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

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March 14, 1997

TO: File

THRU: Joe Helfrich, Permit Supervisor

FROM: Sharon Falvey, Senior Reclamation Specialist

RE: Stipulation Response, Horizon Coal Company, Horizon Mine, PRO/007/020, Folder #2, Carbon County, Utah.

SYNOPSIS

This memo serves to update the Technical Analysis (TA) completed for the Horizon Mine. The amendment to address the stipulations was submitted to the Division on February 8, 1997. This portion of the TA addresses sections where hydrologic and related information is presented. Corrections were made throughout the document. All sections in the TA should be replaced.

ANALYSIS

CLIMATOLOGICAL RESOURCE INFORMATION

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

Analysis:

Climate is discussed in the following areas within the MRP; in Chapter 11, in Chapter 9, in the Soils Section, in the Biology Section, and in the Cultural and Paleantologic Resources Study Addendum (Appendix 5-1).

Climate information presented in the plan was obtained from three data collection sites in the surrounding area: the Skyline Mine (1993 data); 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 temperatures is presented, 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 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.

Within the Soils Section, the average annual temperatures at the mine site were stated to range from 36°F to 45°F and the cumulative annual precipitation ranges from 12 inches to 30 inches. In the Biology sections the range of cumulative annual precipitation is presented as 16 inches to 20 inches.

The Cultural and Paleontologic Resources Study Addendum describes the prevailing climate using data from records compiled at Hiawatha, Utah. Hiawatha was used because its 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 town receives its highest precipitation in August, and averages 2 inches.

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 Permittee set up a weather station at the site so that precipitation events can be correlated with other monitoring data.

Findings:

The information in the plan meets the minimum regulatory requirements for this section.

ALLUVIAL VALLEY FLOORS

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

Analysis:

The Permittee provides a discussion on Alluvial Valley Floors (AVF's) in Section 7.4. In Appendix 7-6, a June 13, 1980 memo 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, exist 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. The following paragraphs discuss the potential for AVF's in the permit and adjacent areas.

According to the reconnaissance map completed by the Office of Surface Mining, dated 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, Jewkes Creek , and continue for short distances into the tributaries above the drainages. Alluvial deposits identified at the mouth of Jewkes Creek and along the North Fork of 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 plan, 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 utilization on undeveloped rangelands in the permit area can be found on Plate 4-1 - 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 plan meets the minimum regulatory requirements for this section.

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.

Surface Water Resource Maps.

Surface water drainages can be found on surface maps. The names of important perennial and intermittent drainages were included for surface waters in the permit and adjacent area.

HYDROLOGIC RESOURCE INFORMATION

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

Analysis:

Sampling and Analysis.

The permittee 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 some baseline samples collected; however, recent data has included sample date, time, and method of analysis beginning in December 1993. The 1996 metal samples were not analyzed according to the guidelines. The samples were analyzed as total metals rather than dissolved. This occurred because sedimentation in the water made filtering difficult. The samples were not filtered but, were preserved with an acid solution, thus it was necessary to analyze the parameters as total. In the future, samples should not be preserved if they cannot be filtered first. Instead, they should be filtered immediately upon delivery to the lab, within a maximum of 2 days from obtaining the sample.

Baseline Information.

Water Rights and Points of Diversion

The permittee has provided information on water rights including use description and period of use in Appendix 3-5. The point of diversion for water rights near the mine operations are presented on Plate 7-3. The plan states that water from the area is almost exclusively used for stock watering (section 7.1.4). Although this is true for the permit area, the adjacent area's downstream uses include irrigation and wildlife uses. The predicted volumes for waters used in mining are within the total allocated by the water rights presented. (See the discussions under "**Probable Hydrologic Consequences Determination** " in this TA).

The permittee obtained the rights to use water in the area. The following documentation associated with the use of these rights were presented in the plan:

1. A copy 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. The water rights exchanged in the agreement with Florence A. Sweet are associated with two unnamed springs and an underground water tunnel.

2. Copies of approvals for the water right change applications.

3. An assignment of the right to use Sweet's Canyon Pond and lease one acre-foot of water for evaporation losses are presented under Water User's Claim # 91-750, in Appendix 3-5.

4. A dam application is included and describes the pond use as a Water Truck Fill / Private Fish Pond. The private fish pond is proposed for a postmining land use in the agreement. Sweets Pond will be used to collect and convey water associated with the spring water rights used for domestic and industrial consumption at the Horizon Mine.

The approvals received from the Division of Water Rights for the water rights, 91-353, 91-94, and 91-330 followed a protest from some downstream water users. Changes in use for the water rights were approved with conditions. The conditions for rights 91-353 and, 91-94 are summarized below:

1. Redevelop spring box at same elevation as the existing one.

2. Install a flow measuring device and provide records of the water diverted.

3. The season of use will remain the same.

The permittee has received the right to change the location of use. Based on the following information: 1) The water previously used in the Sweets Mine was determined to come from the same waters. 2) The sump will be located 1000 feet down gradient of the Sweets Mine. 3) The total amount of water estimated to be consumed by the mine were presented as 9.1 acre feet consumed in-mine and, 6.8 acre-feet used in surface operations or, a total of 15.9 acre-feet of water per year. 4) The mining should not affect the use of water rights by the protestants. The conditions for water right 91-330 is summarized below:

1. A flow measuring device is to be installed to account for the water used by Horizon under the water right and diversion records will be provided.

Table 1
Water Rights to be Used in Mining

Water Right #	Season of Use	Quantity of Use (cfs)	Potential total for season of use (AF)
91-94	5/1 to 9/1	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
91-750	1/1 to 12/31	1AF evaporation	1 AF

General Baseline Water Quality

Baseline information was collected according to the 1986 Division guidelines. During early baseline data acquisition the permittee 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 previously collected data will provide useful information, new data will be collected according to the new guidelines. Table 7-5 presents surface water monitoring parameters, while groundwater

monitoring parameters are provided, in Table 7-2 for operational and reclamation mining phases. The baseline groundwater parameters are described in the plan under Section 7.1.5, and the baseline surface water parameters are presented in Section 7.2.2.3. Baseline parameters will be collected every fifth year, prior to permit renewal, at low flow for the operational monitoring sites.

Groundwater Information.

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

The Gordon Creek area is considered a regional recharge area to groundwater. Currently it is not considered a region with potential for large scale groundwater development. Most groundwater use is tied to spring discharge and mining consumption. The potential recharge areas delineated in Figure 7-4, show a limited recharge potential except in the northern portion of the permit area and in canyon bottoms.

The area is also heavily faulted. Faulting and fracturing provide conduits for surface water to enter the groundwater and allows movement between aquifers. The plan states that a relatively small number of springs are within the proposed mined area which supports the theory of limited recharge. However, the adjacent area has numerous springs, mostly associated with fault/fractures systems and the previously mined areas are discharging water from associated fractures. (See Table 3, which presents a summary of the springs found in the permit adjacent area.)

The major faults that surround the proposed mine workings are associated with a graben. The graben is within the North Gordon and Fish Creek fault zones which trend North and South, and North 60 degrees West, respectively. The faulting appears to have influenced the location and orientation of Gordon Creek and influences the locations of springs and seeps in the permit area. Another major structural feature potentially controling groundwater occurrence is the Beaver Creek Syncline which trends NE-SW and dips at approximately 3.5 degrees.

The regional aquifers are the Emery and Ferron Sandstone, which are not considered to extend into the Gordon Creek area (thus, the mine area). Other important aquifers are the Star Point Sandstone and Blackhawk formations which are located in the mine area. Locally, potential water bearing members below the Hiawatha Coal Seam include 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 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 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 formation is approximately 900 feet thick in the Gordon Creek area. Recharge to the Star Point occurs primarily from vertical movement through the Blackhawk. The plan suggests that due to the low vertical permeability the magnitude of recharge is limited. However, the vertical permeability from fractures in the area appears to be relatively significant. Within the adjacent area, springs issue from the Star Point formation through fractures in connection with previous mining activities as evidenced by springs issuing from the formation in Coal Canyon. The in-mine waters sampled at Horizon No. 1 Mine in 1995 and 1996 indicate the standing water in the mine has varied from 7,584.1 feet msl in December 1995, to 7,587 feet msl in May 1996, then to 7,585 feet msl in June 1996.

Above the Hiawatha, the Castlegate 'A' coal seam overlies the Aberdeen Sandstone. Drill logs suggest the Aberdeen Sandstone member thins near the mine and is discontinuous over the permit area. The sandstone is interbedded with siltstones and shales. This sandstone is not anticipated to be a significant aquifer, by the permittee, because it has a thin interbedded lithology and no springs in the permit or adjacent area issue from the formation (section 6). However, at least one seep appears to issue from this formation in Coal Canyon.

The floor of the Castlegate 'A' seam is carbonaceous silty shale to fine grained fluvial sandstone. The plan stated that water has not been produced from the floor in previously mined areas of the Castlegate 'A' seam. 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.

Other members containing aquifers above the previously mined portions in the Castlegate 'A' seam include the Castlegate Sandstone, the Price River Formation and unconsolidated alluvial sediment deposits. The Castlegate 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 the 1970's and 1980's, were monitored in 1995. Drill logs of Holes LMC-1, LMC-2, LMC-3, and LMC-4 are found in Appendix 3A. Additionally, three wells were drilled and completed in the Spring Canyon Sandstone in 1995. The Spring Canyon Tongue of the Star Point Sandstone is estimated to be approximately 75 feet thick in the permit area.

