposes to divert all disturbed area run off to the sedimentation pond, including the proposed north return air fan ,receiving runoff from 10.7 acres (Appendix 7-4). The sedimentation pond will be mostly incised except at the downstream face, which will be an earthen embankment. The pond has been designed to contain the runoff from a 10-year, 24-hour precipitation event calculated to be 0.83 acre-feet. The Permit area surfacing is described as a gravel parking lot; the full extent of gravel is not defined.

The Applicant has assumed sediment production of 0.05 acre feet/acre from the disturbed area. The Applicant has not provided a technical method or calculation to determine where the 0.05 acre feet/ acre comes from, Appendix 7-4. However, the final design allowed 1.48 acre-feet for maximum sediment storage which is closer to 0.1 acre foot/acre per year sediment production for disturbed areas and is considered a conservative estimate. Although the maximum sediment storage is considered adequate at this time, if the Applicant should need

additional increases in the sedimentation pond capacity the 0.05 acre feet/ acre will not be considered valid until demonstrated to meet standard through accepted design methods. The Applicant must remove the discussions of excess design capacity or provide technical design information.

The total capacity of the pond below its emergency spillway will be 2.3 acre-feet. The sediment will be cleaned out of the pond at 60% of the total sediment volume, or 0.88 acre-feet. The cleanout volume will be marked by a calibrated pole. One pole is generally not adequate to determine sediment capacity because the sediment tends to be deposited in deltaic form at the inlets. The Applicant will be expected to maintain the capacity required for runoff volume.

The pond will also have a 2" decant pipe with a locking valve. Twenty-four hours after a storm, the pond is to be drained by opening the valve on the two inch decant line in the pond. This valve is to remain locked at all times except when decanting storm runoff. The inlet of the decant line is to be located at an elevation of 7576.0 feet, which is 24 inches above the 60% cleanout level and 3.4 feet below the elevation of the spillway.

Should the quantity of water encountered in mining exceed the amount required by the underground operations the Applicant proposes the water be treated by the sediment pond in order to meet effluent standards. This action may be used as an emergency measure but is not an approved design. The use of the pond for this purpose would need to be approved prior to handling any runoff which might exceed the design requirements.

The sediment pond's spillway is designed to pass the peak flow of the 25-year, 6-hour precipitation event. Calculations for the spillway assume the pond is full to the elevation of the spillway prior to the onset of the event. With a depth of 2.3 feet, a width of 10 feet and side slopes of 2h:1v, the spillway will have 2 foot of freeboard between the top of the pond embankment and the maximum flow elevation. The Applicant designed a non-erodible, open channel emergency spillway for which the outlet will have a riprap with a D50 of 4 inches. However, no filter blanket designs were included.

Although the spillway designs meet the requirements of a single -open channel spillway design under R645-301-743.00, the spillway does not provide the protection of aquatic life through providing an oil skimmer. Since this pond will be receiving oils and grease from the site the pond should provide for some type of oil skimmer.

Pond designs, maps and calculations have been prepared under the direction and certification of Richard H. White (State of Utah, Registered Professional Engineer #7102). The information and calculations contained in Appendix 6E are also certified by Mr. White.

The pond safety factor calculations assume an 11 foot embankment height and a slope angle of 2H:1V (26.56 degrees). The soils are assumed to have soil cohesion and friction

angle of 35 psi and 30 degrees respectively, results in a safety factor of 4.81 dry and 4.44 saturated conditions.

**Other Treatment Facilities.**

No other treatment facilities area proposed at this time.

**Exemptions for Siltation Structures.**

No exemptions for siltation structures were requested or are granted at this time.

**Discharge Structures.**

The sedimentation pond discharge structure is discussed under Siltation Structures.

**Impoundments.**

The only impoundment proposed by the Applicant is a Sedimentation Pond and Sweets Pond. Clarification of proposed permitting actions in Sweets Pond is necessary. The sedimentation pond is discussed under Siltation Structures. In Section 3.3.5, page 3-2, the Applicant has committed to promptly report impoundment hazards to the Division and formulate remedial action and emergency procedures.

**Casing and Sealing of Wells.**

The Applicant has stated that approvals and permits to drill wells will be received from the Division of Water Rights and appropriate Government agencies. The final casing and sealing of wells is discussed in more detail in the section entitled **MINE OPENINGS** under **RECLAMATION PLAN** below.

