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

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TO: File

THRU: Daron Haddock, Permit Supervisor DRH

FROM: Sharon Falvey, Senior Reclamation Specialist SFF

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

SYNOPSIS

This memo serves as a portion of the Draft Technical Analysis (TA) completed for the Horizon Mine proposal, submitted to the Division on July 5, 1996 with updates through the beginning of September 1996. The Applicant has submitted many last minute revisions making it difficult to obtain information to clarify issues that arose with the last minute updates. This portion of the TA addresses sections where hydrologic and related information is presented.

ANALYSIS

CLIMATOLOGICAL RESOURCE INFORMATION

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

Analysis:

Climate is discussed in the following areas within the PHC; Chapter 11, Soils Section, 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.

According to the Soils Section, the average annual temperature at the proposed mine site ranges from 36°F to 45°F and the cumulative annual precipitation ranges from 12 inches to 30 inches. In the Biology 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 Applicant set up a weather station at the site so that precipitation events can be correlated with other monitoring data.

Findings:

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

ALLUVIAL VALLEY FLOORS

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

Analysis:

The Applicant provides a discussion on Alluvial Valley Floors (AVF's) in Section 7.4. In Appendix 7-6, a 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, exists in Section 17, T 13S.

R. 8.E. SLBM. This location is specific to the proposed disturbed area and does not mention the adjacent areas. 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, and Jewkes Creek , as well as, short distances into the tributaries above the drainages. Alluvial deposits were also identified at the mouth of Jewkes Creek and along the North Fork of Gordon Creek. Alluvial deposits at the mouth of Jewkes Creek and along the North Fork Gordon Creek are below the coal outcrop and, therefore could not be directly impacted by mine subsidence. Soils in the valley exhibit localized signs of being flooded or water logged.

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

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

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

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

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

Reclamation and Enforcement, 1983.

Findings:

The Applicant has met the requirements of this section.

HYDROLOGIC RESOURCE INFORMATION

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

Analysis:

Sampling and Analysis.

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

The Applicant has not received approval from the Division of Water Rights for the water rights. The Applicant presented the following to document the pursuit to obtain the right to use water in the area:

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. An application for permit change filed at the Division of Water Rights. The point of use associated with the spring(s) are proposed to be changed to Sweets Pond. Domestic and Industrial uses are proposed in association with the Horizon Mine operations.

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. An approval to use the water right(s) has not been issued.

Table 1
Water Rights Used in Mining

Water Right #	Season of Use	Quantity of Use (cfs)	Potential total for season of use (AF)
91-94	9/1 to 5/1	0.1500	72.00
91-353	5/1 to 9/1	0.0150	3.66
91-330	1/1 to 12/31	0.5570	2565.00
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 Applicant collected data according to the 1986 guideline. The Division has a new guideline effective April 1995. The major difference between the data collected through 1996 and the data required by the new guidelines is the acquisition of certain dissolved constituents, total alkalinity, and phosphates as orthophospates. Although older data acquisition will provide useful information, new data will be collected according to the new

guidelines. Table 7-5 presents surface water operational and reclamation parameters, while groundwater operational and reclamation parameters are provided, in Table 7-2. 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 has not been considered a region with potential for large scale groundwater development. Most groundwater use has been related to spring discharge and mining consumption. The Applicant delineates potential recharge areas in Figure 7-4, which shows 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. Under the discussion the Applicant 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 bound 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 occurance 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 of the Mancos shale, which probably do not 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. The recharge to the Star Point occurs primarily from vertical movement thorough the Blackhawk. The Applicant suggests that due to the low vertical permeability the magnitude of the recharge is limited. However, the vertical permeability from fractures in the area appears to be relatively significant. Within the permit 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.

Above the Hiawatha, the Castlegate 'A' coal seam overlies the Aberdeen Sandstone. Drill logs indicate this sandstone member thins near the mine and is discontinuous over the permit. The sandstone is interbedded with siltstones and shales. The Applicant indicates this sandstone is not anticipated to be a significant aquifer because it has a thin interbedded lithology and no springs in the permit or adjacent area issue from the formation (Section 6). However, 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. It has been 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 for water occurrence in 1995. Drill logs of Holes LMC-1, LMC-2, LMC-3, and LMC-4 are found in Appendix 3A. Also, three wells were drilled and completed in the Spring Canyon Sandstone in 1995 and are discussed below. 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 to present data used in determining ground-water occurrence 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 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 unmined portions of the lease area. Water however, was found in the formations above the Castlegate 'A' seam in the HZ wells. (See discussion 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	Water Elevation Dec.1995
HZ-95-1	12/13/95	7,272.6 (1080)	Spring Canyon	7,331.6	7,277.6-7,287.6	7,570.7
HZ-95-1S	12/5/95	8132.6 (220)	Blackhawk	NA	8,101.6-8,110.6	8,221.5
HZ-95-2	12/5/95	7,146.3 (1200).	Spring Canyon	7,189.3	7,151.3-7161.3	7,519.3
HZ-95-3	10/28/95	7,427.6 (470)	Spring Canyon	7,477.6	7,432.6-7,442.6	7,522.7

In building the potentiometric surface map, the Applicant has assumed maximum water level fluctuations of + or - 30 feet based on Skyline Mine well data from 1982 to the present. The intent in using this data for this purpose is not clear since mining has occurred at Skyline and the

change in water levels may not be considered "baseline" information. 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 Applicant 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 Applicant indicates the Hiawatha Coal Seam may be saturated very soon in the mining operations. The potentiometric surface map was developed based on water elevation data obtained in December, 1995. Data obtained in July and August 1996 indicate the surface water elevation had remained relatively steady in Well HZ-95-2 Other water levels had changed. Water elevation 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. Currently it is not known whether the potentiometric surface has stabilized. Water elevation data is presented in Table 7-1.

In the plan, Applicant states that the data collected in July 1996 verifies the December 1995 data. The Division does not agree with this statement. However, other information in the plan, such as water issuing from fractures, indicates the general direction of flow is accurate but may have a steeper gradient and may be more southerly than indicated.

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 and were not completed through the formation.