Tables 2A and Table 2B were generated to present information gathered from the LMC drill holes and the HZ wells and were used in determining ground-water occurrences in the permit and adjacent areas.

Table 2A
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.	7,682 (568 ft.)	7,732 (518 ft.)	Unknown*
LMC-3	Nov. 1976	836 ft.	665 ft.	7,556 (664 ft.)	7,590 (630 ft.)	7499 (791 ft.)
LMC-4	Jan. 1980	430 ft.	220 ft.	7,585 (215 ft.)	7,694.8 (105.2 ft.)	7,584.7 (215.3 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 overlying strata to be mined within this permit term. Documentation of the LMC drilling procedure was provided in a notarized letter from 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 the Castlegate 'A' seam are probably dry in the area covered by this permit term. LMC-3 is located north east of old workings developed from the Blue Blaze No.3, Castlegate 'A' Seam. Drill hole LMC-4 extends through the Hiawatha Seam, ending 213 feet into the Storrs Sandstone. LMC-4 penetrates old workings in the Hiawatha Coal Seam. Therefore, LMC-4 does not represent information on groundwater occurrences for the un-mined portions of the lease area. Water was found in the formations above the Castlegate 'A' seam in the HZ wells as presented in Table 2B below.

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.

Table 2B
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	Minimum and Maximum Water Elevations 12/95-1/97
HZ-95-1	12/13/95	7,272.6 (1080)	Spring Canyon	7,331.6	7,277.6-7,287.6	7,570.7 7,585.9
HZ-95-1S	12/5/95	8132.6 (220)	Blackhawk	NA	8,101.6-8,110.6	8,221.5 8,224.0
HZ-95-2	12/5/95	7,146.3 (1200).	Spring Canyon	7,189.3	7,151.3-7161.3	7,517.6 7,519.6
HZ-95-3	10/28/95	7,427.6 (470)	Spring Canyon	7,477.6	7,432.6-7,442.6	7,513.7 7,522.7

In building the potentiometric surface map, the permittee 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. The changes may be the result of present mining activities and therefore the use of this data may not be appropriate for the comparison presented.

With the information provided from the HZ wells, the permittee has constructed a potentiometric map for the Spring Canyon Sandstone. The presented information suggests the Spring Canyon aquifer has a hydraulic gradient of 0.014 in 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 plan suggests that the Hiawatha Coal Seam is saturated and water may be intercepted early in the mining operations. The potentiometric surface map was developed based on water elevation data obtained in December, 1995. Another map was developed based on the data obtained in September 1996. Data obtained after initial completion in July and August 1996 show the surface water elevation remained relatively steady in Well HZ-95-2 while other water levels varied. Water elevations decreased by approximately nine feet at Well HZ-95-3 and, increased by 15 feet at HZ-95-1, from December 1995 to August 1996. It appears that the changes in water elevation at the wells are related to seasonal fluxuations. Well water levels are presented in Table 7-1.

A Slug test was completed to determine the hydraulic conductivity of the HZ wells except for well HZ-95-1-S. The hydraulic conductivity for well HZ-95-1 was determined to be 16.1 ft/day while HZ-95-2 and HZ-95-3 were 0.25 and 0.20 respectively. HZ-95-1 is located on the north side of Beaver Creek, and HZ-95-2 is located on the northeast side of the Beaver Creek Fault zone and is outside of the proposed mined area. These wells are all completed in the upper tongue of the Star Point but, were not completed through the formation.

The HZ wells were drilled near fracture systems as shown on Plate 6-1. Data from the wells indicate the unfractured portion of the Star Point Spring Canyon tongue has relatively low conductivities and does not transmit water quickly. Well HZ-95-1 is within a permeable zone associated with the fractured system which provides increased permeability over the other two wells completed in the Spring Canyon Tongue. The variation in the water elevation, the hydraulic conductivity determined by the slug test and drill log information suggest the changes in head are related to increase permeability through fracture porosity and responds to seasonal variation. Other factors could cause increase in head however, the increasing and decreasing pattern appears to be seasonal. The fracture associated with the well is shown to extend across Beaver Creek and into the proposed mining area. It is unknown at this time what component of Beaver Creek surface flows may have in recharging this fracture. However a stream flow study

was completed and is discussed below.

Groundwater was observed while drilling in the HZ wells above the Star Point at 100 to 600 feet below the ground surface. This indicates there is a potential for aquifers to be present above the Hiawatha seam in areas that were not previously effected by mining. Well HZ-95-1-S was completed at 205 to 210 feet below the ground surface (some where around 500 ft above the coal). Two drill holes previously drilled by Beaver Creek Coal Company near Beaver Creek were artesian flow and are referred to as BC-1 and BC-2. These wells are assumed to produce water from 80 to 100 feet below the ground surface. The plan states that the presence of artesian wells suggests these waters rest on aquitards and are overlain by confining units. Since, most springs issue above the presented potentiometric surface of the Star Point the water may not be in connection with the fractures. Another possible explanation, not discussed in the plan, is that the the water bearing fractures are full but the low hydraulic conductivity in the lower formations transmits water more slowly, when the water bearing zones become saturated in the upper formations discharge occurs from springs at contact zones and areas where the fractured systems are expressed at the topographic surface. This would be similar to a dam with a bottom release spillway. The spillway only lets a specific amount of water through however, excess water may discharge over the emergency spillway. Both conditions may exist within the permit area.

The permittee has not completed the wells fully through the Star Point Formation. The Star Point sits over shale members through the proposed permit area potentially blocking vertical flow below the aquifer. However, where there are fracture related flows water has issued from formations below the Star Point. No wells were completed in the Blackhawk, where the coal is to be mined.

The permittee has committed to discuss a more stringent monitoring program for Well HZ-95-1 prior to entering the northernmost mining block in Section 8 of the permit area. Currently it is the Division's recommendation that when mining progresses into the area near the fracture zone, monitoring will increase to monthly monitoring and increase to weekly monitoring if water is expressed from the fracture, or if increased flows are expressed from the roof or floor. The permittee has provided a commitment in the plan. The permittee should take measures to ensure that access to the wells and data from the wells may be collected over the period where mining will occur near the fault system. Additionally, the hydraulic conductivity of the alluvium and HZ-95-1-S, and stream flow of Beaver Creek should be analyzed if large quantities of in-mine water are associated with mining this area.

The permittee's 5 year mine plan and predicted future mining will be conducted under Beaver Creek and through Well HZ-95-1. Thus, eliminating the third well used to monitor the Star Point piezometric surface. The permittee will, therefore, need to supply additional well(s)

beyond the extended lease area. Since mining this area is not approved under this permit review, this request is provided for consideration as a future baseline need. It is recommended that placement of the wells be promptly conducted and coordinated with the Division. It is recommended the well(s) be completed in each water bearing formation above, within and below the coal seam to be mined. It should be noted that the deficiency from the previous Blue Blaze Mine proposal required the well be drilled through the Star Point Formation in order to mine into the Hiawatha Coal Seam but, this request was not followed by the permittee.

Previous Mining History

The location and extent of all known, abandoned, underground mine workings within the permit area and adjacent area are shown on Plate 3-3, Figure 3-1, and Figure 3-2. Figure 3-1 shows the Consumer's Mine and the Blue Blaze Coal Co. #3 Mine have mined coal from the Castlegate 'A' Seam underneath Beaver Creek.

According to the permittee the Gordon Creek #2 Mine, operated by Beaver Creak Coal Company (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 in Coal Canyon, 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 up-gradient 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. Within the past 10 years an area below Gordon Creek #3 Mine has received increased flow from springs. It is suspected that currently much of the groundwater collecting in the abandoned Gordon Creek #3 and #6 Mine is draining toward this fracture. Until baseline information was provided by Horizon there was no monitoring of this site. However, there has been a notable vegetation change (Cottonwood die back and increased wetland species) and increase in flow north west of the junction of County Road 290 and the Beaver Creek #3 road.

Springs

Baseline reconnaissance information was gathered in the field with former Oil, Gas and Mining employee, 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 conducted in 1996. Plate 7-1 identifies springs in the permit and adjacent area.

Table 3
Spring Survey Summary
(Summary of information from Plate 7-1 for this permit term only, Figure 7-3 and Appendix 7-2)

Drainage	Number of Springs located spring and formation*	Elevation (ft msl)	Water Quality	Water Quantity	Comments/ Characteristics
Coal Canyon	6 springs, July 1996 CC-1,-5,-6 (kss or km17) CC- 2(Kba) CC-3, -4 (Kbm 2-4)	CC-2 to CC-4 occur between 7,675 ' and 7,925' CC-1, CC-5, and CC-6 occur at approximately 7,360 '	CC-2 -CC-4 pH from 7.35 to 7.79 SP.Cond. from 788 to 922 ohms CC-1,-5,-6 pH from 7.34 to 7.69 SP.Cond. from 714 to 788 ohms	CC-2 -CC-4 flowed < 1 gpm CC-1 flowed 10 gpm, CC-5 flowed 2 gpm and CC-6 flowed 20 gpm	Flows in this area are likely affected by previous mining activities. CC-1, -5,-6 are issuing from a fault down stream of Gordon Creek 3 and 6.
Unnamed drainage west of Coal Canyon	5 springs MC-1, MC-2, MC-3, MC-3a,-MC-4	Between 7360' and 7450'	MC-4 ph ranged from 7.58 to 7.97 while Sp. Cond. ranged from 747 to 1068 ohms	MC-4 flowed at 2 gpm from 7/96 to 10/96.	
Upper Beaver Creek Drainage south and west of the Main fault bounding the permit area.	Upper drainage 10 springs and seeps CV-1,-2,-3, -4, (Kbm 1-4) CV -5, -6, -30, -31, -32, (Kbm 1 CV-4 fracture related)	CV-1,-2,-3 and SP-9 occur between 8,480' and 8,640 CV -4, -5, -6, -30, -31, -32, occur between 8,720 to 8,960.	pH ranged from 6.89 to 7.37 while Sp. Cond. Ranged from 250 to 429 ohms	CV-1,-4, -5, were Seeps. CV-6, -30, -31, -32 flows were 1 gpm to 2 gpm. CV-2, and-3 flowed at 15 and 9 gpm respectively.	These springs may be in line with a fracture in connection with SP-4, and SP-1 (Interim Geologic Map of the Jump Creek Quadrangle).
Beaver Creek Drainage Beaver Creek and Sand Gulch	5 springs and seeps GV-32 -Beaver Creek(Kbm 1-4/fract) GV -25, -26,-27,-28 Sand Gulch (Kc and GV-25 fracture)	Between 8400' and 8880'	not obtained	GV-32, Seep GV-25, -26,-27,-28 flows were 3 to 5 gpm.	Springs located within the existing and proposed mine lease area..

