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State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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*Mine file
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Also*

November 14, 1997

Wendell Owen
Co-Op Mining Company
P. O. Box 1245
Huntington, Utah 84528

Re: Federal Lease U-024316, 2nd Technical Analysis and Remaining Deficiencies, Co-Op Mining Company, Bear Canyon Mine, ACT/015/025-97-1, Folder #3, Emery County, Utah

Dear Mr. Owen:

The Division has reviewed your application for mining in Federal Lease U-024316 including the latest submittals which were intended to resolve outstanding deficiencies. While most of the outstanding deficiencies have now been addressed, there are still a few remaining ones that deal primarily with hydrology. A Technical Analysis is enclosed which gives the results of the Divisions review. Please review it carefully. You should provide a response to the remaining deficiencies by no later than November 26, 1997.

Thank you for your help in completing the permitting requirements. Please call me, or any of my technical staff if you need clarification on the requirements outlined in the Technical Analyses.

Sincerely,

Daron R. Haddock
Permit Supervisor

vb

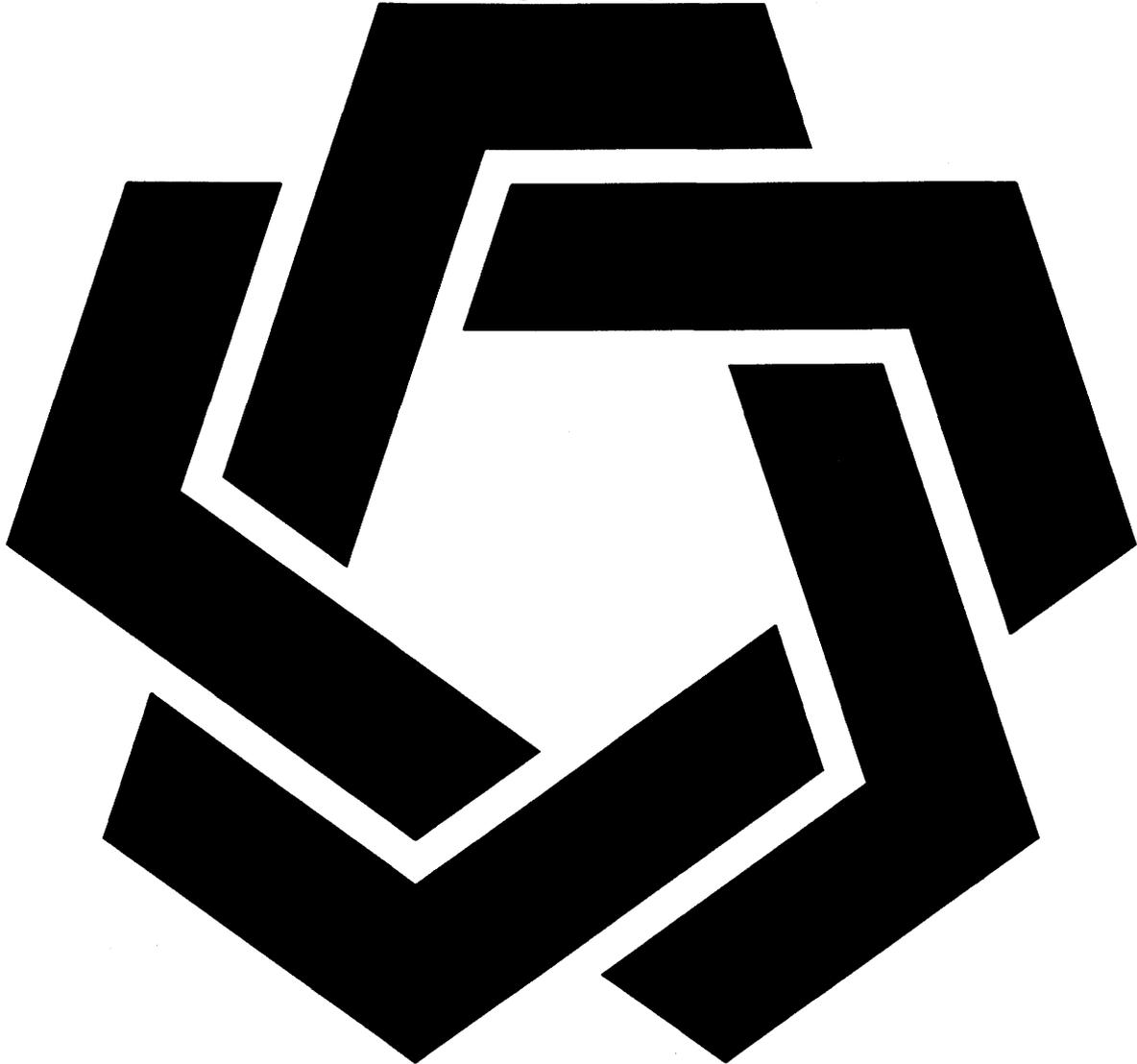
Enclosure

cc: J. Kaiser, Forest Service, Price

P. Hess, PFO

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State of Utah
Division of Oil, Gas and Mining
Utah Coal Regulatory Program



Technical Analysis and Findings
Bear Canyon Mine
ACT/015/025
Federal Lease U-024316
Tank Seam Lease Addition
November 7, 1997

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TECHNICAL ANALYSIS

INTRODUCTION

This Technical Analysis (TA) is written as part of the permit review process. It documents the Findings that the Division has made to date regarding the application for a permit and is the basis for permitting decisions with regard to the application. The TA is broken down into logical section headings which comprise the necessary components of an application. Each section is analyzed and specific findings are then provided which indicate whether or not the application is in compliance with the requirements.