**Findings:**

The plan does not fulfill the requirements of this section.

The Applicant must provide the following, prior to approval, in accordance with the requirements of:

**R645-301-742**

The Applicant must: 1) either obtain an additional mine water discharge point for the UPDES permit or, adequately design the sedimentation pond to treat mine water discharge. Correct the statement regarding dewatering plans under Section 3.3.1.6. which conflicts with the remainder of the plan; 2) provide the even numbered pages to the copy of the UPDES permit; 3) provide designs which demonstrate the Applicant has prevented to the extent

possible additional contributions of sediment to the adjacent area where undisturbed drainages have steep slopes up to 0.5 feet/foot (failure is common with riprapped drainages at this slope), and; 4) remove the discussions of excess design capacity for the sedimentation pond or provide technical design information for the estimated erosion sediment production; and, 5) clarify proposed permitting actions for Sweets Pond.

**R645-301-731.121**

The Applicant must: 1) provide the protection of aquatic life through providing an oil skimming design on the sedimentation pond.

**R645-301-742.322**

The Applicant must: 1) provide the calculations for the values presented to demonstrate that the design capacity for the intermittent stream is at least equal to the unmodified stream channel above and below the site.

**R645-301-742.300**

The Applicant must: 1) provide filter blanket designs for the riprapped spillway outlet.

**R645-301-742.400**

Provide a discussion on information specific to road drainage designs.

**R645-301-730**

To meet all applicable federal and state laws the Applicant must obtain a stream alteration permit.

**R645-301-731.500 and .513**

The Applicant must: 1) address the requirements of this regulation as it relates to the proposed underground water tunnel water in the mine.

## RECLAMATION PLAN
## HYDROLOGIC INFORMATION

**Regulatory Reference: 30 CFR Sec. 784.14, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-301-512, -301-513, -301-514, -301-515, -301-532, -301-533, -301-542, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-733, -301-742, -301-743, -301-750, -301-751, -301-760, -301-761.**

**Analysis:**

**Ground-Water Monitoring**

See information under this same heading in the subsection entitled **HYDROLOGIC INFORMATION** under **OPERATION PLAN** above.

**Surface-Water Monitoring**

See information under this same heading in the subsection entitled **HYDROLOGIC INFORMATION** under **OPERATION PLAN** above.

**Acid- and Toxic-Forming Materials**

In Section 6.5.7.1 is a commitment to monitor the conditions of the overburden and underburden. Samples will be taken at 2,000 foot intervals through out the mine and tested according to the Division requirements.

The Applicant has committed, in Section 3.5.4, to cover all acid and toxic forming material with four feet of noncombustible, non-acid, non toxic, forming material. This material should also be a suitable growth material. (See the Soils Section.) The Applicant has also committed to backfill a highwall or cut slope with any underground development waste that is temporarily stored on the surface and has committed to cover it with 4 feet of suitable backfill. The maximum extent of material proposed to be used should be identified

Where noncoal waste rock from initial development will be incorporated as fill. The Applicant must provide a commitment and control measures to assure acid and toxic materials will not be left as backfill in the location of the reclaimed stream sections and drainages.

**Transfer of Wells.**

No request for a transfer of water wells are presented.

**Discharges into an Underground Mine.**

No discharges into an underground mine are applied for or granted for the reclamation area configuration.

**Gravity Discharges.**

The Applicant has proposed that a drain be included in the stopping for portal closure. This site may have gravity discharge and should be monitored following closure through bond release.

**Water Quality Standards and Effluent Limitations**

See information under this same heading in the subsection entitled **HYDROLOGIC INFORMATION** under **OPERATION PLAN** above.

**Grading to Drain**

The Applicant has committed to keep potential surface drainage from entering sealed entries in Section 3.5.3.1. The Applicant has committed to recontour the area to drain to the final reclamation channel in Section 3-25. In Section 3.3.3.6 the Applicant has proposed to scatter rock piles along the perimeter of Jewkes Creek. The Applicant should not allow the rock piles to interfere with drainage.

