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STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

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March 1, 1985

Mr. Allen D. Klein, Administrator
Western Technical Center
Office of Surface Mining
Brooks Towers
1020 Fifteenth Street
Denver, Colorado 80202

Dear Mr. Klein:

RE: Final Technical Analysis and State Decision Package, Consolidation Coal Company, Emery Deep Mine, ACT/015/015, #2 and #4, Emery County, Utah

Enclosed please find the updated Final Technical Analysis (TA) and State Decision Package for Consolidation Coal Company's Emery Deep Mine. This document has been reviewed as per the Division's Administrative Review policy.

The Division has updated the Final TA of June 20, 1984 to reflect the comments received from OSM's Washington office on July 25, 1984 and the narrative and final ground water model output received from the Western Technical Center on January 28, 1985.

There are no Stipulations to Final Permit Approval, as the applicant responded adequately to all proposed Stipulations prior to June 20, 1985.

The Division hopes that this Final TA and the associated Environnmental Analysis (EA) put together by your office can be quickly forwarded to Washington for Secretarial approval.

Please contact me or Susan Linner of my staff if we can be of assistance.

Best regards,

Dianne

Dianne R. Nielson
Director

SCL:jvb
Enclosure
cc: E. Anderson
R. Daniels
S. Linner
L. Kunzler
0020R-32

MINE PLAN INFORMATION

Mine Name: Emery Deep Mine State ID: ACT/015/015

Operator: Consolidation Coal Company County: Emery

Controlled By: Consolidation Coal Company

Contact Person(s): Ervin Anderson Position: Permit Coordinator

Telephone: (314) 275-2414

New/Existing: Existing Mining Method: Room and Pillar

Federal Lease No(s).: U-5287
Legal Description(s): T. 22 S., R. 6 E., Sec. 19: NE1/4 SW1/4, NW1/4 SE1/4, E1/2 SE1/4, S1/2 NE1/4. Sec. 20: NW1/4 SW1/4, S1/2 S1/2, NE1/4 SE1/4. Sec. 29: NW1/4 NW1/4, E1/2 NW1/4, W1/2 NE1/4, NW1/4 SE1/4

State Lease No(s).: #25005 (2) #19797
Legal Description(s): T. 22 S., R. 6 E., Sec. 29: S1/2 SW1/4. Sec. 30, SE1/4 SE1/4 (2) Sec. 31: NE1/4 SE1/4, NE1/4 SW1/4, SE1/4 SW1/4

Other Leases (identify): (1) R. Jensen (2) G. Olsen (3) J. Lewis (4) R. Lewis (all leases in T. 22 S., R. 6 E, SLBM)
Legal Description(s): (1) Sec. 29: SE1/4 NE1/4 (2) SW1/4 NW1/4 and Beginning 20 rods N of SE corner of NW1/4 SW1/4 thence N 60 rods thence W 80 rods thence S 20 rods thence SE to point of Beginning (3) Sec. 29, Beginning 20 rods S of NW corner of SW1/4, Thence S 60 rods , thence E 80 rods, thence N 20 rods, thence NW to point of Beginning and Sec. 30: NE1/4 SE1/4 (4) Sec. 30: S portion of N1/2 NW1/4 SW1/4.

Ownership Data:

Surface Resources (acres)	Existing Permit Area	Total Life Of Mine Area
Federal	80	Unknown
State		Unknown
Private	5,100	Unknown
Other		Unknown
TOTAL	5,180	Unknown

Coal Ownership (acres):

Federal	720	Unknown
State	240	Unknown
Private	4,220	Unknown
Other		Unknown
TOTAL	5,180	Unknown

Coal Resource Data	Total Reserves (tons) (all seams)	Total Recoverable Reserves (I zone A seam)
Federal	6,926,000	2,776,000
State	5,037,000	2,469,000
Private	34,476,000	17,087,000
Other		
TOTAL	46,439,000	22,332,000

Recoverable Reserve Data	Name	Thickness	Depth
Seam	K-Seam	6 Feet	80'- 750'
Seam	I-Zone	14-18 Feet*	100'- 800'
Seam	G-Seam	5 Feet	150'- 850'
Seam	C-D Seam	12-13 Feet*	180'- 900'
Seam	A Seam	0-13 Feet	300'-1,000'
Seam			

*Includes several thin clay partings.

Mine Life: 30 years
Average Annual Production: 700,000-1.7 Million Tons
Percent Recovery: 50% (in mineable seams)
Date Projected Annual Rate Reached: Dependent on market conditions
Date Production Begins: Existing Active Mine
Date Production Ends: 2010
Reserves Recoverable By: (1) Surface Mining: **
(2)Underground Mining: 100%
Reserves Lost Through Management Decisions:
Coal Market:
Modifications that have been Approved:

Borehole Road - Pump Access Road	October 1, 1981
Preparation Plant Facilities	September 21, 1982
Use of Borrow Area	February 3, 1982
Bathhouse and Powerline	February 12, 1982
New Coal Stockpile	August 3, 1982

**100% of coal mined in the five year permit term will be by underground methods. However, a portion of the 5,180 acre permit area overlaps with the permit area of the proposed surface mine.

0150R

FINDINGS DOCUMENT

Consolidation Coal Company
Emery Deep Mine
ACT/015/015, Emery County, Utah

February 26, 1985

1. The Regulatory Authority has determined that the Permit Application Package (PAP) submitted on March 23, 1981 and updated through December 27, 1983 and the permit with conditions are accurate and complete and comply with the requirements of the Utah State Program, the Surface Mining Control and Reclamation Act (SMCRA) and the Federal Lands Program including the Mineral Leasing Act (as required by UMC 786.19[a]).

2. The regulatory authority has prepared the Technical Assessment (TA) and based on this has made the following findings:

   A. The information in the permit application package details acceptable practices for reclamation. Test plots are proposed to validate the proposed reclamation plan and provide information for changes where needed. Reclamation success has been demonstrated immediately adjacent to the minesite (EMRIA Report No. 16, 1979 BLM, Denver, CO). The regulatory authority has determined that reclamation, as required by the Act, can be feasibly accomplished under the PAP (UMC 786.19[b]).