Often the first technical review of an application finds that the application contains some deficiencies. The deficiencies are discussed in the body of the TA and are identified by a regulatory reference which describes the minimum requirements. In this Technical Analysis we have summarized the deficiencies at the beginning of the document to aid in responding to them. Once all of the deficiencies have been adequately addressed, the TA will be considered final for the permitting action.

It may be that not every topic or regulatory requirement is discussed in this version of the TA. Generally only those sections are analyzed that pertain to a particular permitting action. TA's may have been completed previously and the revised information has not altered the original findings. Those sections that are not discussed in this document are generally considered to be in compliance.

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SUMMARY OF DEFICIENCIES

The plan does not meet the minimum regulatory requirements. The Permittee should provide the following in accordance with:

R645-301-731. Update the monitoring and sample location map to show the monitoring required under the Hydrologic Resource Information section of this TA.

R645-301-731. 1) SDH-2 and SDH-3 must be included in the monitoring plan to determine the potential of mining impacts on the Star Point potentiometric surface and to assist in determining the recharge zone to Big Bear Spring monitoring water levels, and 2) water from SDH-2 and SDH-3 should be analyzed using water dating techniques and baseline data parameters, and 3) a well should be drilled through each tongue in the northern portion of the permit area with an adequate time allowed for the surface to reach equilibrium prior to elimination of the well. During the period that in-mine wells are monitored, the SDH-2 and SDH-3 wells should also be monitored.

R645-301-731. A totalizing meter should be installed for the a waterline installed from the Blind Canyon Seam up through a borehole to the Tank Seam. Monthly totals should be submitted to the Division on a quarterly bases. This information should be included in the water monitoring plan to quantify the water used in mining, and volume of water removed from the Blind Canyon Seam.

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ENVIRONMENTAL RESOURCE INFORMATION

PERMIT AREA

Regulatory Requirements: 30 CFR Sec. 783.12; R645-301-521.

Analysis:

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. The additional area is shown on Plate 2-1--Permit Area. A formal description of the additional area is found on page 2-3 and is as follows:

Township 16 South, Range 7 East, Salt Lake Base & Meridian
Section 13: W $\frac{1}{4}$
Section 14: NE $\frac{1}{4}$

Findings:

This permit amendment fulfills the requirements of this section.

MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION

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

Analysis:

Affected Area Boundary Maps

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. The additional area is shown on Plate 2-1--Permit Area. Plate 2-1 was certified by Kimly C. Mangum, a licensed professional engineer registered in the state of Utah.

Coal Resource and Geologic Information Maps

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. Coal resource and geologic information for the lease area was added to Plates 6-1 through 6-12. The geology of the area, including the locations of coal outcrops and property and lease boundary lines, is shown on Plate 2-1--Geologic Map.

TECHNICAL ANALYSIS

There are 3 minable coal seams in Federal Lease U-024316. They are, from lowest to highest, the Hiawatha seam, the Blind Canyon seam, and the Tank seam. The thickness and orientation of the Hiawatha seam are shown, respectively, on Plates 6-7--Hiawatha Seam Isopach Map and 6-8--Hiawatha Seam Structure Contour Map. The thickness and orientation of the Blind Canyon seam are shown, respectively, on Plates 6-3--Blind Canyon Seam Isopach Map and 6-4--Blind Canyon Seam Structure Contour Map. The thickness and orientation of the Tank Seam are shown, respectively, on Plates 6-11--Tank Seam Isopach Map and 6-12--Tank Seam Structure Contour Map. The respective depths of the coal seams are shown on Plates 6-6--Hiawatha Seam Overburden Map, 6-2--Blind Canyon Seam Overburden Map and 6-10--Tank Seam Overburden Map.

All of the maps which were revised in 1997 to show the coal resource and geologic information for Federal Lease U-024316 were certified by Kimly C. Mangum, a licensed professional engineer registered in the state of Utah.

Mine Workings Maps

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. Plate 3-4C--Bear Canyon No. 2 Mine was revised to show anticipated panel and entry development in the lease area. Plate 3-4C was certified by Kimly C. Mangum, a licensed professional engineer registered in the state of Utah.

Permit Area Boundary Maps

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. The additional area is shown on Plate 2-1--Permit Area. Plate 2-1 was certified by Kimly C. Mangum, a licensed professional engineer registered in the state of Utah.

Surface and Subsurface Ownership Maps

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. Surface ownership information for the lease area was added to Plate 2-2--Surface Ownership. Subsurface ownership information for the lease area was added to Plate 2-3--Sub-Surface Ownership. Plates 2-2 and 2-3 were both certified by Kimly C. Mangum, a licensed professional engineer registered in the state of Utah.

Well Maps

There are no known oil or gas wells in the permit area.

TECHNICAL ANALYSIS

Certification

Cross sections, maps, and plans included in this proposed Tank Seam amendment have been prepared by, or under the direction of, and certified by a qualified, registered, professional engineer.