Drainage	Number of Springs located spring and formation*	Elevation (ft msl)	Water Quality	Water Quantity	Comments/ Characteristics
Beaver Creek Drainage , Unnamed Drainage North of Sand Gulch	4 springs and seeps GV -10, -11, -12,(Kp) GV-13 (Kc).	Between 8,640' and 9200'	not obtained	and GV- 12 flowed at 1 gpm or less GV--10,-11, flowed at 10 and 18 gpm. GV-13 flowed at 50 gpm.	Springs located within the existing and proposed mine lease area..
Beaver Creek drainage /Beaver Creek outside of the major fracture.	10 springs and seeps GV-1, -2, -3, (Kc fracture related) GV-15, 14,(Kbm 1-4) GV-16, -21, -22, -23, -24 (flow from alluvium fracture associated Kc Kp).	Between 8,150' and 8,400'	not obtained	GV-1, GV-16 Artesian Wells 50 and 30 gpm. GV-2, 3, flowed 8, 10, GV-15, -22, -23,-24 seeps to 4 gpm GV-25 flowed 25 gpm.	Artesian and larger flowing wells appear to be in connection with the Beaver Creek and Jump Creek (covered) fault zones.
Beaver Creek drainage Jump Creek/Un-named Drainage outside of major fracture.	6 springs and seeps GV-9, (fracture associated Kc) GV-8, -7, -6, -5, (Kc) GV-4 (associated with Jump Creek Fault)	Between 8,170' and 8,640'.	GV- 9 and -6 are described as Mineral springs.	GV-9, -6, -5, seeps to 1 gpm GV-8, -7, flowed at 4 and 5 gpm GV-4 flowed 18 gpm and from the hillside at 40 gpm.	

* formation was obtained from a map and not verified on the ground.

Kss - Storrs Sandstone member
Kba - Aberdeen Sandstone
Kbm - mudstone members
Km - Mancos shale members
Kc - Castlegate formation
Kp - Price River formation.

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

Table 4

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 1989 to present	Station #1 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 pH 7.5 - 8.5	Late Spring 10-15 gpm High flow on 5/89 was 45 gpm Late Summer/Fall 5 to 6 gpm	
SP-2 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 pH 7.5 - 8.5	Flow in Late Spring 1-2.5 gpm 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 1989 to present	#4 1989 through 1993	Jewkes Creek Drainage flows along road empties into Jewkes Creek (Blackhawk, 8102 ft msl)	TDS 350-480 mg/l pH 7.5 - 8.5	Flow in Late Spring 1-2.25 gpm Flow in Late Summer/Fall <1 gpm	
SP-6 1989 to 1995	#6 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
2-6-W	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.	

Sampling Point	Monitoring History	Location (Formation)	Water Quality	Water Quantity	Comments
SP-9	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 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 considered spurious).	Location mapped on Figure 7-3

In Section 6.4.2 the plan states a series of springs in the North Fork of Gordon Creek, in the northwest corner of Section 18 T13S R8E, may be related to faults bisecting the area. The North fork Drainage may have formed subsequent to, or contemporaneously with, the movement along the Gordon Creek Fault Zone.

The Homestead Spring is identified as one of the main contributing springs to Beaver Creek. The permittee has included this spring as a baseline monitoring site to provide information on the flows contributing to Beaver Creek. This information will be used to determine the climatic variation, as it is believed the recharge to this spring is outside of the potential impact area due to its location relative to the fault system.

Groundwater Quality

Groundwater collected from the HZ wells in December 1995, November 1995, and January 1996 were affected from the foam drilling fluid used during installation. Data analyses indicate TDS ranged from 380 to 680 mg/l. Due to potential effects from the foam drilling, representative water quality data is not available.

The water quality of the wells, without influences from the drilling fluid, are not available and are not proposed to be presented from the permittee. The permittee has proposed that water elevation be the only data obtained at the HZ wells. It was stated that the intensive pumping required to obtain a sample with the slow recharge rates and the slow recharge would also influence the ability of the well to reach equilibrium following sampling. Currently, the water elevation is of more relative importance. However, it would appear that recharge to Wells HZ-95-1 and HZ-95-1-S are not as tight and water samples could be obtained to characterize the signature of the water quality of these two points. The permittee feels that in mine monitoring along with spring monitoring will adequately characterize these waters. TDS in the Star Point

Sandstone was presented as ranging from 335 to 391 mg/l to characterize water quality, while the Blackhawk Formation varies from 63-796 mg/l, Waddell et. al. (1981).

Two water quality samples were collected in the Blue Blaze No. 1 Mine workings, 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 samples collected in-mine at the Horizon #1 Mine in 1995 and 1996 show pH ranging from 7.38 and rising to 8.36, with specific conductance ranging from 485 to 595 ohms.

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, 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 Creek, is located over the future proposed mine workings and, is classified as 1C and 3A, designated for domestic and agricultural uses respectively. Downstream of the proposed disturbed area in Gordon Creek there are fisheries. (For further discussion 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 periods during the winter and late summer

months.

Beaver Creek is a perennial stream with base flow maintained by seeps and springs. Beaver Creek drainage follows the axis along the Beaver Creek Fold to the north and diverges northeast along a suspected fault zone. Beaver ponds are common in Beaver Creek and also play a part in providing perennial flows. Some of the springs contributing to baseflow include the Gunnison Homestead Spring, one mile west of the proposed additional lease area and Jewkes Spring one mile west of the permit area, near the northwest corner. Discharges from these springs have varied between 3 to 136 gpm and 1.1 to 38 gpm respectively over the baseline period to date.

The U.S.G.S., from 1960 through 1989, has maintained a gauging station (09312700) near the mouth of Beaver Creek several miles northeast of the permit area. The minimum annual discharge for this period was 284 acre-feet in 1981. The maximum annual discharge of 9,950 acre-feet occurred in 1981. 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 permittee 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 runoff would provide more significant information. Snowtel 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 one square mile and discharges to the North Fork of Gordon Creek. The permittee has referred to this stream as intermittent. The flow data submitted indicates that normally the creek flows all year at Sampling Point 5, but becomes intermittent at Sampling Point 3. According to information contained in the plan, Jewkes Creek flows diminish in a downstream direction beyond Sampling Point SS-5. Streamflow infiltrates into the alluvium and does not reappear immediately downstream. 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 and potential losses to fracture systems. Characterization by observation in the North Fork of Gorden Creek was conducted to determine whether this flow re-emerges as constant flow downstream; no re-emergence was noted.

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 plan suggests mining the Hiawatha Seam would not affect the quantity or quality of flow in the North Fork of

Gordon Creek. However, the plan also shows the Spring Canyon Aquifer below the Hiawatha Coal Seam contains water, and mining might reduce the piezometric water elevation potentially affecting water discharged to the surface water in this stream. See discussions relating to Coal Canyon springs. Discharge from the Starpoint aquifer to this stream section are to be characterized through sampling springs.

The 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 adjacent area will need to be presented. Future mining operations are proposed to take place under Sand Gulch and an unnamed drainage to the north. Baseline information is presently being 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 most likely controls the hydrologically defined adjacent area. The graben and fault system appears to extend all the way to Jump Creek. Additional, baseline information will be necessary to permit this site in the future. Further baseline sampling should focus on the springs and surface waters potentially impacted through intercepting water from faults and fractures. Baseline information for future mining was extended to Jump Creek.

Table 5
Baseline Surface Water Sampling

Sampling Point	Location	Flow	Water Quality	Comments
SS-3 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. Total Fe <0.02 to 8.7 mg/l Total Mn <0.01 to 0.05 mg/l TSS <1 to 72 mg/l pH 6.25 to 9.5	Information presented in the text does not match the data in appendices
SS-5 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. Total Fe .05 to 3.9 mg/l Total Mn 0.05 to 1.0 mg/l TSS 1 to 245 mg/l 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
SS-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
SS-7 1991 through present	Beaver Creek above 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.
SS-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.
SS-11	Sand Gulch Tributary of Beaver Creek Drainage upstream of the Northeast Fault	Perennial trough August winter flow not available.	pH 8.12 to 8.96 Sp. Cond. 163 to 353 ohms.	Associated with future mining and potentially the fault crossing Beaver Creek.
SS-10	Unnamed tributary North of Sand Gulch tributary to Jump Creek Drainage upstream of the Northeast Fault	Intermittent dry in July	pH 8.12 to 8.96 Sp. Cond. 74 to 110 ohms.	Data collection associated with future mining.
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.