   B. Cumulative hydrologic impacts have been assessed for the Emery Mine by the regulatory authority (see Cumulative Hydrologic Impact Assessment (CHIA) attached). Of the three mines in the cumulative impact area, (the Quitchupah Creek watershed) including Southern Utah Fuel's Convulsion Canyon Mine, only the Emery underground mine and the proposed Emery Surface Mine present concerns in terms of ground water and surface water impacts. The details of the type and extent of impacts are included in the CHIA (UMC 786.19[c]). It has been determined that mining will contribute additional salt loading to surface waters and will decrease ground water levels in the area of the deep mine. However, these impacts will not impact the existing and natural environment to a significant degree and are therefore determined by the regulatory authority to be insignificant.

3. After reviewing the description of the proposed permit area, the regulatory authority has determined that the area is (UMC 786.19(d)):

A. Not included within an area designated unsuitable for coal mining operations (see PAP, page 2-3) (see BLM letter dated March 30, 1984 in Appendix A).

B. Not within an area under study for designating lands unsuitable for coal mining operations (see PAP, page 2-3).

C. Not on any land subject to the prohibitions or limitations of 30 CFR 761.11(a) (national parks, etc), 761.11(f) (public buildings, etc.) and 761.11(g) (cemeteries) (see PAP, page 2-3).

D. Within 100 feet of the outside right-of-way of public roads, however, the Emery Deep Mine was permitted prior to August 3, 1977 and is, therefore, subject to valid existing rights (UMC 761.5) (UMC 761.11).

E. Within 300 feet of an occupied building, but the applicant will not mine within this 300 foot buffer zone unless a written waiver is received from the owner of the dwelling (see TA section UMC 817.121-.126).

4. The issuance of a permit and the Secretarial decision on the Mineral Leasing Act plan are in compliance with the National Historic Preservation Act and implementing regulations (see October 24, 1983, letter from SHPO, Appendix A and TA section UMC 817.121-.126) (UMC 786.19(e)).

5. The applicant has the legal right to enter and begin underground mining activities in the permit area. The private mineral estate to be mined has been severed from the private surface estate. The applicant has provided information required by UMC 782.15(b) (see PAP, Section 4.3) (UMC 786.19 (f)).

6. The applicant has submitted proof and the regulatory authority's records indicate that prior violations of applicable laws and regulations have been corrected (personal communication, Joe Helfrich, Field Supervisor, DOGM, February 21, 1985) (UMC 786.19(g)).

7. The regulatory authority's records confirm that all fees for the Abandoned Mine Reclamation Fund have been paid (personal communication, John Sender, OSM Fee Compliance Officer, February 25, 1985) (UMC 786.19 (h)).

8. The regulatory authority's records show that the applicant does not control and has not controlled mining operations with a demonstrated pattern of willful violations of the Act of such nature, duration and with such resulting irreparable damage to the environment as to indicate an intent not to comply with the provisions of the Act (personal communication, Joe Helfrich, Field Supervisor, DOGM, February 21, 1985) (UMC 786.19(i)).

9. Coal mining and reclamation operations to be performed under the permit will not be inconsistent with other underground mines in the general vicinity of the Emery Mine (UMC 786.19 [j]). No other underground mines occur in the vicinity.

10. The applicant must post a performance bond in the amount of $828,000 (see Bonding Section of TA) as required under the Act, the Utah State Program and the Federal Lands Program prior to permit issuance. The bond must be made payable to both the United States and the State of Utah in the approved amount (30 CFR 742.12[b], 786.19[k]). A bond in the amount of $2,592,922 is currently in place for the proposed Preparation Plant and Loadout Facility.

11. The applicant has provided evidence and the regulatory authority has found that there are prime farmlands in the permit area which are being protected as required by 30 CFR 785.17 (see TA section UMC 823.11-15) (UMC 786.19(l)).

12. The regulatory authority has determined that an active irrigated alluvial valley floor exists in the proposed permit area. The applicant contests this determination, but has committed not to undermine this area in the PAP (see TA Section 822) (UMC 786.19[l]).

13. The proposed postmining land-use for the permit area has been approved by the regulatory authority (see TA section UMC 817.133) (UMC 786.19[m]).

14. All specific approvals required by the Act, the Utah State Program, and the Federal Land Program have been made (UMC 786.19[n]).

15. The proposed operation will not affect the continued existence of threatened or endangered species or result in the destruction or adverse modification of their critical habitats (see January 20, 1984 letter of concurrence from U.S. Fish and Wildlife Service in Appendix A) (UMC 786.19[o]).

16. All procedures for public participation required by the Act, and the approved Utah State Program have been complied with (CFR 741.21[a][2][ii]).

Prior to the permit taking effect, the applicant must post the performance bond for reclamation activities.

Susan C. Linner
Permit Supervisor

L. P. Braxton
Administrator, Mineral Resource
Development and Reclamation Program

Associate Director, Mining
Division of Oil, Gas and Mining

APPROVED AS TO FORM BY:

Assistant Attorney General

Director,
Division of Oil, Gas and Mining

0149R

CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT

Consolidation Coal Company
Emery Deep Mine
ACT/015/015, Emery County, Utah

February 26, 1985

Definition of Cumulative Impact Area (CIA)

Cumulative hydrologic impacts have been assessed for the Emery Mine by the regulatory authority. This assessment weighs the impact of mining activities proposed in the permit application along with those of existing and proposed mining operations in proximity of the permit area against the existing hydrologic regime and existing water rights.

The Emery underground mine is located in the Quitchupah Creek watershed, near Emery, Utah. The surface facilities area is located at the confluence of two perennial streams, Quitchupah Creek and its tributary, Christiansen Wash. Quitchupah Creek, with a drainage area of 430 square miles, flows to the southeast from the mine complex, converging with Ivie Creek, immediately above the confluence of that stream with Muddy Creek at Highway I-70. Muddy Creek, with a drainage area of 1,450 square miles, is one of the major streams in the Dirty Devil River watershed, a tributary to the Upper Colorado River. Flows in Quitchupah Creek and Christiansen Wash derive from three sources: direct runoff; baseflow from the Upper and lower Ferron Sandstone aquifers; and returning irrigation flows that are diverted out of Muddy Creek. Quitchupah Creek is also directly impacted by discharge from the mine as all mine-inflow pumped from the underground workings is directed to a single treatment pond that discharges into a small tributary of that stream.