Monitoring Sampling Location Maps

In-mine drill holes TS-1 through TS-10, TS-12, TS-13, and TS-14 are listed in Table 7.1-5 and locations are shown on submitted maps. Water sampling point WM-C and eleven other in-mine drill-holes are listed in Table 7.1-5 but could not be located on any submitted maps; Co-Op Mining Company has indicated in the Tank Seam amendment (Table 7.1-5) that the locations for these bore-holes are not known. Drill holes DH-1A, DH-2, DH-3, and DH-4; SDH-1, SDH-2, and SDH-3; and MW-116 and MW-117 are listed in Table 7.1-4 and locations are on Plate 7-4.

Maps showing elevations and locations of monitoring stations used to gather data on fish and wildlife and air quality were not revised for the proposed Tank Seam amendment.

The amendment includes a monitoring and sample location map. The permit contains a map that shows all previous and existing monitoring sites. This map will need to be updated to show the monitoring required under the findings for the **HYDROLOGIC RESOURCE INFORMATION** section of this TA.

Findings:

This permit amendment does not meet the requirements of this section. The Permittee should provide the following in accordance with:

R645-301-731. Update the monitoring and sample location map to show the monitoring required under the Hydrologic Resource Information section of this TA.

HISTORIC AND ARCHEOLOGICAL RESOURCE INFORMATION

Regulatory Reference: R645-301-411.

Analysis:

No additional historic and archeological resource information was provided with the current lease application. No escarpment failure is expected with the current mining plan. If the mine

TECHNICAL ANALYSIS

proposes mining underneath the Castle Gate escarpment an archeological and historic resources inventory will be required.

Findings:

Information provided in the proposed application meets the minimum regulatory requirements of this section.

VEGETATION RESOURCE INFORMATION

Regulatory Reference: R645-301-320.

Analysis:

Plate 9-1, Vegetation Map was updated to include Federal Lease U-024316. The riparian community type along Bear Creek is shown to extended into the Federal Lease. No wetlands were delineated on the map. Plate 9F-1, Vegetation Resources Map for Federal Lease Area U-024316 was developed during vegetation field work for this lease. Plate 9F-1 does not correlate with Plate 9-1. Different vegetative communities are described for the same areas, for example, no riparian community is delineated along Bear Creek on Plate 9F-1. Plate 9F-1 is of a larger scale and was verified in the field and therefore will be considered the correct map of the lease area. The vegetation descriptions as well as the map units on Plate 9-1 is of concern and will need to be resolved but will not be tied into this lease approval since Plate 9F-1 meets the requirements for this approval.

Findings:

Information provided in the proposed application meets the requirements of this section.

GEOLOGIC RESOURCE INFORMATION

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

Analysis:

The current MRP includes geologic information to assist in determining the probable hydrologic consequences of the operation upon the quality and quantity of surface and ground water in the permit and adjacent areas. The only change to the text in Chapter 6 - Geology in the proposed Tank Seam amendment is removal of the "Upper Beds" from the list of coal beds in Table 6-2 on page 6-17. What was previously referred to as the Bear Canyon coal seam is now referred to fairly consistently throughout the text and on maps as the Blind Canyon coal seam.

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All plates for Chapter 6 have been updated with information from additional drill holes. Well completion diagrams for drill-holes SDH-1, SDH-2, and SDH-3 have been added to Appendix 7-A and the drill-hole log for TS-14 is added to Appendix 6A. Water levels and stratigraphy for SDH-1 and SDH-2 are shown on Plates 7J-1 and 7J-2, and water levels are tabulated on page 7-27.

Figures 7.1-2 and 7.1-3, generalized cross sections, are being removed from the plan but Plates 7J-1 and 7J-2 are detailed cross sections that have been added as part of the Tank Seam amendment. Figure 7.1-4, which is a generalized stratigraphic section, has been removed from the body of the MRP and is now Table 2-4 in Appendix 7-J. Figure 7.1-5 was a stratigraphic section based on interpretation of a geophysical well-log from bore-hole T-5; the information has been incorporated into Plate 7-9, a stratigraphic correlation diagram or cross section, but with less detail.

Water levels for Los Angeles Department of Water and Power (LADWP) wells MW-116 and MW-117 are discussed in the proposed Tank Seam amendment. Collar elevations and water elevations are in Table 7.1-4. Plate 7J-2 shows the water levels in these wells and the relationship of the potentiometric surfaces on each side of the Bear Canyon fault and formation contacts. Figures 7A-17 and 7A-18 show general stratigraphy and well completion details for these two wells. Lithologic characteristics and water levels are also shown on Plate 7-9, where these wells are labeled M91-16 and M91-17. Locations are shown on Plate 7-4.

Information on 20 in-mine drill holes is listed in Table 7.1-5. Most of these were drilled upward, and all but 2 were dry. Locations of 8 of the bore-holes, TS-6 through TS-10 and TS-12 through TS-14, are on Plate 6-11. Locations of the other 12 bore-holes are not known, but drillhole logs are in Appendix 7A. Drillhole logs for TS-6 through TS-10 and TS-14 are in Appendix 6-2. Logs are not available for TS-12 and TS-13. There is no information on TS-11 and it may be that it was not drilled, but this is not stated explicitly in the MRP. Water quality data from bore-hole WM-C is included in Table 7.1-1.