The HZ wells were drilled near fracture systems as shown on Plate 6-1. The wells associated with the baseline information 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 fracture and has increased permeability over the other two wells completed in the Spring Canyon Tongue. This is evidenced by the 15 foot increase in the water elevation over the initial water measurement and the hydraulic conductivity determined by the slug test, as well as, drill log information. The cause of increase in head at this well is unknown, but could be caused by any of the following: recharge from aquifers in connection with the fracture zone, drilling fluid losses, transmission of water between the aquifers due to poor well development, increased porosity and water availability from previous mining

activities, and an inability of the well to reach equilibrium with the potentiometric surface since development (wells may not have recovered from pumping completed during drilling and sampling). 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 whether Beaver Creek plays a part in recharge to this fracture.

Groundwater was observed in the HZ wells above the Star Point and was present from 100 to 600 feet below the ground surface. The presence of water indicates a potential for aquifers to be present above the Hiawatha seam in areas that were not previously mined. Well HZ-95-1-S was completed above the Hiawatha at 205 to 210 foot depth. 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 Applicant indicates that since these are artesian wells this suggests the water rests on aquitards and are overlain by confining units. Most springs issue above the presented potentiometric surface of the Star Point. This may indicate the Star Point is not in connection with the fractures or, because of the low hydraulic conductivity of the lower formation, water transmission may occur slowly causing the water to be retained and discharge through springs associated with fractured systems near the surface.

The Applicant 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 is 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 water quality of the wells without influences from the drilling fluid were not available and are not proposed to be presented from the Applicant. The following characterization from Waddell et. al. (1981), was presented in the plan regarding the Star Point Sandstone. TDS ranged from 335 to 391 mg/l. The Applicant has proposed that water elevation be the only data obtained at the HZ wells. The reasoning presented include the intensive pumping required to obtain a sample and the inability for quick recharge. The ability for 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 should be obtained to characterize the signature of the water quality of these two points.

The following are recommended as permit conditions, based on lack of conclusive baseline data concerning ground water. Prior to mine development the Applicant must determine what conditions cause the increase in head at Well HZ-95-1 and must provide a discussion with

supporting information in the permit. Because of the disparity in the original potentiometric surface, the Applicant has committed to monitor the HZ well levels monthly. The Applicant has committed to discuss a more stringent monitoring program for Well HZ-95-1 prior to entering the northernmost mining block in Section 8. Currently it is the Division's recommendation that when mining progresses into the area near the fracture zone, monitoring will increase to weekly monitoring and increase to daily monitoring if water is expressed from the fracture, or increased flows are expressed from the roof or floor. The Applicant should provide a commitment in the plan, with 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. The hydraulic conductivity of the alluvium, HZ-95-1-S, baseline water quality samples and, the differences in stream flow should be analyzed.

Additionally, the Applicant's five year mine plan proposes to mine through the Beaver Creek Fault Zone and will also mine through Well HZ-95-1 eliminating the third point used to monitor the Star Point piezometric surface. The Applicant will, therefore, need to supply additional well(s) for the proposed five year lease area. Since mining this area is not approved in this permit, this request is a consideration for future baseline needs. It is recommended that placement of the wells be promptly conducted promptly and coordinated with the Division. It is recommended the well 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.

Previous Mining History

According to the Applicant 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, a result of previous dewatering or elevation differences upgradient of the mine. It was also deemed possible that groundwater stored in the fault zone did not have a significant recharge rate that maintained the flow. Within the past 10 years an area below Gordon Creek #3 Mine has increased in water seepage. 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 now 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.

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 Blue Blaze Coal Co. #3 Mine have mined the Castlegate'A' Seam underneath Beaver Creek. The Creek will also be undermined by Horizon in the Hiawatha Seam.

The in-mine waters sampled at Horizon No. 1 Mine in 1995 and 1996 indicate the standing water in the mine has varied from 7584.1 feet msl in December 1995, to 7587 feet msl in May 1996, then to 7585 feet msl in June 1996.

Springs

The plan indicates 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, 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 CC-1,-5,-6 pH from 7.34 to 7.69 SP.Cond. from 714 to 788	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'			Newly developed springs. Information was not presented in adequate time to analyze.

Drainage	Number of Springs located spring and formation*	Elevation (ft msl)	Water Quality	Water Quantity	Comments/ Characteristics
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	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..
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.

Drainage	Number of Springs located spring and formation*	Elevation (ft msl)	Water Quality	Water Quantity	Comments/ Characteristics
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	

Sampling Point	Monitoring History	Location (Formation)	Water Quality	Water Quantity	Comments
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 1372 gpm considered spurious).	Location mapped on Figure 7-3 Information on flow discussion in Section 7.2.2.2 varies from Section 7.1.2.2

In Section 6.4.2 the Applicant has indicated a series of springs in the North Fork of Gordon Creek, in the northwest corner of Section 18 T13S R8 E, 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 Applicant has stated the Homestead Spring is one of the main contributing springs to Beaver Creek. The Applicant 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

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 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.

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. Information on the fisheries is lacking in the plan. (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 during the winter and late summer months.

Beaver Creek is a perennial stream with base flow maintained by seeps and springs. Further north the fold follows Beaver Creek drainage up to Section 8 T13S R8E where Beaver Creek diverges from the axis to the northeast along a suspected fault zone. Beaver ponds are common in Beaver Creek and also play a part in providing perennial flows. Springs contributing to baseflow include the Gunnison Homestead Spring, one mile west of the proposed additional lease area and Jewkes Springs one mile west of the permit area near the northwest corner.

Discharges from these springs vary between 3 to 136 gpm and 1.1 to 38 gpm respectively.

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 338 acre feet in 1961. The maximum annual discharge of 1,610 occurred in 1973. The average annual discharge for the 29 year period of record was 3,310 acre feet. Decreases in downstream flow are observed in Beaver Creek between monitoring stations SS-7 and SS-8. The decrease is most prevalent during the low flow season. This loosing stream section may occur due to either alluvium, fracture and fault systems or other unknown factors.

The Applicant discusses the annual variability of flow in Beaver Creek. Although there is annual variability, the variability in base flow related to snowfall and possibly spring 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 Applicant 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 in the PAP, the flow diminishes in a downstream direction beyond Sampling Point SS-5, 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 Applicant suggests the mining of the Hiawatha would not affect the quantity or quality of flow in the North Fork of Gordon Creek. However, the Applicant has shown the Spring Canyon Aquifer below the Hiawatha Coal Seam contains water, and mining might reduce the piezometric water elevation potentially affecting the surface water in this stream. Discharge from the Starpoint aquifer to this stream section should be determined. Loosing and gaining reaches in this section of the stream should be identified.