The mine removes coal from the I-J zone coal bed, in the Ferron Sandstone member of the Mancos Shale. The Ferron Sandstone comprises a principal areal aquifer in the region and consists of two distinct water bearing zones; the Upper Ferron aquifer and the Lower Ferron aquifer. Both zones exist under confined conditions, the Lower Ferron unit showing higher hydrostatic pressure under undisturbed conditions than the Upper unit. The I-J zone bed defines the bottom of the Upper Ferron aquifer.

Overlying the Ferron Sandstone is the Bluegate Shale, which acts as a confining bed over the Upper Ferron aquifer. Due to the shale content of this formation, permeability is considered to be very low. Water is contained in the Bluegate Shale; however, it is not considered an aquifer in the regional context. Water is generally thought to exist and move via localized fracturing in the formation.

Unconsolidated alluvial aquifers also exist at the mine. Alluvial terrace deposits overlying the Bluegate are waterbearing, as are the alluvial deposits of Christiansen Wash and Quitchupah Creek.

The CIA as defined above encompasses two other mining operations in addition to the Emery underground mine; the existing Convulsion Canyon underground mine complex, located approximately 12 miles northwest of the Emery Deep Mine in the Wasatch Plateau along Quitchupah Creek; and, the proposed Emery Surface Mine, with a proposed location within and adjacent to the existing Emery underground mine. Both the Convulsion Canyon and Emery Surface Mines are located in the Quitchupah Creek watershed.

The Convulsion Canyon Mine is considered sufficiently removed hydrologically that it will not adversely impact surface and ground water quality and quantity of the permit area. Therefore, it is not viewed as a factor in the cumulative impact assessment. This is made on the basis of geologic and hydrostratigraphic findings for that mine. At the Convulsion Canyon complex, mining will take place within the Blackhawk Formation. The areal aquifer to be affected at the Convulsion Canyon Mine consists of sandstone units within the Blackhawk; at the Emery Mine, the Blackhawk Formation is not present. The Bluegate Shale comprises the surface geology formation at the Emery Mines and if present, the Blackhawk would be situated several thousand feet stratigraphically above the Bluegate Shale. The Convulsion Canyon Mine is located in the highlands of the Wasatch Plateau, whereas the Emery complex is located on the outwash plain east of the Wasatch Plateau; there is several thousand feet of elevation difference between the two mines. In regards to surface water concerns, the quality of water being discharged from the Convulsion Canyon mine is comparable to the natural outflow from the areal aquifer, therefore, there will be no measurable increase in downstream total dissolved solids (TDS) levels and the flow in Quitchupah Creek in the vicinity of the Emery Mine is unaffected by the Convulsion Canyon Mine. Sediment controls utilized by the mine have been found to be adequate to prevent any influx of total suspended solids (TSS) to Quitchupah Creek.

Of concern, therefore, for potential cumulative ground water and surface water impacts in the Emery area are the existing Emery Mine underground complex and the adjacent proposed Emery Surface Mine.

Current Federal and State regulations call for an evaluation of both permit term and life-of-mine impacts of all anticipated mining in the CIA. The disturbance associated with the Emery underground mine includes a 33-acre surface facilities area comprising portals, coal stockpiles, service buildings, storage yard, roads and surface water control structures. A proposed preparation plant facility, comprising 206 acres, and a mine discharge treatment pond located near the mine yard were approved as separate permit (see Appendix B). Proposed underground workings include 570 acres to be mined in the five-year permit term with mining to occur in the I-J zone at a depth of 100 to 800 feet. To date, approximately 800 acres of the I-J zone have already been mined. The Resource Recovery and Protection Plan for the Emery underground mine is defined by the permit boundary shown on Map 3-7 in the PAP. This area, which can be considered the life-of-mine for the I-J zone, encompasses approximately 5,200 acres. At proposed production levels,

this area could allow for an additional 10-20 years of mining in the I-J zone. The exact duration of mining cannot be determined due to the uncertainties in production levels at the mine.

The proposed Emery Surface Mine will have an anticipated life of 15 years. Approximately 1,160 acres of land area will be affected by the mine complex, 320 of which will be actually mined. The remaining 840 acres will not be mined, but will be affected by ancillary mining support functions.

The surface mine will be located immediately adjacent to the underground mine, on the east side of Christiansen Wash about 0.75 miles above Quitchupah Creek. Mining will proceed northwestward from that location. The mine will remove coal from the I-J zone, with most of the coal coming from the upper I seam. Similar geologic conditions exist at the surface mine that affect the underground mine; the same waterbearing zones (alluvium, Upper and Lower Ferron Sandstones and waterbearing segments of the Bluegate Shale, see the Ground Water Section of this analysis) are present as are the same hydrogeologic relationships between the zones. In the area of the surface mine, however, the thickness of the overburden cover and the saturated thickness of the upper Ferron Sandstone, is much less. The Bluegate Shale also pinches out in this area and the Upper Ferron Sandstone comprises the principal exposed geologic unit. In the area where the Bluegate Shale is exposed, it is highly weathered, allowing for communication between the Christiansen Wash alluvium and the Upper Ferron Sandstone aquifer.

The Bluegate Shale ranges in thickness from 0 to 70 feet in the surface mine permit area. The Ferron Sandstone aquifer has an average saturated thickness of 60 feet, and the alluvium along Christiansen Wash varies from a few feet to 25 feet in thickness. Overburden depths range from 20 to 140 feet over the coal (for futher description of the ground water system, see the Ground Water section of this analysis).

Discussion of Projected Impacts & Ground Water

Underground mine

A technical analysis of the Emery Deep Mine (See Groundwater Section UMC 817.41-.54) found the following projected real or potential ground water impacts during the next five-year permit term:

1. Predicted Upper Ferron aquifer drawdown on the order of 350 feet over the mine.

2. Predicted Upper Ferron aquifer drawdown of 50 feet near the permit boundary.

3. Potential for downward migration of saline Bluegate Shale waters into the upper Ferron aquifer, due to a reversal of hydraulic pressure gradients and fracturing of up to 300 feet of mine cover.