Locations, isopach thicknesses, and coal seam elevations for bore-holes T-1, T-2, T-4, and T-5 are on Plate 6-2 through 6-12. Lithologic characteristics and ground-water elevations are shown on Plate 7-9.

Plates 6-2 through 6-12 also show locations for WHR-1, WHR-2, WHR-3, WHR-5, and WHR-8. These five drill-holes are outside the proposed permit areas but fall within the adjacent area and within the Cumulative Impact Area (CIA). Co-Op Mining Company has no hydrology information for these bore-holes.

There is no new information on potentially acid- or toxic-forming strata. Mining proposed in the area covered by the Tank Seam amendment should not require a change to the current

TECHNICAL ANALYSIS

reclamation plan. Plates 6-2 through 6-12 have been updated and the information can be used to upgrade the subsidence control plan, if necessary.

Appendix 7-N contains a detailed hydrologic evaluation of the Star Point aquifers.

Findings:

Information provided in the proposed Tank Seam amendment is considered adequate to meet the requirements of the Geologic Resources section.

GENERAL

Regulatory Reference: R645-301-411, -301-521, -301-721.

As mining has progressed some of the permittee's general understanding of the environmental ground water resources have changed. Related changes in section 7.1.2 and 7.1.3 have been incorporated into this amendment. Major changes are identified and discussed below:

1. Separate and distinct aquifers exist in the Spring Canyon, Storrs and Panther tongues of the Star Point Sandstone rather than one single aquifer within the Star Point/Blackhawk Formation. The formations of the Star Point Sand Stone were stated to be unsaturated in the southern portions of the permit area. The separate potentiometric surface determination is based on information from the in-mine drill holes DH-1, DH-2, and DH-3. The formations are saturated at the north end of the site. However, the following statements are presented to lend caution to interpretation of this information.
 - a. The wells were drilled following mining. Therefore, it is unknown what the water elevation in the formations were prior to mining. Two factors may drive this condition, one factor is the presence of the low permeability Mancos tongue and the second is that the outcrops of the formation essentially function as an outlet, similar to a well drawing down the potentiometric surface to some distance up gradient. The separateness of the aquifers in this location probably occurred for some distance up gradient prior to mining.
 - b. Lateral flow between the tongues of the formation is greater than vertical flow through the tongues except where fractured. This could result in the observed separate piezometric surfaces.

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- c. Information presented in the Star Point Mine found that the Blackhawk and Star Point formations were in hydrologic connection to the north of the Bear Canyon Mine. (See the CHIA for further information). The Bear Canyon Mine Plan also indicates that all three tongues are saturated at the northern end of the site in Appendix 7-J, pg. 7-33.
2. Previously the permittee indicated that the "Bear Spring flow is derived from water bearing zones north of the mine site and includes water originating from the Star Point Blackhawk contact, cut by the fault to the north of the springs". The permittee no-longer provides a statement in this section about the area that recharges Big Bear Spring. General recharge information is provided under section 7.1.33. Snowmelt at higher elevations provides the recharge for the ground water system and is controlled by; permeability of the strata; surface relief and, rate of snowmelt, formation outcrops, and alluvium within the drainages of the Bear Canyon Area.

Although some of the water could enter the system in the manner described by the permittee this does not explain the quick recharge and historic seasonal response to snowmelt which would occur through fracture flow. These fracture flows could also contribute to recharge. Big Bear Spring is considered to have a component of modern water recharge as is suggested by tritium dating conducted on the spring.

3. Previously the permittee stated that the Big Bear Spring fault and related sub-parallel fault zones are the primary control for a major amount of ground water occurring in the permit area. The permittee states that the relative dryness of the faults and the existence of fault gouge in the mine indicate that little or no flow across these faults occur. On page 7-16, the plan states "secondary permeability due to voids in joints or fractures, may occur in a near vertical direction." The description under section 7.1.4 suggests that flows exist which moves downward through permeable strata, faults and joints and then move laterally until other permeable strata, faults and, joints allow vertical movement. In appendix 7-J, page 2-5, Big Bear and Birch Springs are stated to issue from fault and joint zones of the Panther Tongue of the Star Point.

Additional information was provided in appendix 7-J, page 2-7 in the plan. Groundwater has entered the mine through roof bolt holes and fractures. In past PHC discussions, drainage of water from faults and fractures were stated to produce the largest volumes of water flowing into the mine. And, the crossings of the fault in the East Bleeders E ½, SE 1/4 of section 14, was considered the principal source of water in the portal sump which then re-entered the fracture. Now it is presented that the majority of the water is from the sand channel. It is my understanding that

TECHNICAL ANALYSIS

the portal sump area was never a collection point for the water dating techniques. See: attached pages 7-6 and 7-17 from the Federal Lease Application U-024316.

4. Previously the permittee stated that secondary permeability is present along the near-vertical joints and bedding plains. Now, the permittee states that permeability is generally low with the exception of the Castlegate Sandstone.

The statement on permeability and porosity for the Star Point formation is more descriptive in section 7.1.4. Fractured zones and fractured bedrock will have the greatest permeability. The peak flows and quick recharge of some springs supports the concept that recharge occurs through permeable fracture flows.

Because the potentiometric surface to the north of the mined area at SW-2 has an increased potentiometric surface gradient in the Spring Canyon Tongue between SW-2 and SDH-1, and because the source of recharge to Big Bear Springs has not been identified, there is a need for additional monitoring and data collection to determine the recharge zone to Big Bear Springs and verify the elevations of the potentiometric surface(s).