The proposed Five Year Mine Plan, as shown on Plate 3-3, illustrates a proposed lease area to the north and east of the currently designated permit area. The surface water descriptions and baseline information for the permits adjacent area have not been presented. The Applicants future mining operations are proposed to take place under Sand Gulch and an unnamed drainage

to the north. No baseline information was collected for this area. In addition, Plate 3-3 shows the major fault systems which run northeast and southwest of the proposed mine operations. This fault system 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 has been 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
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

Sampling Point	Location	Flow	Water Quality	Comments
SS-7 1991 through present	Beaver Creek above pond upstream of the proposed future permit area outside of potential subsidence zone?.	Perennial	TDS 216 to 353 mg/l. Total Fe 0.05 to 5.19 mg/l Total Mn <0.1 to 0.19 mg/l TSS <1 to 297 mg/l pH 6.0 to 8.54	Beaver Creek tends to have a lower TDS than Jewkes Creek.
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	Not available	Not available	Not sufficient information / associated with future mining and potentially the fault crossing Beaver Creek mined into in this permit term.
SS-10	Unnamed tributary North of Sand Gulch tributary to Jump Creek Drainage upstream of the Northeast Fault	Not available	Not available	Not sufficient information / 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.
2-3-W	Beaver Creek	Perennial	Not discussed	Monitored by Beaver Creek Coal . Not found on any map
2-4-W 1982-	Beaver Creek 1 -1/2 mile west of permit area	Perennial	Not discussed	Monitored by Beaver Creek Coal

Baseline Cumulative Impact Area Information.

A cumulative impact area assessment is being conducted by the Division.

Modeling.

No specific modeling was presented.

Alternative Water Source Information.

In Section 7.1.6, the Applicant purports no significant impacts are foreseen to groundwater as a result of mining in the permit area. However, under this section the Applicant has referenced 7.3 and 3.4.8.2 and committed to provide mitigation measures. In Section 3.4.8.2, under the subsidence mitigation plan, the Applicant 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 and replacement of lost water, if indicated by monitoring. The Applicant has committed to enact a mitigation plan should mining impacts be identified. Only emergency mitigation will be performed prior to notification of Water Rights and UDOGM, with an extended mitigation plan being correlated with both agencies prior to the plan's implementation."

Information provided in the PAP indicate the water rights applied for are a leased and not an acquired right. Therefore, the Applicant would have to acquire other sources to replace a water right, 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 Applicant has provided a discussion for acid- and toxic-forming materials potential under the Probable Hydrologic impacts. Additionally, the Applicant provided the following in other sections of the plan;

1. Disposal of waste rock from partings and splits will be in underground workings. No acid- or toxic-forming materials are present in the overburden or underburden for samples analyzed (Section 6.5.7.1), suggesting no acid or toxic forming materials will be in the partings. The waste rock will be backfilled and compacted

after second mining subsidence occurs and the waste rock will not be saturated. Thus, water quality would not be impacted (Section 3.3).

2. If underground waste cannot be blended, sold, or gobbed, arrangements will be made to dispose of this material in permitted refuse piles at a nearby mine. Hi-tech Engineering in their forthcoming letter, have agreed to accept coal refuse from the Horizon No.1 Mine at the refuse disposal site at Hiawatha.

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

Table 6-5 summarizes the quality of the Hiawatha coal seam. The acid base potential of each of the three coal samples collected from the HZ-series holes indicate the coal has a potential to be acid-forming with values from -9.1 to -13.6 tons $CaCO_3$ per1000 tons of material (Section 6.5.6). Tests for acid- and toxic-forming materials were conducted on roof and floor samples in LMC-4 and HZ drill holes. One sample contained a high pyritic sulfur content of 0.24 percent. The Applicant suggests this pyritic sulfur content is likely of limited areal extent. In Section 6.5.6, the Applicant has presented analysis core samples of the coal obtained from the Hiawatha Seam. 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 a lowering in the pH of water in contact with the pyritic sulfur. 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 values near a pH of 7.4.

Acid-forming discharges are uncommon in the region and acid forming materials are not known to be extensive in Utah coal mines. 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 hydrologically defined 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 map is presented based on the December 1995 elevations and ranges from 7,570 ft. msl to 7,520 ft. msl. With the information presented to date, it seems likely that the high permeability at HZ-95-1 is an important recharge zone for the aquifers in connection with the fracture. Sources of water issuance, geology and topography are compared to the potentiometric map in order to understand potential impacts.

The Applicant indicates inter-basin transfer out of the Price River drainage cannot occur in this region. However, inter-basin transfer between Beaver Creek and Gordon Creek could occur. Currently, the presented information suggests the Spring Canyon Tongue aquifer has a hydraulic gradient of 0.014 and 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. This structure influences the dip of the coal seam and may influence the potentiometric water surface that would result due to mining the coal.

The elevation of HZ-95-1 was 7585.4 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 at Well HZ-95-1 is approximately 7,331.6 feet msl; at HZ-95-3 approximately 7,477.6 ft msl; and HZ-95-2 is approximately 7,189.3 ft. msl (288 ft. difference) and 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.

The largest volume of water issuing from springs associated with outcrops of the Star

Point include spring discharges in Coal Canyon which increased following mining of the Gordon Creek #3 and #6 Mines. Additional evidence, of newly formed springs, occur in Coal Canyon (based on discussions with Chris Hansen, Earth Fax Engineering). These springs discharge from the Star Point formation at, or below, the lower end of the Storrs Sandstone member outcrop at an elevation of approximately 7,360 ft msl. If the coal is removed at, or below, 7,331.6 feet and if the water is in connection with the fracture the seeps in Coal Canyon and the unnamed canyon to the west could potentially be affected. A resulting loss of head could disrupt stream and spring flows relocating the water 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. Decreased late season flows at the seeps and potential drying of seeps could occur during mining. This would continue until after mining ceases or water fills the mine to an elevation where discharge would again occur. The proposed operations have the potential to affect these springs (depending on the depth to which the coal is removed). However, no baseline (seasonal quantity or quality) information other than initial flow and field parameters were collected for this area. There is no proposed operational monitoring for these springs. It should be noted that these springs are new occurrences or, have increased in flow and appear to be associated with previous mining activities.