4. Potential diminution of up to 0.2 cfs subsurface outflow collectively to Quitchupah Creek and Christiansen Wash via mine interception.

5. Potential for diminution of spring flow to three appropriated springs (Anderson, Jensen and Christiansen springs); two springs issuing from the terrace gravels overlying the Bluegate Shale; and one spring issuing from the Upper Ferron Sandstone at the head of Miller Canyon.

6. Potential interception of up to 2.6 cfs (1,170 gpm) of upper Ferron aquifer water by the mine.

7. Potential subsidence as a result of dewatering the aquifer and subsidence of the aquifer itself.

The uncertain nature of mining conditions preclude an accurate estimate of life-of-mine (25 year) drawdown and inflow. A model utilized by the applicant takes into account subsidence, fracturing and cave-height considerations. At this time, these factors are unknown in the life-of-mine areas. Therefore, the most reasonable estimate of mine impacts in the area may be to consider the "worst-case" scenario projected by the model for the permit term, e.g., drawdown on the order of 350 feet adjacent to the mined areas, and inflows as great as 1,170 gpm.

Consol's computer model simulations of the anticipated five-year drawdown and inflow levels indicate that a maximum value for inflow may be reached during the permit term, as inflow was found in the projection to drop after three years. However, it is uncertain whether this trend will continue beyond the modeled five-year permit term since several variables that need to be applied to models for accurate analysis are unknown or unobtainable at this point during the mining process..

As the mine expands into the larger life-of-mine area, it can be expected that the drawdown cone predicted for the permit term will advance outward. However, it is probably not a reasonable assumption to conclude that inflows and drawdown will triple as a result of tripling the mine area. The basis for this statement is that during the five-year permit term, much of the water inflow to the mine arises from the intial dewatering of the aquifer above the mine. Water is therefore being removed from aquifer storage. Once this storage is depleted and the cone of depression takes its fundamental shape, the amount of inflow will be reduced. Further increases in the area mined will project the drawdown cone outward; however, the ultimate depth of drawdown, as limited by the thickness of the aquifer, will probably be reached during the permit term.

The Office of Surface Mining (OSM) Western Technical Center conducted a complete modeling analysis (results attached in Appendix C) of the effect that mining will have on both the upper and lower Ferron aquifers over the life of the mine. The model results predict the following groundwater inpacts over the life of the mine (25 years):

1. Dewatering of the Upper Ferron Aquifer over the mine and permit area.

2. Drawdown of 400 feet in the upper Ferron aquifer potentiometric surface as far north as the Town of Emery and up to 1.5 miles south of the permit area.

3. Drawdown of 130 feet in the lower Ferron aquifer potentiometric surface at the Emery municipal well.

The OSM groundwater model simulated the effect of mining on the Ferron aquifer system over the 25-year life of the mine; however, the applicant's proposed monitoring system will provide factual information regarding effects on the groundwater system as mining proceeds. Any changes in interpretation of impacts resulting from the increase in data over time will be factored into mining plan changes, mitigation efforts as necessary, and future permitting approvals.

Surface Mine

The adjacent surface mine is proposed to have the following ground water related impacts.

1. Interception of up to 0.3 cfs of Upper Ferron aquifer water by the mine, after 15 years of operation.

2. Predicted Upper Ferron aquifer drawdown of up to 60 feet at the mine, after 15 years of operation.

3 Predicted Upper Ferron aquifer drawdown of up to five feet, radiating up to 2.5 miles from the mine.

4. Potential for leaching of dissolved solids from displaced overburden, as water levels in the area reestablish themselves. USGS leaching experiments with site overburden samples and deionized water indicated a range in TDS of 539 mg/l to 2,536 mg/l with a mean of 1,160 mg/l (USGS, 1980). Iron concentrations were elevated in two samples and pyrite has also been observed in the overburden. It is predicted, on the basis of the USGS studies, that contact waters of the Upper Ferron could be elevated from a baseline of 1,300 mg/l to over 4,000 mg/l.

5. Potential for diminution of flow to the Christiansen Spring at the head of Miller Canyon. This appropriated spring issues from the Upper Ferron aquifer.

Findings - Cumulative Hydrologic Impacts: Ground Water

It can be seen that the underground mine produces the greater drawdown impacts to water levels in the Upper Ferron aquifer. The drawdowns produced by the underground mine will also influence the levels of drawdown induced by

the surface mine. As the underground mine expands in the future, increased drawdown will serve to reduce pit inflow at the proposed surface mine and the prediction by the USGS can be viewed as a maximum value for pit inflow. In fact, current drawdown projections made for the five-year permit term of the underground mine indicate that the surface mine may, in fact, become a "dry" mine due to the projected levels of drawdown which may be induced by the underground activities. The Upper Ferron aquifer will be totally dewatered in a large segment of the permit area (see Plate 7-5B of the PAP). As such, the potential exists for lowering of the land surface due to this dewatering.

The cumulative drawdown effects, therefore, of both mines operating together should not be any more significant than the drawdown effects induced by the underground mine itself.

Based on current drawdown projections reviewed in the underground mine TA, Christiansen Spring in Miller Canyon can be impacted by the mine. The spring has been included in the applicant's monitoring plan to foresee such impacts. In the absence of drawdown from the underground mine, the proposed surface mine would also have the potential to dewater the spring. Therefore, it is uncertain which mine would be ultimately responsible for impacting the spring, should diminution of flow be realized. It is important to note that a cumulative drawdown from both mines is not necessary to affect the spring; either mine has the predicted capacity to potentially cause the impact while operating independently.

The amount of inflow which the surface mine would ultimately encounter depends entirely on when it comes on-line. Currently, the projected start- up date for the mine is behind schedule. The longer the time period before the mine comes in line, the greater the possibility that the drawdown effects will be muted by the underground mine.

In the postmine sense, water quality impacts to the Upper Ferron aquifer could be increased by having both the surface mine and the underground mine operating concurrently. Addition of the surface mine increases water quality impacts by elevating TDS levels in the Upper Ferron aquifer via the leaching of freshly exposed elements in the spoil ridges yeilding disolved solids. Spoilwater may increase in TDS levels from 1,300 mg/l to over 4,000 mg/l. However, this concern would be tempered by the relatively small area of impact. The surface mine is located directly in the area of outcrop of the Upper Ferron Sandstone, which generally defines the downgradient boundary of the aquifer. Given this consideration, there is very little aquifer area remaining between the mine and the aquifer's lower terminus. This downgradient area is less than one half mile long. Only one water user exists within this small area downgradient of the mine (Christiansen Spring). This potentially impacted user is included in the ground water monitoring programs for both mines.