**Diversions.**

The Applicant has proposed a drainage plan which reconfigures Jewkes Creek's drainage channel and Portal Canyon drainage channel. The new configuration of Portal Canyon eliminates the basin behind the existing embankment but, does not greatly reduce the existing refuse embankment. The steepest drainage slope, according to information provided on the post mining topographic map is a 20 foot elevation drop over approximately 56.25 foot horizontal section or approximately a 32% slope. Channels with slopes of this steepness tend to be instable. Numerous other channels in Utah mines have failed at this gradient. Mines which operated prior to SMACRA often were limited to steepened channels. At these steepened gradients riprap fails and erosion occurs during high intensity short duration thunderstorms. If the Applicant wishes to maintain this gradient it will be necessary to demonstrate that competent bedrock exists in the channel over the steep section. Otherwise, since it is practical, further grading should be accomplished to reduce this slope. Additionally the presented riprap sizing methods were not developed from information based on channels at the proposed gradient.

The Applicant has provided a centrally-located channel section which is not located against the toe of steepened and backfilled slopes. Near cross section C there is an old coal spoil slope. The channel is placed to avoid the area and to avoid any unnecessary leaching or erosion of that pile. The Applicant has provided a demonstration that the design capacity will be at least equal to the design capacity of the unmodified stream channel up stream and down stream of Jewkes Creek for the by pass culvert design. This information should also demonstrate the capacity of the reclaimed diversions meet these criteria.

The channel design follows practices which have been accepted in the past based on a design flow regulated by the rules. However, the rules also say the flood plain and channel bank must adequately pass the design flow. The channel in the lower reaches should be designed to reflect the function and characteristics of a stream type which would occur naturally through this section. Use of Rosgrin's channel classification system is one method that provides for channel characteristics associated with a wet meadow riparian area. An increased

meander with a low gradient channel slope and deep narrow channel configuration would also provide a stream system with characteristics similar to those which might be found in a wet sedge meadow, would be similar to the existing stream configuration, and would better support the proposed postmining land use.

**Stream Buffer Zones.**

At the time of reclamation the Applicant will need to submit another stream alteration permit. The Applicant must receive approval for stream alteration before the reclamation construction can commence.

**Sediment Control Measures.**

The Applicant has proposed the pond be removed during the reclamation phase. The Applicant stated the location of the pond and channel re-establishment makes it impractical to retain the pond through the reclamation period. In Section 3.5.8 the reclamation time table shows that pond maintenance will occur 10 years after seeding. However the Applicant has proposed to remove the sedimentation pond. The Applicant has also shown pond reclamation and grading to occur in Phase II bond release period. The Applicant needs to clarify whether the sedimentation pond is proposed to be removed under Phase I or Phase II reclamation.

If the Applicant placed the culvert into the location of the Jewkes Creek the Applicant could retain the pond and culvert system until Phase II bonding or until vegetation is adequate to control erosion. The Applicant should describe why this is not a practical alternative.

The Applicant states, "If feasible, efforts will be made to minimize reclamation activities during periods of wet weather. During short periods when reclamation construction activities will be suspended, the construction site will be left in a condition which would minimize the impact on the hydrologic system if a rainfall event were to occur". Sediment control measures during the reclamation activities include the following:

1) Construction of the reclaimed stream channels and grading to commence at the upstream end of each channel/canyon working downstream. The Applicant also committed to retain the sediment pond in place as long as possible.

Alternative methods employed prior to removal of the sedimentation pond include:

1) Strawbale dams will be placed in the stream channels of the North Fork and Right Fork drainages to capture sediment which reaches the channels. These will be cleaned out and removed when reclamation is completed.

2) A Sediment Control Monitoring and Maintenance Plan and corrective action measures are outlined on page 7-51.1. In Section 3.5.4.2 the Applicant indicates

that rills or gullies will be filled graded or stabilized then reseeded or replanted. Backhoe and hand work may be used. In Section 3.5.5.4 the Applicant indicates erosion will be monitored and will be controlled by regrading (if necessary), mulching, and matting.

Silt fences will be placed parallel to the contours with ends turned up perpendicular to the slope. Approximate locations are on Plate 7-7 and they will be installed according to Figure 7-9. As each reclaimed channel reach is reconstructed, the channel will be lined with silt fence or straw bale dikes. Silt fences or strawbale dikes will be used in road ditches, and immediately downstream of the road ditches. In addition, Section 3.5.4.3 indicates silt fences will be established at the bottom of fill slopes and along the top bank of the reclamation channel.