Sampling Point	Location	Flow	Water Quality	Comments
2-3-W	Beaver Creek	Perennial	Not discussed	Monitored by Beaver Creek Coal Not found on any map, information may be found in the Gordon Creek #2, #7, #8 mine plan.
2-4-W 1982-	Beaver Creek 1 -1/2 mile west of permit area	Perennial	Not discussed	Monitored by Beaver Creek Coal
Upper North Fork Gordon Creek	Above Coal Canyon below unnamed drainage	Perennial	A pH of 7.8 and Sp. Cond. of 604 ohms	Flow upstream was 555 gpm on 8/7/96
Lower North Fork Gordon Creek	Below Coal Canyon	Perennial	A pH of 7.98 and Sp. Cond. of 522 ohms	Flow was 806 gpm on 8/7/96.

Baseline Cumulative Impact Area Information.

A cumulative impact area assessment was processed by the Division. The CHIA should be updated with the data and information presented to date.

Modeling.

No specific modeling was presented.

Alternative Water Source Information.

In section 7.1.6, the permittee purports no significant impacts are foreseen to groundwater as a result of mining in the permit area. To meet regulatory intent the permittee has committed to provide mitigation measures as outlined in section 7.3 and 3.4.8.2. In Section 3.4.8.2, in the subsidence mitigation plan, the permittee states that if substantial groundwater inflow occurs in-mine, mitigation measures will be provided and may include: attempts to seal off inflow, increased monitoring, lining of stream bed through the affected area and, replacement of lost water, if indicated by monitoring. The permittee has committed to enact a mitigation plan should mining impacts be identified. An extended mitigation plan would be correlated with Water Rights and UDOGM.

Information provided in the plan indicate the water rights are leased and are not an acquired right. Therefore, the permittee would have to obtain other methods to replace a water right use, should diminution or quality of a water right be impacted through mining activities.

Probable Hydrologic Consequences Determination.

Acid- and Toxic-Forming Material

Operational Monitoring and Identification of Acid- and Toxic-forming materials

The plan discusses the presence of acid-forming and toxic-forming materials in the Probable Hydrologic Impact section. Additional information provided in other sections of the plan are summarized below:

1. Disposal of waste rock from partings and splits will be placed in dry underground workings within the permit area when practical. No acid-forming 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 prior to second mining (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 from each of the three coal samples collected at the HZ-series holes vary from -9.1 to -13.6 tons $CaCO_3$ per 1000 tons of material these values suggest the coal has a potential to be acid-forming (section 6.5.6). Tests for acid-forming 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 permittee suggests this pyritic sulfur content is likely of limited areal extent. In section 6.5.6, the permittee presented core sample analysis obtained from the Hiawatha Seam coal. The presented analyses show total sulfur content from 0.38% to 0.61% of which 0.02% to 0.07% is shown to be pyritic sulfur.

Coal will be stored on the surface for short periods and runoff from the coal stockpile will be routed through the sedimentation pond where it will mix with runoff water that is more

alkaline. However, all of the coal will not be removed in the mining process and much of this coal will be in contact with air and water during and following mining operations. This may cause oxidation and lowering the pH of water coming in contact with the pyritic sulfur.

Acid-forming discharges are uncommon in the region and acid forming materials are not known to be extensive in Utah coal mines. Recent water samples obtained from the old Blue Blaze No.1 Mine workings are shown to have a pH of 8.65 to 8.63 and have increased from the 1995 pH values near 7.4. Should the presence of pyrite in the mined area cause a decreased pH locally, the mixing with higher pH water in the system would result in localized effects in the permit area and would not likely occur off the permit area due to downstream buffering.

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

Potential Groundwater Impacts

The following are considered by the Division to be the potential groundwater impacts in the permit and the hydrologic adjacent area:

1. Interbasin transfer of waters between Beaver Creek Drainage and Gordon Creek Drainage.
2. Dewatering fractures and associated springs or surface waters.
3. A change in the potentiometric surface.

The potentiometric surface maps presented for the Starpoint aquifer water ranges from 7,5138 ft. msl to 7,550 ft. msl within the permit area. Sources of springs and seeps, geology and topography are compared to the potentiometric map in order to understand potential impacts.

The permittee states inter-basin transfer out of the Price River drainage cannot occur in this region. This is true, however, inter-basin transfer between Beaver Creek and Gordon Creek could occur. Currently, the presented information suggests the aquifer in the Spring Canyon Tongue has a hydraulic gradient of 0.014 to 0.019ft/ft and flow is in an east-southeast direction. The permit area sits within a graben between two WNW-ESE trending faults. In the northwest section of the permit and adjacent area there is a gentle NW-NE dip 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. These structures influences the dip of the coal seam and may influence the potentiometric water surface that could result following mining.

The elevation of HZ-95-1 was 7,585.4 ft in July 1996. The standing water elevation in the Blue Blaze No. 1 Mine was 7,587 ft on 5/16/96, and 7,585 ft on 6/14/96; similar to the surface elevation in HZ-95-1. This could indicate an interconnection with the in-mine water and the fracture, but could also be due to local influences. The base of the Hiawatha is approximately 7,331.6 feet msl at Well HZ-95-1; approximately 7,477.6 ft msl at well HZ-95-3; and is approximately 7,189.3 ft. msl (288 ft. difference) at HZ-95-2. HZ-95-2 is outside the proposed mining area on the side opposite the fracture associated with the graben. The potentiometric surface elevation presented indicates the Star Point aquifer is in connection across the fracture of the graben. The elevation to which coal is removed could potentially decrease the potentiometric surface in the permit area and could affect springs outside the permit area if there is a hydrologic connection to the mined area. The only springs that currently are recognized to as having a higher potential to be affected by mining are those issuing from the Starpoint below the coal to be mined.

The largest volume of water issuing from springs associated with outcrops of the Star Point include spring discharges in Coal Canyon which appeared to increased following mining of the Gordon Creek #3 and #6 Mines. Additional evidence, of newly formed springs, occur in the unnamed canyon upstream of Coal Canyon (based on discussions with Chris Hansen, Earth Fax Engineering). These springs discharge from the Star Point formation in the Storrs Sandstone member and outcrop at an elevation of approximately 7,360 ft msl an elevation in line with the Starpoint piezometric surface. If the coal is removed at or below 7,331.6 feet, and if the water is in connection with the fracture feeding the springs in Coal Canyon and in the unnamed canyon to the west, these springs/seep could potentially be affected. As a result, a loss of head may relocate water flows along the geologic structure of the Beaver Creek syncline. Changes in quantity and quality to spring and surface water discharges associated with faults in hydraulic connection with the mined area, could result. The potentiometric surface elevation could be lowered and local changes in gradient and flow direction could result creating localized increases or decreases in flow and relocating discharges. This would continue until after mining ceases or water fills the mine to an elevation where discharge would again occur from these fractures. It is likely that water issuing from the Coal Creak area could be maintained through locating sumps in the areas that would recharge the springs, should it be determined that there is a hydrologic connection. It is also probable that localized recharge provides some component of flows to this spring which may not be affected.

The proposed operations have the potential to affect the springs in Coal Canyon and the unnamed canyon to the west (depending on the depth to which the coal is removed). Baseline flow data and field parameters were the collected for this area.

A fracture is present at the north end of the permit area. This fracture appears to have influenced permeability in HZ-95-1 and is shown on the geologic map to cross Beaver Creek into

the permit area. Mining into the region where this fracture occurs could result in dewatering the fracture. Currently it is unknown whether Beaver Creek is in connection with the fracture, and whether it provides some recharge to the fracture. The seepage evaluation conducted on Beaver Creek in 1996 shows a measured loss in flow between HZ-10 and HZ-11 (figure 7-4a) a loss of 6.8 gpm. It is not certain whether all or part of this loss is due to alluvial transmission losses. The amount of loss was considered insignificant, in the plan, because it could have easily been caused from measurement error.

Several other points presented in the plan suggests that if an interconnection exits between Beaver Creek and this fracture losses associated with mining would not be significant. These are summarized below:

1) There is approximately 600 feet of strata between the Starpoint and the overlying aquifer.
2) Recharge following pumping is slow in well HZ-95-1.
3) The overburden exceeds the 500 ft of overburden where subsidence has effected streamflow according to the Miller Creek Study.
4) The differences potentially reducing the likely hood of subsidence affecting Beaver creek v.s. the Miller creak study are as follows; the sandstone strata above the Hiawatha Seam has an increased thickness over that present in the Miller Creek area; Long wall mining is not proposed; only one seam will be extracted.
5) Fault Breccia show healed mudstone units when observed at depths greater than 500 feet.

The permittee has committed to increased monitoring over the period where mining will occur near the fracture for water level monitoring at Well HZ-95-1 and Beaver Creek.

Due to low permeability formations and, due to planned avoidance of faulted zones, the permittee projects inflow to the mine from faulted zones to be minimal (section 7.1.2.2). An inflow analyses which assumes porus medium flow rather than fracture flow was presented and adjusted, according to Lines who stated that fractured bedrock flows are on the order of one magnitude larger than that predicted for unfractured bedrock. The inflow from fractured bedrock, using Lines (1985), was estimated to be 0.08 cfs or 36 gpm. The inflow estimated to be present from the existing and potential future mining varied from approximately 36 to 90 gpm. This prediction was based on a hydraulic gradient of 0.014 ft/ft. Based on the 1996 data the inflow value may fluctuate seasonally.