OSM's groundwater prediction model indicates that the upper Ferron aquifer will be essentially dewatered in the vicinity of the underground mine, and that there will be no additional effect on the aquifer system from the

proposed surface mine. Because the applicant has already achieved a mitigation agreement with the owners of the wells which may be impacted by the dewatering, the impact is considered insignificant.

The OSM model further indicates that drawdown in the static piezometric level of the lower Ferron aquifer will eventually reach up to about 140 feet. Although this amount may seem significant, the current potentiometric head confined in the lower Ferron corresponds to a level approximately 1,200 feet above the Ferron sandstone. Drawdown in the peizometric head at the Emery municipal well is predicted to be approximately 130 feet. A reduction of 130 to 140 feet in the artesian piezometric head would amount to a decrease of 11 to 12 percent. A piezometric reduction is not considered significant until it reaches a minimum of 25 percent of current level. The greatest impact of the predicted drawdown would be at the Emery municipal well where slightly more electricity will be required to pump the water from a lower level in the well.

In summary, the addition of the surface mine to the existing underground mine complex should not add appreciable impacts to the hydrogeologic regime beyond those already projected for the underground mining disturbances. This does not imply that impacts will not be realized. Rather, the magnitude, duration and timing of site impacts will remain on the order of those projected for the underground mine. A complete discussion of those impacts can be found in the TA (Section UMC 817.41-.54) for the underground mine.

Discussion of Projected Impacts - Surface Water

Underground mine

The Emery Mine is located in a drainage area that contributes 20 percent of the total salt load carried by the Dirty Devil River into the Colorado River. This also accounts for a TDS load of 14 mg/l in the Colorado River. Mine discharge contributes to this total, but the majority of TDS entering Muddy Creek in the Emery area derives from surface runoff and ground water flowing over and through saline shales. Irrigation drainage, including canal seepage, contributes to the saline ground water (Bureau of Reclamation, July 1983).

The significance of contaminants discharging from the mine to the streams must be viewed in light of the existing environment. Water quality samples above the mine taken in Quitchupah Creek and Christiansen Wash are characterized by high TSS, TDS, sulfate and sodium. The mine is not contributing an undue amount of TSS to the streams because the mine discharge pond and the sediment control structures in the surface facilities area are performing adequately. Mine discharge is, however, increasing the salt load of the streams.

Salt loading in Christiansen Wash is higher upstream of the mine where irrigation return flows contribute salts, while TDS concentrations decrease downstream where the stream receives flow from the Ferron Sandstone. TDS values in Christiansen Wash are higher than those in Quitchupah Creek, with

means of 2,233 to 3,871 mg/l as opposed to means of 1,429 to 1,947 mg/l. Calcium, chloride, sodium and sulfate are picked up from the rock dust in the mine and are responsible for the high TDS levels in mine discharge. The quantity of mine discharge has fluctuated over the years due to roof falls, and is currently at a level of 1.2 cfs. The present concentration of TDS is approximately 4,000 mg/l.

Data collected between July 1980 to April 1983 indicates that the concentration of TDS decreases with an increase in discharge. More specifically, TDS concentrations are reduced by one-quarter when discharge values double. Ground water inflow projections formulated by the applicant for the years 1984-1988 have been used to generate the TDS values found in Table 1. It should be noted, however, that the Ferron Sandstone, even under natural conditions, was contributing TDS to the streams. Since those natural contributions are not known because the undisturbed outflow of the Ferron aquifer to the streams is unknown, they have not been factored into this analysis. This analysis, therefore, is a "worst-case" projection since it assumes that the mine is responsible for the entire TDS concentration in the discharge.

Table 1. Total Dissolved Solids Projection

Year	Q(cfs)	TDS (mg/l)	TDS (tons/year)
1984	1.7	2,500	4,200
1985	2.1	2,350	4,850
1986	2.6	2,200	5,600
1987	2.3	2,300	5,200
1988	2.0	2'400	4,700

The estimated salt load entering the Emery area is 15,800 tons per year and measurements taken at Muddy Creek below I-70 indicate that 26,700 tons per year are leaving that area (Bureau of Reclamation, July 1983) (see permit area map attached to the Decision Document). Mine discharge values during the period April 1982 to April 1983 showed that the Emery Mine was contributing 3,632 tons of salt to the 26,700 tons in Muddy Creek below the mine. This accounts for 13 percent of the salt pick-up above I-70 and 27 percent of the salt specifically contributed within the Emery area. Using the mine inflow projections, Table 2 illustrates the percentages of salt contribution to the watershed from the mine:

Table 2. Percentage of TDS from the Emery Mine

Year	Tons/Year	% Muddy Creek at I-70	% Emery Area
1984	4,200	15%	30%
1985	4,850	17%	34%
1986	5,600	19%	37%
1987	5,200	17.5%	35%
1988	4,700	16%	33%

Given that the salts measured at Muddy Creek at I-70 are 20 percent of the Dirty Devil River salt load, the maximum 1986 projection for TDS from the mine is four percent of the Dirty Devil salt load.

Ongoing subsidence impacts to the surface water regime from underground mining will be minimal. A buffer zone of 500 feet which includes the angle of-draw, will be left between underground workings and Quitchupah Creek and Christiansen Wash in order to prevent any damage to those streams. It is anticipated, however, that surface subsidence will create localized depressions that will alter the drainage patterns of overland flow. Similar depressions have already occurred, creating alkali swamps in flood-irrigated fields. Mitigative measures have been proposed by the applicant to restore positive drainage in these areas.