In Section 3.5.5.1 the Applicant suggests mechanical treatment of disc, harrow or clod buster for seed bed preparation. Mechanical treatment of slopes with a grade of less than 10 percent will be completed by ripping the soil 18 inches deep with shanks placed at 7-foot intervals to achieve parallel slots 4 to 10 inches wide. These areas will be mulched. Additionally, in Section 3.5.4.2 the Applicant indicates the grading and placement of overburden and topsoil will be done along the contour, and in Section 3.5.4.4., the Applicant indicates disturbed areas will be loosened by ripping to allow easier back fill and grading operations and compacted zones will be eliminated by deep chiseling. Prior to placement of topsoil the area will be scarified. Although these are accepted practice the BTCA for most Utah sites is to provide deep pocking as the roughening factor. The Applicant is not considered to be using the BTCA for this area unless pocking is proposed for slope roughening technique.

In Section 3.5.4.3 indicates slopes 2½:1 or greater will be matted and all areas will be mulched during seeding. Slopes greater than 10 percent will have erosion control matting installed. The Applicant has indicated in Section 3.5.5 if revegetation is delayed a sterile cover crop will be planted. The Applicant has not indicated whether mulch will be used also at this time. Since mulching is part of the proposed BTCA practice for erosion control it should also be applied at this time. Although this proposal is acceptable, it conflicts with Chapter 3. Where an area is to be mulched a tackifier or crimping should be provided. The Applicant should commit to install erosion control matting according to the manufacturer's directions.

Estimated erosion production for the proposed methods are compared with erosion production expected from an established vegetative cover of 50 percent and were determined by the Applicant to be adequate. This vegetation standard is based on data which is not current. Additionally the standard assumes that 50% vegetation will control erosion. However, this has not been demonstrated. Should this data be considered inappropriate this section would need to be reevaluated.

**Siltation Structures.**

No sedimentation ponds, discharge structures, impoundments or other treatment facilities are proposed or approved for retention as a postmining land use.

**Sedimentation Ponds.**

The sedimentation pond will be removed during Phase II of final reclamation and replaced with alternative sediment control measures. The Applicant has indicated sediment control following removal of the sedimentation pond will be provided as outlined in Section 3.5.4.3. Section 3.5.4.3 indicates the pond will be removed at the end of backfilling and grading procedures and conflicts with the proposal for removal at Phase II bond release. The Applicant should correct this conflict and include reference to information provided in Section 7.2.3.2, which also conflicts with the reclamation time table.

**Other Treatment Facilities.**

No treatment facilities, other than the sediment pond, will be constructed at this site.

**Exemptions for Siltation Structures.**

No areas exempt from BTCA are proposed or granted for the applicable portions of the reclamation plan.

**Discharge Structures.**

The sedimentation pond and its associated discharge structure will be removed during reclamation.

**Impoundments.**

The only impoundment proposed at this site is the sedimentation pond, the reclamation of which is discussed under **Sedimentation ponds** above.

**Casing and Sealing of Wells.**

The final casing and sealing of wells is discussed in more detail under **MINE OPENINGS** above.

**Findings:**

The plan does not fulfill the requirements of this section.

The Applicant must provide the following, prior to approval, in accordance with the

requirements of:

**R645-301-742.322**

The Applicant must: 1) demonstrate that reclaimed intermittent and perennial channels will carry the capacity of the upstream and downstream channel sections

**R645-301-742.300**

The Applicant must: 1) provide a stable channel design for Portal Canyon drainage (riprapped slopes of approximately 32% are not stable).

**R645-301-731.121,**

The Applicant must: 1) provide a commitment and control measures to assure acid and toxic materials will not be left as backfill in the location of the reclaimed stream sections and drainages.

**R645-301-742,**

The Applicant must: 1) commit to install erosion control matting according to the manufacturer's directions; 2) correct statements where commitment for removal at the end of backfilling and grading procedures conflicts with the proposal for removal at Phase II bond release, describe why placement of the culvert into the location of the Jewkes Creek, is not a practical alternative, to allow retention of the pond and culvert system until Phase II bonding or until vegetation is adequate to control erosion; 3) BTCA for Utah sites includes deep pocking as the roughening factor, the Applicant is not considered to be using the BTCA for this area unless pocking is proposed for slope roughening technique in applicable areas; and,
4) demonstrate that the 50% vegetation for bond release will control erosion since this is used as the standard for BTCA erosion control methods exclusive of the sedimentation pond.

**Recommendation:**

It is recommended that the outstanding issues under baseline information and monitoring based on the probable hydrologic consequences be addressed prior to permit approval.