The permittee has stated the fault associated with the water in the Beaver Creek No. 3 Mine will be closely monitored and periodically drilled horizontally into the fault zone. This

should aid in avoiding water in this zone. The permittee should document these activities in the annual report.

The permittee has concluded that the Hiawatha Coal Seam will be saturated from the beginning of mining operations. The Division believes the rate of inflow may increase locally, this will depend primarily on whether a faulted zone is encountered that contains groundwater in storage or, whether it is in connection with an overlying perched aquifer.

The coal seams dip away from the portal entrance and excess water will be sumped underground. Waste rock from the mining production is proposed to be gobbed underground and backfilled. Due to removal processes the gob has increased surface area, which increases the potential impacts, should water and air come in contact with the materials. Potential water quality changes that might occur would be increases in TDS (ions in solution) and increased potential for acid and toxic formation.

Baseline data obtained from an underground mine water sample from the Horizon No. 1 Mine is found in Chapter 7. The permittee has averaged baseline data sources and compared the data with the data obtained in-mine. The in mine values fall within the 95% confidence interval for and according to the plan suggest the water should not be adversely impacted. However, this method ignores potential seasonal variations. The permittee has indicated Calcium Carbonate Rock dust will be used in mining thus, minimizing impacts to water quality. See the section above on **Acid and Toxic Forming Materials** in this TA.

The permittee 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 where 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 similar to the water interception which occurred in the Beaver Creek Coal Mine.

The permittee has estimated the "worst case" potential inflow through a porous formation (exclusive of fracture flows) to be 2.6×10^{-4} and to have an average potential inflow of 1.5×10^{-4}. Or, a flow rate of 9 and 5 gpm per section. Assuming six sections would be removed 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. The up gradient well HZ-95-1 had a maximum water elevation of 7,522.7 feet in the Starpoint Formation and the base of the Hiawatha coal seam is approximately 7,331.6 feet msl at Well HZ-95-1 therefore, the potential is that a decrease of head in the Star Point aquifer, of approximately 191 feet could occur at the mine-site over time. The extent to which this affects the adjacent area is limited to the interaction of water bearing

members along the fault zones and recharge and discharge zones. The aquifer may be de-watered within the graben without interaction with the fracture/fault related waters across the fault, or may affect the waters across the fault system. According to information in the GEO-Hunt Consulting report, appendix 7-11, most faults in the Wasatch Platteau act as a barrier to bedding plane groundwater flow which causes an increased presence on the up-dip side and a groundwater shadow on the down-dip side.

Potential Surface Water Impacts

On page 7-22, the permittee states that proposed mining operations will occur north of Gordon Creek and should not affect the quantity or quality of water in the drainage. However, it was noted that approximately 400 gpm 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 and change the potentiometric surface of the Star Point aquifer immediately below the Hiawatha Coal Seam. This flow interception could impact base flows provide by springs in and near Coal Creek or, relocate the source of the flow. It is assumed the control point for the piezometric surface would likely be at the elevation related to the lowest point that the coal is removed. The coal dips 5.3% to the northwest, and outcrops at approximately 7,600 feet at Portal Canyon. Drill logs shows the depth of the Hiawatha Coal Seam to be at 7,499 feet at LMC-3 to 7,331.6 feet msl at Well HZ-95-1. The furthest extent of the block of coal to be removed is located between these drill holes. Therefore, the potentiometric surface (approximately 7,580 feet to 7513 feet) may be impacted and decreased to somewhere between 7,491 ft and 7,331.6 feet. As a result of the change in potentiometric surface the water quantity and water quality to Gordon Creek could be affected and change discharge rates at Coal Canyon. Quarterly flow rates will be monitored on the North Fork of Gordon Creek below this seep area. This proposal meets minimum requirements. However, it is not clear how the base flow will be differentiated from runoff influences with only quarterly flow samples. A continuous recording flume or more frequent low flow readings and one high flow reading would better meet the objective for monitoring this location.

The permittee indicates the water intercepted from the fault associated with the Beaver Creek Coal Company No. 3 Mine will be avoided when mining the proposed Horizon No.1 Mine. The fault will be avoided by evaluating maps, closely monitoring the activities in the fault area and, if necessary, periodically drilling horizontally into the fault zone .

Subsidence Control and Renewable Resource Protection

The Stream Buffer Zones will be maintained for 100 feet on either side of Beaver Creek

within which second mining will not occur without regulatory approval. No mining under Beaver Creek is proposed under this permit term. Presently mining panels are set up to avoid Jewkes Creek.

The permittee has stated that mining is designed to preclude subsidence of perennial and intermittent steam reaches. The permittee references Gentry and Abel 1978 which indicate streams tend to be protected by upwarping of adjacent slopes during subsidence.

Mining 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 Castlegate '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 was under further investigation, with no definitive answers, because of seasonal constraints.

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. Mitigation measures are discussed under **Alternative Water Source Information** in this T.A.

Water Use

Average water use was predicted to be approximately 21 gpm with 15 gpm to be used underground and 6 gpm to be used in surface operation. The 37 gpm were considered consumptive use lost through the following sources; 6 gpm were estimated to be lost in surface consumptive uses; 25 gpm were predicted lost due to coal removal; another 6 gpm is estimated for evaporative loss through mine ventilation. With future expansion it is predicted that up to 50 gpm would be discharged from the mine. According to information in the water rights permit the total amount of water estimated to be consumed by the mine were presented as 9.1 acre feet consumed in -mine and, 6.8 acre-feet of surface operation consumption or, a total of 15.9 acre-

feet of water per year.

The permittee believes water will need to be pumped into the mine only during initial development and during peak operating procedures. It was estimated that approximately 60 acre-feet of water per year will be removed with the coal.

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 permittee 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 permittee has also committed to store snow in sites that will directly drain to the sedimentation pond (Section 3.3). Following backfill and grading operations, sedimentation ponds are proposed to be removed. Alternate sediment control measures are discussed in Section 3.5.4.3.

Surface Water Quality

The permittee considers impacts from increases in TDS to be minimal and cites downstream increase in TDS when water comes in contact with Mancos Shale, as the major factor in this determination. Because downstream waters are naturally degraded the use and quality of the upstream waters retains its importance. However, impacts to downstream waters, where the water comes in contact with the Mancos Shale, would probably not be notable.

The road to the mine is maintained as a gravel road. The use of road salting is not likely to occur. The county has requested Magnesium Chloride and Magnesium Oxide be used to minimize dust. Increases in these constituents may be seen during periods of runoff. Pre existing and existing reclamation operations in the area also used this as a dust suppressant.

Hydrocarbons

Horizon Coal Company 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. A shop maintenance area will be located next to the mine office area.

The permittee proposes a concrete containment structure will be used and will be adequately sized to contain any spill, Section 3.23. The permittee indicates spills will be handled in accordance with the Spill Prevention and Contamination Control (SPCC) Plan. This plan is provided in Appendix 7-10 without a certified signature required by the SPCC regulations and should be present on the mine manager's copy. 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.

The permittee's proposal uses accepted practices for their SPCC plan. The permittee's operation plan includes cleanup procedures for small scale spills, and a commitment to retain absorbent materials on site. Because the permittee has not provided a valve to allow draining of surface water, water that collects in the concrete containment structure, maintenance pumping of excess water will need to be conducted to maintain the designed size. A copy of the SPCC plan will be maintained on file in the Mine Manager's office and the Mine Engineer's office.

Flooding or Streamflow Alteration.

The permittee discusses the potential for flooding as being diminished during operations from reduced peak flows through attenuating water in the sedimentation pond. In addition to the permittee's 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. The operator has provided an impact basin below the culvert to minimize this potential.

Changes will also occur from reclamation activities. Currently the waters that exit from Portal Canyon are collected behind the waste embankment and are evaporated, used by vegetation or seep through the waste pile. The reclamation of Portal Canyon will return the ephemeral flows from this canyon directly to Jewkes Creek. The permittee has provided riprap channel designs for the velocities that may occur from a 100 year- 6 hour event for Portal Canyon and has committed to develop a channel design that will encourage development of riparian vegetation in Jewkes Creek. Other potentials for streamflow alteration include an increased discharge through the operation period due to mine dewatering and other changes discussed under Potential Surface Water Impacts and Potential Groundwater Impacts.

Findings:

The proposed amendment is not considered adequate to meet the requirements of this

section. Prior to approval, the permittee must provide the following in accordance with:

R645-301-731, clarify the information presented on page 7-30, of this submittal so that the proposed monitoring at CC-5 and MC-4 is clearly presented (the parameters to be collected should include field monitoring parameters and TDS).

OPERATION PLAN

HYDROLOGIC INFORMATION

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

Analysis:

General

General hydrologic inputs for determining design standards at the Horizon Mine are described. 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 hydrologic groups B and C were used for these soils.

The Permittee has used a CN of 89 for the disturbed areas. This number is adequate at this time. However, should the Permittee propose additional buildings, road surfacing or pad surfacing the design CN would require re-analysis. The Permittee used a CN of 48 for the Curecanti/Oak-Aspen soil/cover type and a CN of 73 for the Senchert/Pinyon Juniper. The vegetation map indicates vegetation types other than those described for determining the CN. For the undisturbed areas draining the weighted value was increased to a CN of 70 which is higher than the estimated CN. Based on the increase in this value the design CN used is considered adequate.