Life-of-mine impacts deriving from the underground mine will continue to load the streams with TDS, since it is thought that discharge values and TDS concentrations will remain approximately the same when the I-J zone is extracted in that portion of the permit area that will be mined after 1988. Discharge values may fluctuate, as they have in the past, with varying permeability and roof conditions. These values may also change with utilization of a mining method that differs from the current room and pillar approach. At the close of operations, the portals will be sealed and equipped with a bleeder drain. While it has not been conclusively demonstrated that the Ferron aquifer will be reestablished to baseline levels after pumping of the mine has ceased, it would be expected that water would accumulate in the mine. This drain will serve to mitigate hydraulic pressures on the seal if they occur, and direct the mine discharge to the sediment pond, where it will be treated and sampled. Once the pond is removed, any drainage will be essentially uncontrolled. It can be anticipated that the discharge, which will be approximately 0.4 cfs through the pipe, will carry TDS concentrations similar to those occurring during operations.

Due to the dewatering of the Upper Ferron aquifer, subsidence of the

land surface or subsidence of the aquifer itself may occur reducing the initial permeability of the sandstone. However, due to probable fracturing of the sandstone resulting from the caving of the overlying strata from the underground operations a secondary permeability may be established. The overall postmining permeability of the Upper Ferron aquifer is not known at this time. If the permeability is significantly reduced, base flows to the streams from the Upper Ferron may not be reestablished along with discharge to Christiansen Spring. However, the coal seam will have a greatly increased permeability and water will flow through this zone and could recharge the streams. Also, the aquifer may reestablish flow paths around the subsided area and eventually reach the streams and springs.

Surface mine

The proposed Emery Surface Mine is expected to increase the levels of discharge to Christiansen Wash, and this additional discharge will have TDS concentrations of 2,000 to 5,000 mg/l. Using a "worst-case" scenario of 5,000 mg/l, an additional 1,000 tons per year of TDS will be added to the CIA. The percentages of salts that will be contributed by both mines is illustrated in Table 3.

Table 3. TDS Percentages - Emery Deep and Emery Surface

Year	Mine TDS Tons/Year	% Muddy Creek Below I-70	% Emery Area
1984	5,700	19%	37%
1985	6,350	21%	40%
1986	7,100	22%	42%

Table 3. (continued)

Year	Mine TDS Tons/Year	% Muddy Creek Below I-70	% Emery Area
1987	6,700	21.5%	41%
1988	6,200	20%	39%

When the surface mine becomes operable, the combined TDS contribution from both mines will equal approximately 4.5 percent of the Dirty Devil River salt load. It is conceivable that adjacent underground mining will drawdown ground

water levels to such an extent that there will be no inflow to the surface mine pit. If such is the case, TDS concentrations may be decreased because the water will not come in contact with the overburden spoil piles, however, 0.3 cfs will be discharged through the underground mine and the TDS concentration will remain at levels comparable to those currently being discharged.

Findings - Cumulative Hydrologic Impacts: Surface Water

It is apparent that the Emery underground mine will be responsible for some increase in salt-loading to the streams. The "worst-case" scenario involves the surface mine and underground mine operating in 1986 when the two mines will be responsible for 46 percent of the salt picked up in the Emery area. This also will account for 4.5 percent of the Dirty Devil River salt load. Irrigation and the saline shales prevalent in this area continue to contribute the greatest proportion of TDS to both Muddy Creek and the Dirty Devil River. Despite the water quality degradation ensuing from these operations, there are no surface rights that will be impacted in the vicinity of the mine. No water rights exist on Quitchupah Creek and Christiansen Wash near the mine, nor are there any on Quitchupah Creek downstream of the mine. Additionally, there are no water rights on Ivie Creek below its confluence with Quitchupah Creek, nor do any exist on Muddy Creek for a distance of at least 15 miles downstream of its confluence with Ivie Creek. The only identified surface water use that could be impacted in the cumulative hydrologic impact area pertains to cattle that drink from Muddy Creek when adjacent BLM lands are used for grazing.

Summarization of Findings

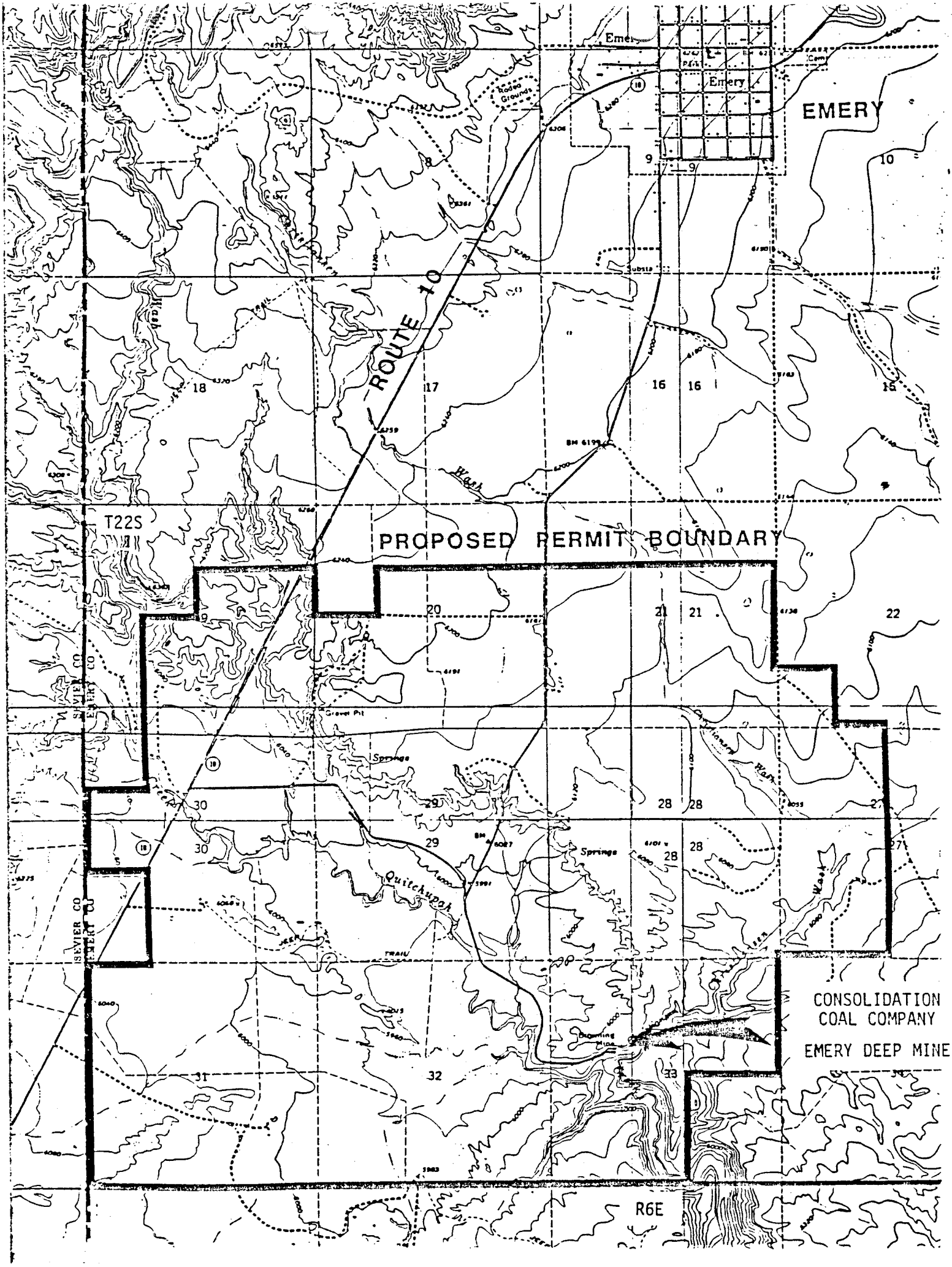
The regulatory authority has made a determination that the Emery underground mine, and to a lesser extent, the surface mine, will contribute additional salt loading to the streams within the cumulative impact area. This is an inevitable consequence of the mining operations and the removal of these salts from mine discharge is not an economically-viable alternative for the mine, based on the Best Available Control Technology at this time.