The information presented on pages 1-7 and 1-8, submitted on 06/18/97 are no longer contrary to text presented in other areas of the plan.

Findings:

This permit amendment meets the minimum requirements of this section related to mining the Tank Seam.

HYDROLOGIC RESOURCE INFORMATION

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

Analysis:

Baseline cumulative impact area information.

The current MRP and the proposed Tank Seam amendment contain geologic information to assess the probable cumulative hydrologic impacts of the proposed operation and all anticipated mining on surface- and ground-water systems for the cumulative impact area.

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Modeling.

No modeling techniques, interpolation, or statistical techniques have been used in preparation of the proposed Tank Seam amendment.

Baseline Information

This section reviews baseline information as it is related to the proposed tank seam lease addition, the addendum is to be attached to appendix 7-J.

Ground-water information

Data is presented for ground water observation wells in table 2-4. Stratigraphic logs were presented for SDH-1, SDH-2 and SDH-3. However, the dates the drilling was conducted was not legible on the logs. The information relating the extent of the mine workings to the uppermost known potentiometric surface of the Blackhawk/Star Point aquifer was provided in the informal conference. That information is now incorporated in the plan with the northern most extent of the proposed workings identified. Information presented in Table 2-4 includes water elevations used to build the cross-section. Water elevations for DH-1A, DH-2 and DH-3A were obtained in December 1995; water elevations from drill holes SDH-1, obtained in August 1994; water elevations in SDH-2 and SDH-3, were obtained in August 1995; and water elevations in drill holes MW-117 and MW-116, were obtained in September 1996.

The location of SDH-3 is now provided on the monitoring location map. In a telephone discussion with Charles Reynold's, environmental engineer for the Co-Op Mining Company, Charles indicated that only one sample was obtained from well SDH-1 before the well failed. SDH-2 has a faulty water monitoring device, which the mine has corrected (fall of 1997).

SDH-1 and SDH-2 lie between the same geologic fault features north of the minesite and may provide data pertinent to the operations. The MW wells lie to the east of the Bear Canyon Fault and are probably in hydrologic isolation from the proposed mining. The water elevation, 7964 feet, at SDH-2 in August, 1995, was obtained in a period where there was a lowering of the potentiometric surface. The observed water elevation at SDH-2 was 7975.8 feet, on September 02, 1997, an increase in elevation of 11.8 feet since the initial well development. The change in water elevation at SDH-2 may be the result of climatic variation and potentially mine pumping operations conducted at Star Point Mine.

The increased potentiometric surface at SDH-2 and steep slope of the potentiometric surface to SDH-1 may indicate that there is a loss of water somewhere between SDH-2 and SDH-1. Additionally it could be that the potentiometric surface at SDH-1 had not stabilized. The decreased potentiometric surface may be from losses to the surface through Bear Canyon

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Creek, the McCadden Hollow/Trail Canyon drainage, and the Bear Canyon Fault Zone. The Bear Canyon Fault and sympathetic faults may in turn, re-charge the Big Bear Springs.

SDH-3 is separated from Bear Canyon by the Blind Canyon Fault and an unnamed fault, and was not considered to be information associated with the proposed mining block. However, this data is needed to provide information for the Trail Canyon Mine area. Since little information on the groundwater hydrology of this area is available, the information from SDH-3 is pertinent to the Trail Canyon Mine and some information suggests it may recharge Big Bear Spring. See the updated CHIA for further information.

Spring Data

Baseline spring sampling was conducted for the sites as identified in table 1 below. The sampling period for most sites was conducted from 1993 through 1994 for sites in McCadden Hollow. While the sampling period for springs within Bear Creek Canyon were conducted between 1993 and 1996.

Review of the available information on the McCadden Hollow Springs indicates that the recharge area for most of the spring sites are localized, except for FBC-4 and FBC-13 which may have a more extensive recharge. The recharge area is believed to be more extensive since flow rates were observed throughout the monitoring period. These springs appear to be associated with fault/fracture systems and are located at the northern most portion of the canyon. FBC-13 flowed at the highest rate and ranged from 22 to 60 gallons per/minute over the period for which data was collected.

The Tank Seam is above the potentiometric surface and this reduces the likely hood that mining would intercept the Star Point Potentiometric Surface with the proposed mining. However, in the Willow Creek Mine water was encountered from an unplugged drill hole that allowed water to move into the mine from a lower formation. Pressure from the up gradient potentiometric surface could cause water move into the mine through an un-plugged drill hole, the rate of inflow would be controlled by the transmitting of the formation and therefore, would have a low potential for impact. Additional drill holes to the Star Point Formation at the northern end of the proposed mine workings may provide additional information with which greater confidence can be placed in determining the hydro-geologic distribution of water in the region.

A well should be completed in each tongue and an adequate time should be allowed for the surface to reach equilibrium prior to elimination of the well. During the period that these wells are monitored, the SDH-2 and SDH-3 wells should also be monitored. SDH-2 and SDH-3 should also be included in the monitoring plan to further analyze the potential impacts

TECHNICAL ANALYSIS

and the recharge zone to Big Bear Spring. Both wells should be analyzed using water dating techniques prior to this winter season.