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 to facilitate the proposed coal mining and reclamation operations. A pipe to the mine was constructed to convey water from Sweets Pond to the mine. Sweets Pond and associated pump facilities are currently bonded by Mountain Coal Company at the #2#7&#8 mine. At or, prior to bond release information in the Horizon plan and the #2, #7, & #8 mine should be coordinated. See additional discussions of *Water Rights and Points of Diversion,* **Baseline Information** in this T.A.

Groundwater Monitoring

The permittee has provided a ground water monitoring plan under Section 7.1.5. The permittee states "Data collected from the springs will allow quantification of potential impacts to perched aquifers within the permit and adjacent areas. Data collected from mine inflows will allow impacts to be quantified to all hydrologic resources that are affected by mine dewatering, and "Data collected from the HZ wells will allow quantification of potential impacts to the regional groundwater system." Although much of the design of the monitoring program meets the goals of determining the impacts of mining on the groundwater system, the permittee has not provided site specific information on how the data will be used to make this determination. Table 6 and Table 7 represent summaries of the groundwater sampling program.

Table 6
Operational Spring Water Sampling

Sampling Point	Location	Formation	Monitored Frequency/Parameters	Comments
SP-1	Hillside flows to Jewkes Creek.	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. Quantifies impact to perched systems.
SP-2 1989 through 1993	Hillside out does not usually reach Jewkes Creek.	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	Blackhawk	Quarterly (when accessible) Flow/Parameters Table 7-2	Flows along the road to Jewkes Creek.
SP-9	Jewkes Spring	Blackhawk	Quarterly	
2-6-W	Homestead Spring	alluvial deposits	Quarterly (when accessible) Flow/Parameters Table 7-2	
GV-70	Markis Spring	Blackhawk	Quarterly (when accessible) Flow/Parameters Table 7-2	Within area of future workings.
CC-5 1977-1999	Unnamed drainage up-stream of Coal Canyon.	Storrs unit of the Starpoint formation.	Quarterly	proposed monitoring not clearly presented
MC-4 1977-1999	Coal Canyon.	Storrs unit of the Starpoint formation.	Quarterly	proposed monitoring not clearly presented

Table 7
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 flows of 2 gpm or greater occur flow will be recorded and a sample taken for water quality analysis. Flow from fractures will be mapped on the mine progression map. Flow will be collected quarterly if present for at least 30 days	Quarterly while accessible	Identified in Table 7-2	According to Table 7-2	
Discharged mine water	If necessary treated in underground sumps.	In accordance with permit.	In accordance with permit.	In accordance with permit.	Currently not expected and not a permitted activity. Will need permit approval.0
Well HZ-1 HZ-1S HZ-2 HZ-3	Completed into the Spring Canyon Tongue of the Star Point Sandstone.	Quarterly	None proposed.	Water level corrected to depth from ground surface.	

The Permittee committed to submit quarterly and annual reports. These reports should be in the format required by the Division. A memo regarding annual report submittals is forwarded to the operators under R645-301-742.420, and outlines those requests. The permittee included a commitment, in the plan, to notify the Division if data indicate non-compliance with permit conditions.

The permittee has stated that data collected from springs will allow impacts to be quantified, and data collected from the HZ wells will allow quantification of impacts on the regional system. Since no representative water quality data has been collected from the HZ wells, the springs and mine-water inflow are proposed to be used to monitor water quality changes.

Should the mining operations intercept the fracture system connected with HZ-95-1, the location of these wells provide useful monitoring. Even with the lack of baseline data, these wells will be useful in determining the first year mining impacts. The position of HZ-95-2 is outside of

the graben within which coal will be mined. This should provide information on whether there is hydraulic connection across the graben in the Star Point, or whether the graben acts more similar to a discreet unit. The location of HZ-95-1 will aid in indicating whether mining will cause dewatering of the fracture. The location of HZ-95-1-S will aid in determining if mining affects the shallow aquifer (100-200 foot depth) adjacent to Beaver Creek.

The permittee states that if, at the initial interception point, the flow exceeds 30 days continuous flow groundwater monitoring will be sampled quarterly. Representative points of inflow will be selected from the source. The permittee has committed to discuss with UDOGM a more stringent monitoring program for HZ-95-1 prior to entering the northernmost mining block in Section 8.

Currently the proposed baseline/operational monitoring includes sampling at springs CC-5 and MC-4. The paragraph states the springs will be analyzed for calcium, magnesium, sodium, potassium, carbonate, sulfate and chloride in 1997 through 1999. A following paragraph states that Table 7-2 will be followed. The parameters to be collected should include field monitoring and TDS as these are more likely to be affected by mining. It should be noted that these springs are recent sources of water discharge or, have increased in flows and appear to be associated with previous mining activities.

However, the permittee has committed to provide monthly flows below Coal Canyon on the North Fork of Gordon Creek, as a surface water monitoring station, when the site is accessible. The Permittee states that this will aid in determining overall impacts of mining. Without the baseline information, the potential for identifying changes in flow related to mining may be difficult to determine, but operational monitoring would potentially provide useful information. For instance, if in-mine flows increase and flows in the North Fork of Gordon Creek increased it would indicate there is a hydraulic connection with the Horizon Mine to those fractures. If the direction of flow changes and follows the geologic feature of the Beaver Creek Syncline the spring flows would decline. Other factors such as climate would need to be considered.

Surface-Water Monitoring.

Specifics on monitoring during the construction period were included in the plan and permittee has committed to collect weekly samples during the operational and reclamation construction period upstream and downstream of construction. The parameter to be analyzed in the field is turbidity. Additional operational surface water monitoring is summarized in Table 8.

Table 8

Operational Surface Water Monitoring

Sampling Point	Location	Flow	Water Quality	Water Quantity	Comments
SS-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	
SS-5	Jewkes Creek upstream of disturbed area but downstream of the confluence with Spring Two Canyon.	Perennial	Quarterly According to Table 7-5	Quarterly	
SS-6	Portal Canyon Drainage and Spring Two Canyon Drainage	Ephemeral	Not proposed	Not proposed	
SS-7	Beaver Creek, upstream of the permit area outside of potential subsidence zone.	Perennial Monthly	Quarterly According to Table 7-5	Quarterly	
SS-8	Beaver Creek downstream north east of permit area. Out of potential subsidence zone.	Perennial	Quarterly According to Table 7-5	Quarterly	Additional seepage studies will be conducted with abnormal variations in flow between SS-7 and SS-8.
Lower NFGC	North Fork of Gordon Creek below coal Canyon	Perennial	Not Proposed.	Quarterly	
SS-10	Tributary to Jump Creek	not determined	Quarterly According to Table 7-5	Quarterly	Additional data being collected.
SS-11	Tributary to Jump Creek	not determined	Quarterly According to Table 7-5	Quarterly	Additional data being collected.
SS-12	Beaver Creek downstream of SS-8.	Perennial	Not proposed	Quarterly	

Acid- and Toxic-Forming Materials.

The permittee 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 permittee 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.

No discharges into an underground mine are approved. The underground water associated with the water right is intended to be obtained from water intercepted in the mined area and is not proposed to be transferred from other workings. See further discussions under **"Baseline Information, *"Water Rights and Points of Diversion"*** in this T.A.

Gravity Discharges.

The dip of the coal is away from the portal faceups. Therefore, no gravity discharges are anticipated during the operations phase. The permittee has provided for a drain to prevent the accumulation of a hydrostatic head on the portal seams. There could be a potential for gravity discharges from the portal following mining depending on the accumulation of water in mine and the elevation of the piezometric surface following mining operations.

Water Quality Standards and Effluent Limitations.

The permittee 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 number UTG040019 is authorized for discharge at outfall 001, latitude 39°41'37" and longitude 111°02'58", to the North Fork of Gordon Creek.

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. Any such discharges will be monitored in accordance with the UPDES permit (Sections 3.4.3 and 3.4.3.2). The permittee 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. The permittee has predicted that future mining will result in a discharge, therefore, the permittee has attempted to obtain an additional mine water discharge point. A letter from Steve McNeal, indicated that the application submitted on August 13, 1996 to meet the Divisions requirement was deficient and could not be processed without information on an oil skimming device, the pond volume and a water quality sample. The water quality sample can not be obtained until the portals are developed and entrance to the mine is allowed. 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 permittee has committed to construct the sewage facility upon plan approval.

Diversions.

Undisturbed diversions are described in Section 7.2.3.2 in the plan and summarized on Table 7. All disturbed diversions are designed to carry the flow from a 25-year, 6-hour event. This is greater than the minimum regulatory requirement for a 10-year, 6-hour event. Culverts UC-1 and UC-3 receive drainage coming from the Jewkes Creek, an intermittent stream, designed to carry the flow from a 100-year, 6-hour event.

Table 9
Undisturbed Drainage Diversions

Diversion	Diameter (culvert)	Function
UC-1	36"	Collects flow from ;UC-2 and UC-3, Portal Canyon and Jewkes Creek and routes it through the pad area.
UC-2	24"	Collects flow from upper Portal Canyon and routes it into UC-3.
UC-3	30"	Collects flow from upper Jewkes Creek and routes it into UC-3.

The permittee 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 dependant on the soil types, also it is common in the region to have flashy high intensity flows that would exceed the erosivity of the minimum design requirements. Additional need to control erosion from drainages within the pad area draining to the sedimentation pond will be determined through site inspection.