The underground mining operation has the potential to decrease ground water levels, thereby disrupting springs in the vicinity of the mine. It is not known if this disruption will be permanent due to subsidence of the aquifer. The surface mine may contribute to this disruption if it begins operation before the underground mine has already lowered water levels in that area. Otherwise, it is possible that the surface mine will be constructed in an already-dry formation if the aquifer has been drawn down by the adjacent underground workings. The three springs that may be impacted by the operations will be monitored for diminution.

References

U.S. Department of the Interior, Bureau of Reclamation, July, 1983, Dirty Devil River Unit, Public Involvement Newsletter, Durango, Colorado

USGS 1980. Three dimensional digital computer model of the Ferron Sandstone aquifer near Emery, Utah. WRI 80-52.


EMERY
ROUTE 10
T22S
PROPOSED PERMIT BOUNDARY
SEVIER CO
EMERY CO
Quitchupah
Springs
Wash
CONSOLIDATION
COAL COMPANY
EMERY DEEP MINE
R6E

TECHNICAL ANALYSIS

Consolidation Coal Company
Emery Deep Mine
ACT/015/015, Emery County, Utah
February 25, 1985

Introduction

The Consolidation Coal Company (Consol) in joint agreement with Pittsburg & Midway Coal Mining Company (a subsidiary of Gulf Oil Corporation) proposes to mine at the Emery Mine in the Emery Coal Field. The proposed operation during the five year permit term is an extension of the existing underground operation. Currently a plan is being reviewed for a surface mine to be operated by Consol which will be located adjacent to the underground workings. The underground operation is currently idle awaiting market improvements, but prior to 1983 produced about 700,000 tons per year and had plans to increase to 1.7 million tons per year.

The Emery Mine is located near the workings of the old Browning Mine which was started in 1937. The area has been disturbed since that time. The facilities area is located at the junction of Quitchupah Creek and Christiansen wash, and encompasses approximately 40 acres. The facilities area includes the portals, sediment ponds, storage areas, offices and other buildings, a coal crusher and associated structures and fuel and explosive storage areas. The entire permit area encompasses approximately 5,180 acres of which approximately 570 acres will be undermined.

The mine is located within Township 22 South, Range 6 East in Emery County. The town of Emery is approximately two miles from the nearest portion of the permit boundary. Interstate 70 is Three miles south and State Highway 10 is to the east, crossing the northeastern portion of the permit area.

The hydrologic setting of the mine is very complex. A major aquifer exists in the Ferron Sandstone above the seam to be mined and alluvial aquifers exist above the mine which discharge to springs in the area. The effects of mining on these aquifers is not clearly understood (see CHIA attached to TA for further information). The mining related subsidence impacts to date have not affected the alluvial aquifers, although the Upper Ferron sandstone aquifer has shown significant drawdown. Associated with the streams above the mine, but not with the alluvial aquifers, are alluvial areas. Some of these areas are farmed using flood irrigation techniques from water diverted from Muddy Creek to the north and east of the mine and from Quitchupah Creek.

The Emery Deep Mine area is characterized by a semi-arid, continental type of climate. Daily and seasonal temperatures vary over a wide range, and there is a large amount of sunshine. The growing season is 110 to 130 days. The total yearly average precipitation is about eight inches. During March, April and May, frequent winds of moderate to high velocity dry the soils and increase rates of evaporation and transpiration.

The majority of mine related disturbance lies within the annual forb, mixed desert shrubland, greasewood shrubland and rock outcrop/talus vegetation types of the Salt Desert Zone of the Northern Desert Shrub Formation. Grazing in the past 60 or 70 years has caused considerable change in the vegetation in the salt deserts. Some perennial native species have decreased and annuals often have become established.

Several facilities have been approved independently as revisions to the Permit Application Package (PAP) by the regulatory authority. These facilities and the approval dates are:

Borehole Road - Pump Access Road	October 1, 1981
Use of Borrow Area	February 3, 1982
Bathhouse and Power Line	February 12, 1982
New Coal Stockpile	August 3, 1982
Preparation Plant/Loadout Facility	September 21, 1982

A Technical Analysis (TA) was prepared for the proposed coal preparation plant and is attached to the TA as Appendix B. Impacts associated with the coal preparation facility area include 206 acres of additional surface disturbance. This TA for the Emery Deep Mine is independent of that review except as relates to cumulative hydrologic impacts.