A fracture is present at the north end of the permit area. This fracture appears to be in connection with HZ-95-1 and is shown on the geologic map to cross Beaver Creek into the permit area. Mining into the region where this fault occurs could result in dewatering the fracture and reducing recharge to associated aquifers. Currently it is unknown whether Beaver Creek is in connection with the fracture, recharging the fracture. A monitoring plan that increases monitoring over the period where mining will occur near the fracture must be proposed for water level monitoring at Well HZ-95-1 and Beaver Creek.

The Applicant indicates that due to low permeability of the formations and due to the plan to avoid mining into faulted zones, inflow to the mine from faulted zones is projected to be minimal (Section 7.1.2.2). The Applicant presents an inflow analyses that assumes porus medium flow rather than fracture flow. Lines stated that fractured bedrock flows are on the order of one magnitude larger than that predicted for unfractured bedrock. The inflow from fractured bedrock was using Lines (1985) was estimated to be 0.08 cfs or 36 gpm. The inflow estimated over initial and future permit terms was in the range of 36 to 90 gpm. This prediction was based on a hydraulic gradient of 0.041 ft/ft. The true gradient in the HZ-wells cannot be determined based on the variation in data. Based on the 1996 data this value may be greater than that estimated by the Applicant.

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 and is lost through the following: 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. The Applicant 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 and the Applicant should provide a commitment to document these activities.

The Applicant has concluded that the Hiawatha Coal Seam will be saturated from the beginning of mining operations. The rate of inflow will depend primarily on whether a faulted zone is encountered that contains groundwater in storage or, that is in connection with, an overlying perched aquifer. The potential sustained inflow occurring was estimated to be 36 gpm. The actual potential impact from intercepting a fracture reservoir and depleting or intercepting the water in the fracture is moderate to high.

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. Because the materials will have an increased surface area due to removal, the potential impacts, should water and air come in contact with the materials, would be increased TDS (ions in solution) and potential acid and toxic formation. Data from a recent underground mine water sample from the Horizon No. 1 Mine is found in Chapter 7. The Applicant has presented the average concentration and compared it with the data obtained in mine. These values fall within the 95% confidence interval for the data and indicates the water should not be adversely impacted. However, this method ignores potential seasonal variations. The Applicant 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 Applicant states "It is not anticipated that large quantities of ground water will be encountered throughout the duration of mining". The Division believes the potential for impact increases, if water is intercepted by mining through paleochannels associated with fractures, or 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 Applicant 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 the total potential inflow would

vary between 30 and 54 gpm. This information assumes a worst case scenario between 270 to 130 feet of head. Therefore, the potential is that a decrease of head in the Star Point aquifer, of between 270 and 130 feet, could occur over time. The extent to which this affects the adjacent area is limited to the interaction of the members along the fault zones and determination of discharge areas. The aquifer may be de-watered within the graben without interaction with the fracture/fault related waters, or may affect the waters associated with the fault system.

Potential Surface Water Impacts

On page 7-22, the Applicant states that proposed mining operations will occur north of Gordon Creek and should not affect the quantity or quality of water in this 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 flow to Gordon 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, with an outcrop elevation of approximately 7,600 feet at Portal Canyon. LMC-3 indicates the depth of the Hiawatha Coal Seam is at 7,499 feet to 7,491.8 feet. The furthest extent of the block of coal to be removed is north and east of this drill hole, indicating the depth to which the coal will be removed is lower than that presented by the LMC-3 drill hole. Therefore, the potentiometric surface (estimated as 7570 feet to 7520 feet) may be impacted and decreased to somewhere below 7,491 ft. As a result of the change in potentiometric surface the water quantity and water quality to Gordon Creek could be affected due to changes in discharge received by springs from Coal Canyon. Seasonal baseline quantity and quality for sections of Gordon Creek above and below this section should be assessed. A continuous recording flume is recommended for operational monitoring.

The Applicant 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. Avoidance will occur 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 Applicant has stated that mining is designed to preclude subsidence of perennial and intermittent steam reaches. The Applicant 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 is under further investigation.

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

Statements for mitigation, if significant groundwater inflow occurs or, if intermittent or perennial stream flows are depleted, are found within the plan under Sections 3.4.8.2 and 7.1.6 . The mitigation measures may include: attempts to seal the inflow, increased monitoring program, lining the stream bed through an effected area, and replacement of water, should it be indicated through monitoring to be mining related (Section 3.4.8.2). The Applicant also indicates an extended mitigation plan will be enacted if an impact is determined to be mining related. Only emergency mitigation will be completed prior to notifying the UDOGM and Water Rights. A mitigation plan will be correlated with both agencies prior to implementation.

Water Use

Based on the predicted inflow information (36 gpm), the Applicant has estimated water will need to be pumped into the mine only at initial development and during peak operating procedures. It is estimated that approximately 60 acre-feet of water per year will be removed with

the coal. No yearly estimate of use will b

Sediment Yield

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

Increases in sediment during the operational period will be minimized through the use of a sedimentation pond and drainage controls. The Applicant has also committed to store snow in sites that will directly drain to the sedimentation pond (Section 3.3). 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 Applicant 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 therefore the use of road salting is not likely to affect water quality.

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 Applicant proposes a concrete containment structure with a drain will be used and will be adequately sized to contain any spill, Section 3.23. The Applicant 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 Applicant's proposal uses accepted practices for their SPCC plan. The Applicant's operation plan includes cleanup procedures for small scale spills, and a commitment to retain absorbent materials on site. 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 Applicant discusses the potential for flooding as being diminished during operations due to reducing peak flows through attenuating water in the sedimentation pond. In addition to the Applicants comments, it is likely that the water flowing through the culvert will have increased flow velocity over the natural velocities for the same discharge rates. A potential impact includes increased downstream erosion. 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 Applicant has provided riprap channel designs for the velocities that may occur from a 100 year- 6 hour event for Portal Canyon and has developed a channel design in order to 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 Applicant has not collected data that describes seasonal water quality and quantity for the HZ wells or for the springs that issue from Coal Canyon and from the unnamed drainage west of Coal Canyon. The proposed operations have the potential to affect these springs and well. However, no baseline (seasonal quantity or quality) information, other than initial flow and field parameters, were collected for the springs. There are no proposed operational monitoring for these springs. It should be noted that these springs are new occurrences, or have increased in flow and appear to be associated with previous mining activities. The plan does not fulfill the requirements of this section.