The proposed extent of mining is approximately 2,250.00 feet away from the southern most spring FBC-2 (estimated by the Division from information contained on plates 7-4 and 3-4C). Information on the localized area dip for McCadden Hollow were not presented on the geologic map. However the regional dip of the lower coal bed north of McCadden Hollow is presented by Dohling 1972, as dipping to the south. Therefore, the likelihood of these springs being impacted during this proposed mining phase would be low.

The sampling period for springs in Bear Canyon provided a minimum of 2 samples per quarter over the period sampled (except for the 1st quarter when access is difficult). These sites are located above the coal seam and adjacent to the area proposed to be mined. The Bear Canyon Fault is near the springs. The porosity of the fractures/fault system may play a part in flows at these springs. Spring flows from FBC-12 have ranged from 21 to 100 gpm while flows from site 16-7-13-1 ranged from 4 to 12 gpm. These sites are potentially more susceptible to the effects from mining because they are closer to the proposed extent of the mine. However, they do issue out of the formation above the mine and on the east side of the Bear Creek Fault. The furthest proposed extent of mining occurs to the south of these springs and on the west side of the Bear Creek Fault. A buffer zone is proposed along the creek where the development pillars will not be removed, in order to protect Bear Creek and the Castlegate outcrop. Based on the information reviewed for the Bear Creek Canyon area springs, the operator has obtained adequate baseline data for the proposed tank seam mine operation.

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Table 1: Baseline Spring Sampling

Site/Location	Date	Site Condition	Comments
FBC-2/McCadden Hollow.	08/01/91	Flowing	Available in the existing plan.
	10/04/92, 6/21/93, 6/16/94.	Not found	
	3/22/93	No Access	
FBC-3/McCadden Hollow.	08/01/91	Flowing	Available in the existing plan.
	6/21/93,10/15/93,6/16/94	Not found	
	3/22/93	No Access	
FBC-4/McCadden Hollow.	6/24/93, 8/29/93, 10/15/93, 6/15/94, 8/30/94,10/31/94.	Flowing	Existing plan baseline sample obtained 08/01/91, 10/13/92.
	3/22/93, 3/30/94,	No Access	
FBC-12/Bear Creek Canyon.	6/29/93, 8/29/93, 10/15/93, 6/15/94, 8/29/94,10/31/94.	Flowing	
	3/22/93, 3/30/94,	No Access	
FBC-13/North Slope McCadden Hollow.	8/29/93,10/15/93, 6/15/94, 8/30/94, 10/31/94, 6/28/95.	Flowing	Not found on map.
	3/22/93, 3/30/94.	No Access	
16-7-13-1/ Bear Creek Canyon.	6/8/94,10/28/94, 7/10/95, 10/18/95, 7/18/96.	Flowing	Associated Water Right.
	3/22/93, 3/29/95	No Access	

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Surface-water Information

Changes in the surface water collection were presented associated with the new lease area. Surface water for the McCadden Hollow Drainage was collected from 1993 through 1994. See table 2. As stated above, the regional dip of the lower coal bed north of McCadden Hollow dips to the south, the likelihood of the springs being impacted during this proposed mining phase is considered low because these springs issue above the coal and are dissected by the drainage north of the area proposed to be mined. This drainage is described as an intermittent drainage. With the exception of spring runoff and precipitation events, the base flows are probably fed by the springs from the north side of the drainage (the combined upstream spring flow values are almost equal to the stream flow for measurements made within the same time). For the presented assumptions and the information reviewed the baseline monitoring for the surface water in McCadden Hollow is determined adequate.

Table 2: Surface Water Sampling

Site/Location	Date	Site Condition	Comments
FBC-1/McCadden Hollow.	6/21/93, 8/29/93, 10/15/93, 6/16/94	Flowing	Existing plan baseline sample obtained 07/31/91
	8/30/94, 10/31/94	Dry	Existing plan dry baseline sample obtained 10/04/92
	3/22/93, 3/30/94	No Access	

Baseline Cumulative Impact Area Information

The Division is concurrently conducting an update of the CHIA based on the changes submitted in the PHC. Most of these changes are related to current operations and are not directly a result of the proposed Tank Seam Amendment.

Alternative Water Source Information

On page 1-11 the plan states "...mitigating measures will be employed if any significant impact occurs." On page 7 -34, the plan states "In the event mining reaches far enough north to mine at an elevation below Bear Creek, an adequate barrier will be left to completely prevent any impact to Bear Creek". The Division believes that as long as the fracture is not intercepted (the workings are placed to the west of the fracture), water would be more likely to follow the fracture then move into the mine workings.

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Alternate replacement for the State and Federal requirements for 30 CFR 817.54 and lease stipulation 19 (pg.2F-10) are presented on page 3-42. Potential alternate water sources are described, and a commitment is included in the plan to obtain Forest Service approval for water sources affected on the Federal Lease and a commitment to replace water supplies in quality and quantity if the supply is impacted by mining operations. A commitment to replace spring water at the source should springs be affected by subsidence is included on page 3-43, section 3.3.6.

Because this is an underground coal mining activity the requirements of R645-301-727 do not apply. The plan meets the minimum requirements of R645-301-727.