Roads are proposed to be surfaced with 12 inches of crushed gravel road base. All roads within the permit area drain to the pond. Culverts were placed to convey water under the roads to reach the pond. The ancillary roads will use waterbars and berms to control the water from the roads. The water bars were sized based on the 10-year, 6-hour event and the locations are shown on Plate 7-4. The maximum length between water bars is 250 ft on the well exploration road. The longest length of flow on the fan portal road is 494 feet. The permittee has stated the worst case peak flow estimate is 0.24 cfs based on a maximum area draining to each water bar of 8 acres and based on a maximum channel slope of 0.02 ft/ft, resulting in velocities of 1.48 fps. The water will be conveyed downstream in half-round culvert to minimize erosion over the outslope. In two locations the road will transition through ditch DD-1. Designs for the transition areas were presented.

Ditch DD-1 will consist of two segments. The upper ditch will consist of small ditches on each side of the canyon and will drain to lower DD-1. The ditch will be triangular in shape and will contain riprap to control erosion where slopes exceed 11.5 %.

Stream Buffer Zones.

The permittee 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 permittee 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 permittee has provided a copy of the stream alteration permit 96-91-OSA. This permit expires on June 21, 97. Thirty days following completion of the stream alteration the applicant was to meet with the engineer to complete a compliance inspection.

Sediment Control Measures.

The permittee 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 Canyon and Spring Two Canyon to capture sediment. Berms, strawbale dikes and silt fences will be located between stream channels and areas being disturbed. The Permittee has committed to cleaning these structures once construction is completed using backhoes and shovels.

The bypass 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. The plan committed to bypass streamflow around construction activities using a diversion dike and flexible culvert. In the field the applicant used a trench to contain upstream waters. No excess sediment was reported related to this action during the construction phase. The permittee constructed the sedimentation pond as soon as possible following construction of the downstream culvert sections. The measures proposed for culvert construction were acceptable practices. The ability of these proposed measures to control sediment was judged in the field through site inspections.

Additional erosion control measures include topsoil treatment and snow removal methods. The topsoil is proposed to be vegetated with interim cover as discussed in sections 3.4.4.1 and section 3.5.2. The topsoil piles will be contoured, fertilized and seeded. A berm will be placed around each topsoil pile to minimize soil transport. In section 3.3, the plan indicates that snow removed will be stored in sites draining directly to the sedimentation pond.

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 provided for water rights use which is currently associated with the Gordon Creek Mines #2, #7, and #8, and the mine sedimentation pond. For a discussion of the mine site sedimentation pond, see the **Sedimentation Ponds** heading below.

Sweets pond also has an existing pumphouse and a head gate to control inlet flows. The permittee has built a water line from the pond to the mine. The pond 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.

The sedimentation pond does not fall under the requirements of a MSHA structure. The 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. Embankments will be vegetated, to control erosion, with a temporary seed mix as described in section 3.5.5.2.

The permittee proposes to divert all disturbed area runoff to the sedimentation pond, receiving runoff from 35.1 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 0.56 acre-feet. The permittee has assumed sediment production of 0.1 acre - feet/acre/year from the disturbed area or 0.92 acre-feet annual sediment production. No sediment production was accounted for from the undisturbed area draining to the pond. The total capacity of the designed sedimentation pond is 2.6 acre-feet, allowing a runoff storage volume of 0.7 acre-feet of runoff and 1.9 acre-feet of sediment storage.

The sediment will be cleaned out of the pond at 60% of the total sediment volume at 7580.6 feet. The maximum capacity for sediment storage is proposed to be at 7582.0 feet. The clean out 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 commitment to clean out the accumulated pond sediment at 60% of the maximum volume will provide adequate space to retain the estimated runoff volume.

The pond will also have a 2" diameter 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 the elevation of the maximum sediment level. If the sediment in the pond should reach the maximum level approximately three feet below the elevation of the spillway. The permittee would have a difficult time draining the pond without draining sediment. Therefore the 60 % clean out level would need to be strictly adhered to. The applicant has provided a oil skimming device on the decant.

The sediment pond's spillway is designed to pass the peak flow of the 25-year, 6-hour precipitation event. The proposed spillway elevation is at 7585 feet. Calculations for the spillway do not route the flow through the pond. The design depth of the spillway is 1.5 feet, a flow depth of 0.08 ft, a width of 10 feet and side slopes of 2H:1V, the spillway will have 1.42 feet of freeboard between the top of the pond embankment and the maximum flow elevation. The permittee proposed this design is non-erodible based on a velocity of less than 5 fps.

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.

The permittee has analyzed the pond embankment designs for stability. Using a standard, circular failure model and the Hoeck Circular Failure Charts, the Permittee 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 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.

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 6 E are also certified by Mr. White.

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 designed to maintain the downstream riparian area. In the design the base of the spillway will have an impact pool. Water is then conveyed from the pool to the channel which carries flow from the bypass culvert outlet. The culvert outlet will then transition to a low flow channel and flood plain design with a 4 foot bottom width and 0.6 foot depth and flood plain area.

Impoundments.

The only impoundment proposed for the operation is a sedimentation pond and Sweets Pond. The sedimentation pond is discussed under Siltation Structures. In section 3.3.5 the permittee has committed to promptly report impoundment hazards to the Division and formulate remedial action and emergency procedures.

Casing and Sealing of Wells.

The permittee 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 proposed amendment is not considered adequate to meet the requirements of this section. Prior to approval, the permittee must provide the following in accordance with:

R645-301-742, obtain an additional mine water discharge point for the UPDES permit, prior to discharge from the mine portal.

R645-301-731.121, provide an oil skimming design on the sedimentation pond spillway.

MAPS, PLANS, AND CROSS SECTIONS

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

Analysis:

Monitoring Sampling Location Maps

Add to Engineer's analysis:

Surface water monitoring stations, including the baseline spring and seep survey, the operational monitoring program, and the UPDES sedimentation pond discharge point are shown on Plate 7-1. Duplication of site labels and miss-represented symbols describing the type of monitoring site are some of the errors found on this map.

Findings:

The proposed amendment is not considered adequate to meet the requirements of this section. Prior to approval, the permittee must provide the following in accordance with:

R645-301-120, Provide accurate information on Plate 7-1. Correct duplication of site labels and symbols which accurately reflect the type of site represented by the label.

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 provided below under the subsection entitled **Sediment Control Measures.**

Acid- and Toxic-Forming Materials

In the plan, under section 6.5.7.1, is a commitment to monitor the acid and toxic conditions of the overburden and underburden. Samples will be taken at 2,000 foot intervals throughout the mine and tested according to the Division requirements.

The permittee has committed, in section 3.5.4, to cover all acid- and toxic-forming material with four feet of non-combustible, non-acid and non-toxic, forming material that is a suitable growth material. The permittee 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.

Where noncoal waste rock from initial development will be incorporated as fill. The permittee has committed to cover all coal waste with four feet of material. No coal or coal waste material will be used in the areas planned for reclamation for Portal and Jewkes Creek. Areas where coal waste was placed during construction of the site is presented in Appendix 3-8 Plate A.

Transfer of Wells.

No request for 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 permittee has proposed that a drain be included in the stopping for portal closure. This site may have gravity discharge and should be monitored following mine closure through bond release to observe whether flow occurs from the portal.

Water Quality Standards and Effluent Limitations.

See information provided below under the subsection entitled **Sediment Control Measures**. The permittee will be required to demonstrate all applicable water quality requirements have been met prior to bond release.

Grading to Drain.

The permittee has committed to keep surface drainage from entering sealed entries in section 3.5.3.1. The permittee has committed to recontour the area to drain to the final reclamation channel in section 3-25. However, the elevation contour lines on Plate 3-7 does not reflect a site graded to drain to the channel. In fact, the portal canyon reclamation contours are nearly the same as the operational contours from cross section D'-D to cross section J'-J. The contour lines indicate a flat planar surface over the lower section of the Portal Canyon drainage. The construction of a relatively flat plane on a slope of this steepness will increase the potential for rill and gully erosion at this site.

Due to weather conditions at the site the applicant was unable to complete the survey of the minesite making it difficult to provide the reclamation channel configuration. Horizon has committed to address the stipulation pertaining to the R645-301-742.300 regulations within 30 days after surveying is completed.

Diversions.

The permittee 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. However, the reclamation topographic information does not provide for grading the surface to drain to the channel.

Portal Canyon was designed to carry a peak flow of 9.95 cfs. The permittee's analysis assumed a one foot flow line because no high water mark was found. Since this is an ephemeral system it is often difficult to determine the height of the channel forming flows. Typically these flows are determined by high intensity short durations events in ephemeral systems. The design capacity of this channel exceeds the minimum required design flow for an ephemeral system.

The permittee has presented a centrally-located channel section, located away from the toe of steepened and backfilled slopes. The channel is placed to avoid a pre-existing coal spoil slope near cross section C'-C in Portal Canyon and to prevent leaching or erosion of that pile. The ability of the Portal Canyon channel design to be stable will be demonstrated over the reclamation period.

The permittee has assessed the design capacity of Jewkes Creek and determined the upstream channel capacity approximates a flow of 27.65 cfs while the downstream channel capacity approximates a flow of 38.67 cfs. The reclamation channel is design to pass the 100-year, 6-hour event through the channel and flood plain configuration. The design capacity of this channel meets the minimum required design flow for an ephemeral system.