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

R645-301-731

The Applicant must: 1) determine what conditions cause the increase in head at Well HZ-95-1 and decrease in HZ-95-3, and must provide a discussion with supporting information in the permit to assess the affects of the variation in head on the potentiometric groundwater gradient; 2) provide baseline information adequate to describe the seasonal quantity and quality for the seeps in Coal Canyon and in the unnamed drainage west of Coal Canyon; 3) describe the seasonal variation in quantity and quality of the HZ wells; and 4) determine the hydraulic conductivity of the aquifer at HZ-95-1-S.

R645-301-114.100

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

R645-301-731.200

The Applicant must: 1) clarify how groundwater and surface water monitoring will be used to determine the **site specific** impacts of mining operations on the hydrologic balance; 2) include a description indicating how water monitoring of Beaver Creek will be used to determine if a marked decrease in flow occurs due to subsidence or intercepted flows from fracture/fault systems; 3) include a discussion of the potential change in potentiometric surface and the effects on springs issuing from Coal Canyon and the unnamed drainage west of Coal Canyon their interrelationship with the surface water, and potential effects on surface water seasonal flow rates; 4) provide a commitment to document the monitoring activities described to avoid mining into the major fault zone.

R645-301-731.220

The Applicant must: 1) provide the location of the North Fork Gordon Creek monitoring station near Coal Creek, on the monitoring map and discuss seasonal quantity and quality.

MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION

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

Analysis:

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.

Ground Water Resource Maps

Add to Engineer's analysis:

Surface water resource information providing the locations of springs in the permit and adjacent area are presented on Plate 7-1. See the discussion in **Environmental Description** under the **Hydrology** heading in this T.A.

OPERATION PLAN

MINING OPERATIONS AND FACILITIES

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

Analysis:
Replace in Engineer's analysis if not updated.

g) Diversions - A bypass culvert will take undisturbed drainage from the main drainages, upstream of the disturbed area and discharge it into Jewkes Creek. Disturbed drainage ditches pass water to the sedimentation pond

k) Sedimentation Pond - Runoff from the entire Horizon site and the adjacent undisturbed areas will go to a single sediment pond. This pond will be located just

east of the County Road.

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

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

In addition to the certified inspections, the pond will also be inspected quarterly by a registered professional engineer. A copy of the report on these quarterly inspections will be complied, recognizing any appearance of structural instability or other hazardous condition, as required by R645-301-514.330. See: **Sedimentation Ponds, Hydrologic Information** under this T.A. for more information.

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 Applicant has used a CN of 89 for the disturbed areas. This number is adequate at this time. However, should the Applicant propose additional buildings, road surfacing or pad surfacing the design CN would require re-analysis. The Applicant used a CN of 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 operation at this site. A new pipe to the mine will be constructed to convey water from Sweets Pond to the mine. Sweets Pond and associated pump facilities may be considered leased rights and excluded from bonding requirements. See additional discussions of *Water Rights and Points of Diversion,* **Baseline Information** in this T.A.

Groundwater Monitoring

The Applicant has provided a ground water monitoring plan under Section 7.1.5. The Applicant 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 Applicant 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	Channel in North Fork of Gordon Creek/Marakis spring	Blackhawk sandstone unit above coal seams	Quarterly (when accessible) Flow/Parameters Table 7-2	Spring sampling should be done at source when at base flow.
SP-2 1989 through 1993	Right Middle Fork North Fork Gordon Creek Hillside out of Creek Bottom	Blackhawk	Quarterly (when accessible) Flow/Parameters Table 7-2	Spring flows through alluvium below the point of origin.
SP-4 1989 through 1993	North Fork Gordon Creek Drainage bottom	Not presented	Quarterly (when accessible) Flow/Parameters Table 7-2	Appears to be associated with a fracture system.
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		Quarterly (when accessible) Flow/Parameters Table 7-2	

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	yes Table 7-1	2 year review period
Discharged mine water	If necessary treated in underground sumps or the Sedimentation Pond. Currently not expected and not a permitted activity. Will need permit approval.	In accordance with permit.	In accordance with permit.	In accordance with permit.	Should be conducted in accordance with UPDES permit according to emergency discharge clause.
Well HZ-1 HZ-1S HZ-2 HZ-3	Completed into the Spring Canyon Tongue of the Star Point Sandstone.	Monthly while accessible.	None proposed.	Water level corrected to depth from ground surface.	

The Applicant committed to submit quarterly and annual reports. However, the annual report is indicated to be just a repeat submittal of the results received during the year. 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 Applicant is required to provide the information requested by the Division. The Applicant included a commitment, in the plan, to notify the Division if data indicate non-compliance with permit conditions.

The Applicant has not provided site specific information that describes how the groundwater monitoring sites will be used to determine the PHC of mining. The Applicant 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 Applicant states that if, at the initial interception point, the flow exceeds 30 days continuous flow. The groundwater monitoring will be sampled quarterly. This may not be logical since, as mining progresses water will be discharging along different facies of the fracture resulting in the Applicant continually monitoring new seeps along the water producing zone. Rather, a fracture, if flowing, should be monitored as a unit. The Applicant 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.

The general groundwater direction is to the southeast. Springs issue from Coal Canyon and from the small drainage west of Coal Canyon. The increased flows at the Coal Canyon Springs and the new occurrence of the springs in the adjacent drainage is believed to be related to mining activities. Because the groundwater gradient occurs in this direction baseline and operational information on these springs should be included as part of this proposed mine plan. The Applicant has just recently completed a survey of these springs. Therefore, adequate baseline information does not exist. However, the Applicant 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 Applicant 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.