Probable Hydrologic Consequences Determination

The plan states the following on page 1-8. "Bear Canyon Mine will have no impact on the quantity of groundwater." The plan should clarify this statement presenting discussions of ground water quantity changes contained elsewhere in the plan. An incorrect statement is made that suspended sediments will be mitigated. A mitigation plan for suspended sediments was not found in the plan. The permittee has incorrectly used the word, mitigation, the appropriate word for the context used is minimize impacts.

The current mining of Lease U-024316 will occur in the Tank Seam only until additional hydrologic and geologic information can be obtained. The Blind Canyon and Tank Seam have recoverable reserves in this lease but, it is uncertain if they can be mined.

The plan states that minor fracturing has been noted in relation to the Bear Canyon Mine (Plate 3-3). Some fracturing and escarpment rock fall have been noted in the Trail Canyon Mine area. A misleading statement can be found on page 3C-2 under the subsidence monitoring plan. Where it was stated that no actual subsidence has been noted from areas pillared as much as 40 years ago. One significant "chimney plug" subsidence event occurred in a drainage above Birch Springs. This is probably the source for the large flows which affected the Birch Spring in 1989. This event was not mentioned in the discussion. Other minor occurrences were exhibited in areas of relatively low cover and unknown outcrop protection.

To prevent subsidence to Bear Creek and the adjacent ledges, no retreat-mining is projected east of the in-mine fault paralleling the section line between sections 13 and 14, T.16.S., R.7.E. (plate 3-4C). Approximately 1200 feet of cover exists in the S.W. corner of Section 13. A non-subsidence zone in a 100 to 200 ft wide corridor from the outcrop and permit boundary area are shown on Plate 3.

The separate potentiometric surface of the Star Point is provided to support a determination that no adverse impact is expected to occur due to mining the Tank Seam. However, there are

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several potential recharge scenarios for the Big Bear Spring and one is that the Bear Canyon Fault Zone and sympathetic faults conduct flow to Big Bear Spring. If this is the case, then mining the Tank Seam could increase or decrease flows to the spring. Because, the mine lies above the potentiometric surface and the mining plan is designed to minimize subsidence in this area, the potential for impact is low. This potential impact is not included in the mine plan.

Because the Tank Seam is above the potentiometric surface, it is reasonable to assume mining would not intercept the Star Point potentiometric surface. However, in the Willow Creek mine water was encountered from an unplugged drill hole which allowed water to move into the mine from a lower formation. If there is a hydraulic gradient, water could move into the mine through a drill hole from pressure. Potential impact is not included in the mine plan, however, the potential impact to hydrologic balance is low because the rate of inflow of the formation is relatively low.

Additional drill holes to the Star Point formation at the northern end of the proposed mine workings may provide information with which greater confidence can be placed in determining the hydro-geologic distribution of water in the region. A well should be drilled through each tongue and adequate time should be allowed for the water surface to reach equilibrium prior to elimination of the bore hole. During the period that these wells are monitored, the SDH-2 and SDH-3 wells should also be monitored. SDH-2 and SDH-3 should also be included in the monitoring plan to further analyze the potential impacts and the recharge zone to Big Bear Spring. Water from SDH-2 and SDH-3 should be analyzed using water dating techniques.

Findings:

This amendment does not meet the requirements of this section. The Permittee should provide the following in accordance with:

- R645-301-731.** 1) SDH-2 and SDH-3 must be included in the monitoring plan to determine the potential of mining impacts on the Star Point potentiometric surface and to assist in determining the recharge zone to Big Bear Spring, and 2) water from SDH-2 and SDH-3 should be analyzed using water dating techniques and baseline data parameters, and 3) a well should be drilled through each tongue in the northern portion of the permit area with an adequate time allowed for the surface to reach equilibrium prior to elimination of the well. During the period that in-mine wells are monitored, the SDH-2 and SDH-3 wells should also be monitored.

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OPERATION PLAN

FISH AND WILDLIFE INFORMATION

Regulatory Reference: 30 CFR Sec. 784.21, 817.97; R645-301-322, -301-333, -301-342, -301-358.

Analysis:

Protection and enhancement plan.

Known raptor nest sites in the area are shown on Plate 3-3 and in Appendix 10-D. One nest is shown in the Federal Lease which was last surveyed in 1996. The "unknown Buteo" nest was tended in 1991 but not found in 1996. Major impacts to fish and wildlife would be caused by subsidizing the Castlegate cliff escarpment and Bear Creek. The current mining plans associated with this permit amendment, 97A, do not allow for pillaring or second mining under the Castlegate escarpment, thus reducing any chance for subsidence. No mining is currently proposed under Bear Creek where it runs through the Federal Lease.

The operator has committed to retaining a copy of the raptor monitoring reports at the mine site. Surveys will be conducted every five years. The reports must be made immediately available to the Division upon request. If future mining plans consider subsidizing cliff escarpments then annual raptor monitoring may be required.

There is a potential for Townsends and Spotted Bats to occur along the cliff escarpment in Bear Canyon. At this time no survey will be required however, prior to any future request for cliff subsidence a survey will be required.

Findings:

Information in the Tank Seam Lease Application is considered adequate to meet the minimum requirements of this section.

MINING OPERATIONS AND FACILITIES

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

Analysis:

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General

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. The additional area is shown on Plate 2-1--Permit Area.