The Upper Jewkes Creek channel is designed to carry 19.75 cfs in the combined channel and flood plain configuration while, the Lower Jewkes Creek channel is designed to handle a combined channel and flood plain flow of 30.21 cfs. The channel forming flows are described by Dunne and Leopold (1978) as **being related to channel characteristics** and often related to the 1.5 year recurrence interval for most perennial and intermittent systems. The estimated capacity of the upper end of the disturbance was 27.65 cfs based on a high water mark. The estimated capacity of the downstream channel below the disturbance was determined to be 38.67 cfs. The minimum requirements for the diversion according to R645-301-742.322 were not demonstrated to have been met by the presented design.

The permittee's proposal includes a small riprapped channel section designed to carry a low flow from the 10-year, 6-hour event. The permittee has provided a sand filter blanket to promote drainage to the surrounding soils. The channel design meets the minimum design requirements of passing the 100-year, 6-hour event through the channel and flood plain configuration however, it does not meet the channel capacity criteria described above. The ability of the channel design to be stable may have a lot to do with the potential of the surrounding soils to attenuate flows and convey subsurface waters. Additionally, the postmining flood plain configuration has an increased slope and the limitation of 12 feet for the extended channel may

not provide an adequate area to meet the vegetative requirements.

The Jewkes Creek channel design is intended to provide a means to re-establish the riparian vegetation, existing at the site prior to disturbance, and is intended to simulate the existing channel while considering other site conditions. Some issues that are related to the success of the permittee's proposal are based on the hydraulic characteristics of the soil adjacent to the channel, the maintenance of the culvert providing a gradient control downstream of the site and, the amount of sediment and intensity of flows being transported through the system. The ability of the design to be stable may be measured through the success of the design to withstand flows received at the site.

According to Rosgren's Classification system Jewkes Creek would approximate an "E stream type" configuration. The channel type is chosen based on characteristics of the existing stream gradient through this section and, assuming a moderate sediment supply and healthy vegetation. The classic channel under these conditions would have a width to depth ratio less than 12, an entrenchment ratio grater than 2.2, a sinuosity greater than 1.5 and, a surface water slope less than 0.02. Because there is a high sediment load in the existing system(upstream logging presently occurring) and because the potential for additional flows from the reclaimed channel section and an increased slope, a channel more closely resembling a "C stream type" might possibly be more appropriate.

During reclamation the pipeline from Sweets Pond to the minesite will be disconnected, the end of the pipes will be plugged and, the pipeline abandoned in place.

Stream Buffer Zones.

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

Sediment Control Measures.

The permittee stated the location of the pond and channel re-establishment makes it impractical to retain the pond through the entire reclamation period. In section 3.5.8 the reclamation time table shows that pond maintenance will occur 10 years after seeding and pond reclamation will occur 5 months after Phase II bond release. In section 3.5.7.1 the plan states that the time table and sequence for removal of the sediment control structures will depend upon the season of the year and precipitation. Horizon committed to begin reclamation activities in portal canyon and to leave the sediment pond and UC-1 located in Jewkes Canyon in place as long as

possible. The permittee needs to correct the reclamation time table to show the intention to remove the sedimentation pond prior to completing re-grading practices.

If the permittee had designed the operational site to retain the pond, the culvert system could have been retained in the location of Jewkes Creek until Phase II bonding or until vegetation was adequate to control erosion. The permittee indicated that this is not practical because it would require re-disturbance of the re-vegetated areas lengthening the time necessary to establish permanent vegetation. If the site was constructed to meet reclamation needs this would only require moving the equipment up-stream in the channel and probably would not have to produce as much re-disturbance as the permittee suggests. However, to achieve the riparian vegetation requirements it may be best to establish flow through the riparian area. The permittee states that prior to removal of the sedimentation pond adequate erosion control measures will be installed and an inspection by UDOGM personnel will be requested. The plan does not meet the requirements of R645-301-763. "Siltation structures will be maintained until removal is authorized by the Division and the disturbed area is stabilized and revegetated". BTCA measures have been granted by the Division in the past, in leu of a sedimentation pond for ephemeral systems, however, this is a perennial/intermittent system.

The permittee 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 precipitation event were to occur." Other sediment control measures proposed to take place during the reclamation activities include the following:

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

2) Alternative methods proposed to be employed during reclamation include:

   Silt fences
   Surface ripping and pocking, and deep gouging
   Mulching
   Straw-bale dikes
   Seeding
   Reseeding areas that do not exhibit successful germination.

Silt fences and straw-bale dikes will also be installed in road ditches immediately downstream from the disturbed area. They are also proposed to be used in the channels of Spring

2 and Portal Canyon. The permittee provided the design provisions for fences installed in ditches or drainages with silt fences installed, silt fences installed in ditches must have a notched spillway. These are current BTCA for proper installation of these structures in a ditch or channel.

In section 3.5.5.4 the plan states that reclaimed and revegetated areas will be monitored and refers to section 3.5 and section 9.8. Measures are outlined in section 3.5.4.2. When necessary soil erosion will be controlled by regrading and application of mulch, and matting. Monitoring included vegetation monitoring only. Should the division determine that adequate information is presented to obtain approval for Alternate Sediment Control measures the applicant will be required to provide a sampling set up on a continual basis at timed intervals to demonstrate that the effluent limitations set forth in R645-301-751 will be met as provided in 40 CFR part 434. The applicant would need to obtain a storm water permit for the site. Additional monitoring may be required at the discretion of the Division depending on site specific determination of the erosional condition of the revegetated areas.

Silt fences will be placed parallel to the contours with ends turned up perpendicular to the slope. Approximate locations are on plate 7-7. Installation will be completed according to Figure 7-9. Silt fences or strawbale dikes will be used in road ditches, and immediately downstream of the disturbed area. 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.

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 plan indicates the grading and placement of overburden and topsoil will be done along the contour, and in section 3.5.4.3, it is stated that slopes 2 ½ :1 or greater will be matted and all areas will be mulched during seeding.

The plan is not detailed enough to allow removal of the sedimentation pond prior to establishment of vegetation. The permittee has committed to provide BTCA at the time of reclamation, however, this does not allow the division to make a determination that the sedimentation pond could be removed at this time. Detailed construction activities are necessary to show the measures proposed to be taken to minimize sediment transport from the site. This detail should include timing and sequencing for the removal of the culvert system. Sequencing of regrading, placement of the topsoil, mulching and, erosion control matting and a design with diagrams showing drainage transport from the disturbed areas to the pond during the phases of reclamation construction. A commitment to obtain an onsite inspection by a Division Hydrologist and to receive Division approval prior to pond removal must be provided in the plan.

The permittee provided the following commitments in the plan. First, to submit for approval from the Division, the specifications to erosion control matting that will be used for reclamation as a BTCA measure, and has committed to install erosion control matting according to the manufacturer's directions. This commitment assures BTCA for the areas where regraded slopes are greater than 2 1/2 H: 1V.

Estimated erosion production for the proposed methods are compared with erosion production expected from the cover required to met vegetative standards for reclamation. This paper exercise indicates that the erosion that would reach the stream is better during reclamation than that which would occur at bond release. This standard presented assumes that the vegetation will control erosion but, does not compare the volume that would reach the stream if a sedimentation pond were used.

Siltation Structures.

According to the agreement under Section 3-5, Sweets Pond will have a postmining land use as a private fishing pond. Mountain Coal Company would be responsible for liability until the reclamation bond is released from the Gordon Creek 2/7/8 mine. There after Horizon or the land owner must take responsibility for liabilities associated with the structure.

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

Sedimentation Ponds.

The permittee stated the location of the pond and channel re-establishment makes it impractical to retain the pond through the entire reclamation period. In section 3.5.8 the reclamation time table shows that pond maintenance will occur 10 years after seeding and pond reclamation will occur 5 months after Phase II bond release. In section 3.5.7.1 the plan states that the time table and sequence for removal of the sediment control structures will depend upon the season of the year and precipitation. Horizon committed to begin reclamation activities in portal canyon and to leave the sediment pond and UC-1 located in Jewkes Canyon in place as long as possible. The permittee needs to correct the reclamation time table to show the intention to remove the sedimentation pond prior to completing re-grading practices.

Other Treatment Facilities.

No treatment facilities are proposed to 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 the reclamation period.

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 proposed amendment is not considered adequate to meet the requirements of this section. Prior to approval, the permittee must provide the following in accordance with:

R645-301-742.322, demonstrate that the reclaimed intermittent and perennial channels can carry the capacity of the upstream and downstream channel capacities.

R645-301-742.300, provide surface topography that is graded to drain to the channels especially as it pertains to Portal Canyon.

R645-301-742, correct the **reclamation time table** to show the intention to remove the sedimentation pond prior to completing re-grading practices; provide a commitment in the plan to **obtain approval from the Division** prior to removal of the sedimentation pond with an inspection to be completed by a **Division Hydrologist**; provide a detailed time table and plan for the construction activities to occur:

this detail should include timing and sequencing for the following; removal of the culvert system, regrading, topsoil placement, mulching and erosion control matting for specific areas; phased drainage control for major stages of reclamation, a monitoring program with sampling set up on a continual basis at timed intervals to demonstrate that the effluent limitations set forth in R645-301-751 will be met as provided in 40 CFR part 434, and which demonstrates sediment contributions to the stream have been minimized; or, provide for retention of the sedimentation pond as required under R645-301-763.

Recommendation:

It is recommended that the information provided to date be inserted into the plan and that outstanding issues tied to the construction of Jewkes creek and Portal canyon reclamation be addressed within 30 days after site surveying is completed. It is recommended a time line be established for the site survey. The remainder of the issues should be placed on a shorter time frame as many of them are related to proposed monitoring, to be conducted this year.

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