The description providing information on how monitoring, based on the site specific potential for hydrologic impacts, will be used, should be further expanded upon. See discussions

under **Environmental Resource Description, Hydrology** for the Potential Hydrologic Impacts and Probable Hydrologic Impacts.

Surface-Water Monitoring.

Specifics on monitoring during the construction period were included in the plan and Applicant 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. The Applicant included a commitment to monitor baseline low-flow for springs and mine in-flow under Section 7.2.2.3, Surface Water Monitoring Plan. It is believed the intent was to identify this as surface water monitoring. 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	Monthly	
SS-6	Portal Canyon Drainage and Spring Two Canyon Drainage	Ephemeral	Not proposed	Not proposed	These sites should be monitored on the same day as sites 3 and 7 when sampling during a precipitation event or snowmelt period

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-7	Beaver Creek, upstream of the permit area outside of potential subsidence zone.	Perennial Monthly	Quarterly According to Table 7-5		
SS-8	Beaver Creek downstream north east of permit area. Out of potential subsidence zone.	Perennial	Quarterly According to Table 7-5	Monthly	Bear Creek is dry below surface water monitoring point 8 as shown in Appendix 7-5 "Historic Mine Development" map 8. This section of the stream is affected by the Fish Creek Fault and Graben.
Not provided	North Fork of Gordon Creek below coal Canyon	Perennial	Not Proposed.	Monthly	Not presented on the monitoring map.

Acid- and Toxic-Forming Materials.

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

Transfer of Wells.

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

Discharges into an Underground Mine.

The Applicant has not addressed this regulation. No discharges into an underground mine are approved. The underground water tunnel has a use of 0.557 cfs. The water source used by the Horizon mining operations, and water quality should be included as part of the operational monitoring plan. This will allow determination of potential impacts of water quality and use over the water intercepted through Horizons mining activities.

Gravity Discharges.

The dip of the coal is away from the portal faceups. Therefore, no gravity discharges are anticipated during the operations phase. The Applicant has provided for a drain to prevent the accumulation of a hydrostatic head on the portal seams. There is 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 Applicant provided a copy of the UPDES permit for the Horizon Coal Corporation in appendix. 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. The Applicant provided a commitment to monitor the sediment pond according to the requirements of UPDES Permit UT-0023761 until bond release or until the revegetation is adequate to permit removal of the sediment pond.

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

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

has committed to construct the sewage facility upon plan approval.

Diversions.

Undisturbed diversions are described in 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 Applicant has considered any flow velocities less than 5 feet per second (fps) as non-erosive flows. However, in the literature there are values which indicate velocities less than 5 feet per second 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. Degradation and additional erosion control needs for drainages within the pad area draining to the sedimentation pond will be determined through site inspection.

Table 10
Disturbed Drainage Diversions

Diversion	Ditch (D) or Culvert ©	Diameter (culvert)	Function
D-1	D	--	Collects runoff from 30.1 acres of disturbed and undisturbed areas upstream of the sedimentation pond and south of the haul roads.

DC-1	**C**	**18"**	**Collects runoff from 15.7 acres from the fan portal road and adjacent undisturbed area and routes it beneath the haul road and into the sedimentation pond.**
DC-2	**C**	**18"**	**Collects runoff from 1.7 acres disturbed and undisturbed area and routes it beneath the haul road loop and into the sedimentation pond.**

Roads are proposed to be surfaced with 12 inches of crushed gravel road base. All roads within the permit area drain to 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 map provided makes it difficult to determine whether water running along the road above the fan portal will continue to flow to the first downstream berm. The Applicant 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 non- erosive velocities for the design should also consider the maximum outslope downstream of the road to determine the maximum discharge that should be passed through the water bar.

The main haul road will be crowned to drain water off the road. A culvert was placed at the inside bend of the main haul road loop to convey water to the pond. However, no provision was made to convey water to the pond from the northwest side of the loop which could potentially send water onto the county road and out of the permit area rather than to the pond. A culvert should be placed at the junction of the loop to assure upstream water is transported to the pond.

The upper haul road is also proposed to be crowned and drains to Ditch DD-1 along the south side. No ditch design is provided along the north side of the road. Since the road is crowned, the drainage from this area will make its way to Culvert DC- 1 on the north side adjacent to the coal stock pile. This culvert was not designed to contain the flow from this area.

Stream Buffer Zones.

The Applicant must demonstrate that all requirements of 742.300 have been met prior to approval and findings of this section. (See R645-301-742.322). The Applicant is required to provide the stream buffer zones and assure they are adequately marked during the channel construction. Plate 3-1 shows a buffer zone sign location. The text indicates buffer zone signs

will be placed adjacent to Jewkes Creek, however, Plate 3-1 does not show a sign located upstream from the disturbance. A sign must be placed at the upstream boundary of the buffer zone.

The Applicant has submitted a stream alteration permit to the Division of Water Rights. The submittal proposes a 3 foot and 2 foot culvert respectively in Jewkes and Portal Canyon. Comments on the proposal were due by May 19, 1996. No verification that the permit was approved is provided. The Applicant must have verification of the stream alteration permit prior to approval of this coal mining permit.

Sediment Control Measures.

The Applicant proposes to begin site construction prior to installation of the sediment pond. During this period alternative sediment control measures are proposed to be used. Straw bales and silt fences are proposed to be placed in the stream channels of Portal 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 Applicant 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. Streamflow will be bypassed around construction activities using a diversion dike and flexible culvert. The Applicant has committed to construct the sedimentation pond as soon as possible following construction of the downstream culvert sections.

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

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 developed for water rights use which is currently associated with the Gordon Creek Mines #2, #7, and #8, and the 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 Applicant has proposed to build 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 Applicant 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 Applicant 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 cleanout volume will be marked by a calibrated pole. One pole is generally not adequate to determine sediment capacity because the sediment tends to be deposited in deltaic form at the inlets. The 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 an elevation of 7583.1 feet, which is approximately one foot above the maximum sediment storage clean out level and approximately two feet below the elevation of the spillway.

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

The sediment pond's spillway is designed to pass the peak flow of the 25-year, 6-hour precipitation event. The proposed spillway elevation is at 7585 feet. Calculations for the spillway do not route the flow through the pond. The Applicant's spillway depth, embankment height and estimated freeboard depth do not add up. The actual depth of the spillway is 1.5 feet, assuming the other values are correct. With a depth of 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 Applicant proposed this design is non-erodible based on a velocity of less than 5 fps. The Applicant stated the channel will be riprapped but did not provide any size criteria for the riprap.