All 3 minable seams--the Tank seam, the Blind Canyon seam, and the Hiawatha seam--are mined in Federal Lease U-024316. The Blind Canyon seam, which is the middle seam, is entered directly through the Bear Canyon #1 portal. The Hiawatha Seam, which is the lower seam, is entered by way of a rock slope from the Blind Canyon Seam. The Tank Seam, which is the upper seam, is entered directly through the Bear Canyon #2 portal. Main entries are columnized to prevent "punching" from the upper to the lower seams.

Findings:

This amendment fulfills the requirements of this section.

COAL RECOVERY

Regulatory Reference: 30 CFR Sec. 817.59; R645-301-522.

Analysis:

The addition of Federal Lease U-024316 in 1997 boosted annual production to approximately 750,000 tons. The overall recovery rate in this Federal lease area is expected to be about 50%, which is the national average for room-and-pillar operations of this type.

Findings:

This amendment fulfills the requirements of this section.

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SUBSIDENCE CONTROL PLAN

Regulatory Reference: 30 CFR Sec. 784.20, 817.121, 817.122; R645-301-521, -301-525, -301-724.

Analysis:

Subsidence control plan.

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. Three subsidence monitoring points were added to the existing network to include the Federal lease area. The locations of these points are shown on Plate 3-3--Subsidence Map.

Using standard subsidence charts, the permittee has calculated the maximum anticipated subsidence from the mining of each coal seam and has tabulated that information on page 3C-4.

Findings:

This amendment fulfills the requirements of this section.

MAPS, PLANS, AND CROSS SECTIONS OF MINING OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-512, -301-521, -301-542, -301-632, -301-731, -302-323.

Analysis:

Affected area maps.

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. The additional area is shown on Plate 2-1--Permit Area. All other relevant maps were also revised to show the Federal lease. Plate 2-1 and all other revised maps were certified by Kimly C. Mangum, a licensed professional engineer registered in the state of Utah.

Mine workings maps.

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. Plate 3-4C--Bear Canyon No. 2 Mine was revised to show anticipated panel and entry development in the lease area. Plate 3-4C was certified by Kimly C. Mangum, a licensed professional engineer registered in the state of Utah.

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Monitoring and sample location maps.

The permit area was enlarged in 1997 to include Federal Lease U-024316, which lies at the north end of the original permit area. Three subsidence monitoring points were added to the existing network to include the Federal lease area. The locations of these points are shown on Plate 3-3--Subsidence Map. Plate 3-3 was certified by Kimly C. Mangum, a licensed professional engineer registered in the state of Utah.

Findings:

This amendment fulfills the requirements of this section.

HYDROLOGIC OPERATIONAL 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.

Ground-water Monitoring

The Table 7.1-6 indicates under the heading "Type of data Collected and Reported" that ground water quality monitoring for springs will be obtained once for a low flow sample. It is assumed this refers to the baseline data collected and not the quarterly collection. The reclamation monitoring was previously approved for a single sample at low flow. However, this may need to be changed in the future based on information collected through the operation phase. The reason this should be assessed is because the potential for impact to water quality may be great during a high flow following a low flow period. Additional sites were added and are identified in Table 3.

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Table 3: Operational Spring and Groundwater Sampling

Site/Location	Sampling period	Sampling Parameters	Formation
SBC-12, previously FBC-12/Bear Creek Canyon.	May, July, August, October.	Operational	North Horn
FBC-13/1st east in-mine pillared area.	Feb, May, August, October.	Operational	Blackhawk, Sandstone Channel
SMH-1, previously FBC-6/McCadden Hollow.	May, July, August, October	Operational	North Horn
SMH-2 previously FBC-2/McCadden Hollow.	May, July, August, October	Operational	Price River
SMH-3 previously FBC-13/McCadden Hollow.	May, July, August, October	Operational	North Horn
SMH-4 previously Hollow. FBC-4/McCadden	May, July, August, October	Operational	North Horn
SMH-5 previously FBC-5/McCadden Hollow.	May, July, August, October	Operational	North Horn

Further review of the ground water resources suggest additional monitoring is required. The permittee has stated that they will conduct similar drill hole investigations of aquifers as they move into the federal lease. This statement is rather non-committal as to the methods and may not meet the objectives to gather adequate information. See requirements under the findings for the **HYDROLOGIC RESOURCE INFORMATION**.

The permittee has indicated that a waterline will be installed from the Blind Canyon Seam up through a borehole to the Tank Seam. A totalizing meter should be installed and monthly totals, submitted to the Division quarterly, and included in the monitoring plan to quantify the water used in mining and volume of water removed from the Blind Canyon Seam.

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Surface-water Monitoring

The surface water collection MH-1, previously baseline site FBC-1, is proposed to be monitored in May, July, Aug, and October in association with the new lease area. According to table 7.1-8 this site is to be monitored according to the operational parameters.

The reclamation monitoring was previously approved for a single sample at low flow. However, this may need to be changed in the future based on information collected until the time when reclamation occurs. This should be assessed because the potential for impact to water quality may be greatest during high base flow periods if water from the mine is recharging the streams.

Findings:

This amendment meets the minimum requirements of this section as it relates to the tank seam amendment.

R645-301-731. A totalizing meter should be installed for the a waterline installed from the Blind Canyon Seam up through a borehole to the Tank Seam. Monthly totals should be submitted to the Division on a quarterly bases. This information should be included in the water monitoring plan to quantify the water used in mining, and volume of water removed from the Blind Canyon Seam.