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 Applicant has analyzed the pond embankment designs for stability. Using a standard, circular failure model and the Hoeck Circular Failure Charts, the Applicant has found that the pond embankments have a static safety factor of 4.81 for dry conditions and 4.44 for saturated conditions (Appendix 3). The 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 by the Applicant is a sedimentation pond and Sweets Pond. The sedimentation pond is discussed under Siltation Structures. In Section 3.3.5 the Applicant has committed to promptly report impoundment hazards to the Division and formulate remedial action and emergency procedures.

Casing and Sealing of Wells.

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

Findings:

The plan does not fulfill the requirements of this section.

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

R645-301-742

The Applicant must: 1) obtain an additional mine water discharge point for the UPDES permit, or provide designs which demonstrate the sedimentation pond will treat mine water discharge; 2) provide the even numbered pages to the copy of the UPDES permit; 3) change the test for in-mine groundwater monitoring where monitoring will occur at an initial interception point, to monitoring along the water bearing unit, such as a fracture or sand channel, as mining progresses. (The Applicant would then be measuring the unit rather than every 2 gpm flow that shows up along the water bearing unit as mining advances); 4) correct the commitment to monitor baseline low-flow for surface waters, as intended, rather than, monitoring baseline flow for springs and mine in-flow, Section 7.2.2.3, Surface Water Monitoring Plan; and 5) provide water quality and quantity monitoring for the underground water right #91-330 as part of the operational monitoring plan and, obtain baseline samples of this water source.

R645-301-731.121

The Applicant must: 1) provide an oil skimming design on the sedimentation pond.

R645-301-742.200

The Applicant must: 1) correct the proposed spillway depth to reflect the difference between the embankment height and estimated freeboard depth or, otherwise provide accurate design information.

R645-301-742.400

The Applicant must: 1) provide designs that demonstrate the drainage from the north side of the upper haul road will adequately be conveyed to Culvert DC- 1 (there is no way to pass this flow across the haul road based on the presented design information); 2) provide designs which allow the road drainage and the adjacent drainage area, draining to the north of the loop haulroad due to the crowned road, to drain to the sedimentation pond. A culvert could be placed prior to the split in the road to take drainage from the north side of the loop road to the pond.; and 3) provide designs which demonstrate the velocities over the outslope, downstream of the ancillary roads, adequately minimize erosion, and determine the appropriate maximum discharge that should be passed through the water bars accordingly.

R645-301-730

The Applicant must provide proof showing a stream alteration permit was obtained.

R645-301-731.500 and .513

The Applicant must: 1) address the requirements of R645-301-731.513 for water from undergound workings as it relates to water right #91-330 which transfers underground water into the Horizon Mine.

RECLAMATION PLAN
HYDROLOGIC INFORMATION

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

Analysis:

Ground-Water Monitoring

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

Surface-Water Monitoring

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

Acid- and Toxic-Forming Materials

In 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 Applicant 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 Applicant has also committed to backfill a highwall or cut slope with any underground development waste that is temporarily stored on the surface and has committed to cover it with 4 feet of suitable backfill.

Where noncoal waste rock from initial development will be incorporated as fill. The

Applicant 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.

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

Water Quality Standards and Effluent Limitations.

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

Grading to Drain.

The Applicant has committed to keep surface drainage from entering sealed entries in Section 3.5.3.1. The Applicant has committed to recontour the area to drain to the final reclamation channel in Section 3-25. 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 instead 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.

Diversions.

The Applicant has proposed a drainage plan which reconfigures Jewkes Creek's drainage channel and Portal Canyon drainage channel. The new configuration of Portal Canyon eliminates

the basin behind the existing embankment. However, the reclamation topographic information does not provide for grading the surface to drain to the channel.

The Applicant 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 Applicant 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 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. Portal Canyon was designed to carry a peak flow of 9.95 cfs. The Applicant has not demonstrated the flow from the upstream channel can be conveyed through the proposed reclamation channel. 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, while the Applicants analysis is based on a high water mark.

The Applicants proposal includes a small riprapped channel section designed to carry a low flow from the 10-year, 6-hour event. The Applicant has provided a sand filter blanket to promote drainage to the surrounding soils. The channel presented meets the minimum design requirements by passing the 100-year, 6-hour event through the channel and flood plain configuration. 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 now existing at the site and to simulate the existing channel and poteintial site conditions. Some issues that are related to the success of the Applicants 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 Applicants design to be stable may be measured through the success of the design to withstand flows received at the site.

According to Rosgrens Classification system 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 may be more appropriate.

Stream Buffer Zones.

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

Sediment Control Measures.

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

If the Applicant placed the culvert into the location of the Jewkes Creek the Applicant could retain the pond and culvert system until Phase II bonding or until vegetation is adequate to control erosion. The Applicant indicated that this is not practical because it would require re-disturbance of the re-vegetated areas lengthing the time necessary to establish permanent vegetation.

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

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

2) Alternative methods employed during reclamation include:

Silt fences
Surface ripping 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 he channels of Spring 2 and Portal Canyon. The Applicant must provide the following design provisions for those fences installed in ditches or drainages. The bales or fences must be anchored into the bank of the ditch, must have the highest elevation of the structure, below or even with the top of the ditch and, silt fences must have a notched spillway. These are BTCA for proper installation in a ditch or channel.

A Sediment Control Monitoring and Maintenance Plan and corrective action. Measures are outlined in Section 3.5.4.2. Rills or gullies will be filled graded or stabilized then reseeded or replanted. In Section 3.5.5.4 the Applicant indicates erosion will be monitored and will be controlled by regrading (if necessary), mulching, and matting. As presented in Section 3.3.5.3 mulching and roughening will occur on areas before seeding where slopes are 2 ½:1 or less. The matting will be applied on slopes 2 ½ : 1 or steeper.

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. As each reclaimed channel reach is reconstructed, the channel will be lined with silt fence or straw bale dikes. Silt fences or strawbale dikes will be used in road ditches, and immediately downstream of the road ditches. In addition, Section 3.5.4.3 indicates silt fences will be established at the bottom of fill slopes and along the top bank of the reclamation channel.

In Section 3.5.5.1 the Applicant suggests mechanical treatment of disc, harrow or clod buster for seed bed preparation. Mechanical treatment of slopes with a grade of less than 10 percent will be completed by ripping the soil 18 inches deep with shanks placed at 7-foot intervals to achieve parallel slots 4 to 10 inches wide. These areas will be mulched. Additionally, in Section 3.5.4.2 the Applicant indicates the grading and placement of overburden and topsoil will be done along the contour, and in Section 3.5.4.4, the Applicant indicates disturbed areas will be loosened by ripping to allow easier backfill and grading operations and compacted zones will be eliminated by deep chiseling. Prior to placement of topsoil the area will be scarified.

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. Slopes greater than 10 percent will have erosion control matting installed. The Applicant has indicated in Section 3.5.5 if revegetation is delayed a sterile cover crop will be planted. The Applicant has not indicated whether mulch will be used also at this time. Since mulching is part of the proposed BTCA practice for erosion control it should also be applied at this time. Although these are accepted practiced the BTCA for most Utah sites is to provide gouging (deep pocking) as the roughening factor. The Applicant has also considered gouging to be used. The Applicant must eliminate the conflicting information concerning matting and gouging in Chapters 3 and 7.

The Applicants plan is not detailed enough to allow removal of the sedimentation pond prior to establishment of vegetation. The Applicant should detail the construction activities to show the measures taken to minimize sediment transport from the site. This detail should include timing and sequencing for the removal of the culvert system. All regrading, placement of the topsoil, mulching and, erosion control matting in Portal Canyon should be competed prior to removal of the Jewkes Creek Bypass Culvert. A design for transporting drainage from the Portal Canyon area during reclamation to the pond during this phase must be included. 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 Applicant has stated that during short periods when reclamation construction activities will be suspended the site will be left in a condition which minimizes impact if a rainfall event were to occur. Specific measures to be employed must be discussed.

The Texas Department of Transportation has analyzed the effectiveness of Erosion Control Blankets. The following testing criteria were used for this site situation a rainfall rates, slopes, effectiveness of vegetation establishment and soils. From these comparison tests there were overall effectiveness ratings developed. Literature such as this provides for an assessment of Best Technology Currently available. The Applicant must provide a commitment in the plan to obtain approval from the Division prior to commencing with reclamation for a specific erosion control matting that will be used for reclamation and, stating that the Applicant will supply current information that demonstrates the proposed matting is one of the Best Technologies Currently available. Additionally, the Applicant should commit to install erosion control matting according to the manufacturer's directions.

Estimated erosion production for the proposed methods are compared with erosion production expected from an established vegetative cover of 50 %. This analyses must be re-evaluated to include the current vegetation standard and include the 71% riparian area standard. Additionally the standard presented assumes that 50 % vegetation will control erosion. However,

this has not been demonstrated.

Siltation Structures.

According to the agreement under Section 3-5, Sweets Pond will be reclaimed to a postmining land use as a private fishing pond. Mountain Coal Company would be responsible for liability until reclamation bond is released for the Gordon Creek 2/7/8 mine and five shares of MCC water rights were assigned to E. E. Pierce. No sedimentation ponds, discharge structures, impoundments or other treatment facilities are proposed or approved for retention as a postmining land use.

Sedimentation Ponds.

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

Other Treatment Facilities.

No treatment facilities 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 reclamation.

Impoundments.

The only impoundment proposed at this site is the sedimentation pond, the reclamation of

which is discussed under **Sedimentation ponds** above.

Casing and Sealing of Wells.

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

Findings:

The plan does not fulfill the requirements of this section.

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

R645-301-742.322

The Applicant must: 1) Demonstrate that reclaimed intermittent and perennial channels can carry the capacity of the upstream and downstream channel capacities.

R645-301-742.300

The Applicant must: 1)provide surface topography that is graded to drain to the channels especially as it pertains to Portal Canyon.

R645-301-742,

The Applicant must: 1) provide a commitment in the plan to obtain approval from the Division prior to commencing with reclamation for a specific erosion control matting that will be used for reclamation and, stating that the Applicant will supply current information that demonstrates the proposed matting is one of the Best Technologies Currently available. Additionally, the Applicant should commit to install erosion control matting according to the manufacturer's directions; 2) correct statements where commitment for removal at the end of backfilling and grading procedures conflicts with the proposal for removal at Phase II bond release; 3) provide the following design provisions for those fences installed in ditches or drainages. The bales or fences must be anchored into the bank of the ditch, must have the highest elevation at below or even with the top of the ditch and, silt fences must have a notched spillway. These are BTCA for proper installation in a ditch or channel; 4) the Applicant must provide a clear and accurate plan between Chapters 3 and 7 regarding roughening techniques and matting.

application. Gouging (deep pocking) and matting on slopes greater than or equal to 2H:1V slopes is considered BTCA.; 5) provide a commitment in the plan to obtain approval from the Division prior to pond removal with an inspection to be completed by a Division Hydrologist for adequacy of erosion control measures, 6) R6745-763100 provide a detailed plan of the construction activities to show the measures taken to minimize sediment transport from the site. This detail should include timing (month) and sequencing for the removal of the culvert system. All regrading, placement of the topsoil, mulching and, erosion control matting in Portal Canyon and a commitment to complete this section of the reclamation prior to removal of the Jewkes Creek Bypass Culvert. A design for transporting drainage from the Portal Canyon area during reclamation to the pond during this phase must be included; 7) discuss the specific measures to be employed for the short periods where reclamation construction activities will be suspended and the site will be left in a condition which minimizes impact if a rainfall event were to occur; and 8) re-evaluate the estimated erosion production for the erosion production expected from an established vegetative cover. This analyses must be re-evaluated for the current vegetation standard including the 71% riparian area standard. Additionally the standard presented assumes that 50 % vegetation will control erosion. However, this has not been demonstrated. Demonstrate that the 50% vegetation for bond release will control erosion since this is used as the standard for BTCA erosion control methods exclusive of the sedimentation pond.

Recommendation:

It is recommended that the outstanding issues be addressed prior to permit approval.

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