The PAP for the underground operation was submitted in March of 1981. The review of the underground operation commenced May 1, 1983. An Apparent Completeness Review (ACR) was sent to the applicant on June 22, 1983. Response to the ACR was received on October 7, 1983. A Determination of Completeness (DOC) was made on October 27, 1983 and at the same time additional questions were sent to the applicant subsequent to a preliminary TA on the PAP and the ACR response. Information was submitted by the applicant in response to these questions on November 15 and 22. Some deficiencies still existed in the hydrology section of the permit application. To clarify the information needed to complete these sections, a meeting was held on December 5, 1983.

Other Federal and State agencies which have reviewed the PAP and provided letters of concurrence are listed below. These letters are attached in Appendix A.

State Department of Health
U. S. Fish and Wildlife Service (USFWS)
Division of Wildlife Resources (DWR)
Division of State History

Division of Water Rights
U. S. Bureau of Land Management (BLM)

Topsoil Protection: UMC 817.21-.25

Existing Environment and Applicant's Proposal

The soil resources are discussed in Volume 6, Chapter 8 of the PAP. Approximately 1,670 acres were mapped to approximate an Order 1 intensity soil survey, as shown on Plate 8-1 (Detailed Mapping Area). Soil Conservation Service (SCS) mapping of an additional 4,500 acres is shown on Plate 8-2 (Permit Area). The soil series are classified in Table 8-12 (page 8-95). The soils of the permit area are discussed in Chapter 8, section 8.9.2.

Soils previously disturbed by mining activities occur at the mine portal and facilities area. The disturbed land (Mapping Unit DL) is composed of various soils with 0 to 15 percent slopes. Surface soils have either been salvaged, buried under coal dust or heavily mixed with subsoils (page 8-37). Excluding the top 11 inches, the soils to a 40 inch depth have only a fair rating as topsoil (Table 8-7, page 8-75).

Future disturbances will occur mainly on the Ravola-Bunderson Complex (Map Unit RaB2), Persayo-Chipeta Complex (Map Unit PCE2) and the Chipeta-Badland Association (Map Unit CBE2). The Ravola-Bunderson Complex (page 8-50) is on nearly level to level alluvial fans, floodplains and bottomlands. The landscape is hummocky in some areas. The slopes range from one to three percent. The vegetation is mainly the greasewood shrubland type. The Persayo-Chipeta Complex (page 8-46) is on nearly level to steep fans, terraces, uplands and shale knolls. The slopes range from 1 to 20 percent. The vegetation is principally the mixed desert shrubland type. The Chipeta-Badland Association (page 8-35) is on steep to strongly sloping broad fans, ridges and sandstone and shale hills. The slopes range from 3 to 30 percent. The native vegetation is principally the mixed desert shrubland and matscale shrubland types. These soils have a poor to fair rating as topsoil.

Soils investigations and methodology

The soils investigation was conducted according to the standards of the National Cooperative Soil Survey. Mapping was conducted on foot using hand augers. Within the Detailed Mapping Area, one profile for each major soil was sampled and described. Soil pits were excavated to a depth of 60 inches or more and pedons were described and sampled according to the standards of the National Cooperative Soil Survey. For the soils occurring outside the Detailed Mapping Area, but within the Permit Area, SCS soil descriptions were used. The methods used are acceptable and in line with current and recognized practices.

Suitability of soil for reclamation

There has been a mine at the site of the current day Emery Deep Mine since

the 1890's. For this reason, no topsoil has been removed and stored, nor is any topsoil currently available for reclamation. The applicant has committed to removing and storing any available topsoil at the site of any future disturbance (page 3-56). In lieu of topsoil, the applicant has proposed using material from roads (following removal of all toxic material) which will be reclaimed and from a "borrow" area. All substitute materials will come from within the permit area. Table 8-7 (page 8-74) indicates that only the Abbott (0 to 60 inches) and Sanpete (0 to 30 inches) have a fair-good or good-fair rating as topsoil, respectively. For this reason, it is imperative that additional chemical and physical information be supplied in order to determine the suitability of the proposed substitute material. The applicant will establish a revegetation demonstration site, and has committed (page 4 of the DOC response) to physical and chemical soil testing of the topsoil substitute as part of the demonstration site data gathering program. This information will help plan future reclamation. Although more data are needed to substantiate the suitability of topsoil substitutes, successful revegetation has been demonstrated on areas immediately adjacent to the mine site (Hodder and Jewell 1979).

Calculations of the amount of suitable soil available

The applicant indicates that about six acres will be covered with approximately four feet of material, thus requiring about 39,000 cubic yards of cover material (page 4 of the DOC response). The greater part of the disturbance associated with the mine will be reclaimed using amended in situ materials. Only six acres will receive borrowed topsoil replacement. This area consists of the coal stockpile yard. It is underlain and surrounded by saline materials. Since ponding often occurs in spring it is considered contaminated to the extent that it requires four feet of topsoil substitute material cover. The 39,000 cubic yards required (page 4, DOC response) will be supplied as follows: about 11,000 cubic yards would come from the road near the bridge across Quitchupah Creek, about 6,000 cubic yards would come from removal of other mine roads and the remaining 22,000 cubic yards would come from the borrow area. The soils borrow area is located near the existing coal stockpile area with cross-sections depicted on Plate 15-1a. Its geologic origin is colluvium, alluvium and sandstone. The colluvial materials which are present at the surface generally have a loamy sand texture. Since the borrow area covers about one acre, a depth of 14 feet would be required. This area must be sampled and data provided to document its suitability for reclamation, as described above. The borrow area contains sufficient material, being 100 feet in depth. The evaporation lagoon (approximately one acre) will be reclaimed by excavating toxic materials (approximately 1,000 cubic yards). The excavated area will be backfilled with material from the embankment. The remaining embankment will be removed down to the original soil surface.

Removal procedures

The applicant states (page 3-56) that no future surface disturbances are planned that would require the removal and storage of topsoil other than that

associated with the preparation plant (refer to Appendix B).

Redistribution procedures

The applicant has detailed the redistribution procedure in the response to deficiencies, December 30, 1983. The applicant has committed (page 3-59) to chemical testing of disturbed area soils and fertilization as needed based on the chemical tests. The testing procedures have been detailed in the January 20, 1984 response to Technical Deficiencies.

Stockpile protection procedures

As discussed above, no topsoil has been stockpiled. With the exception of the preparation plant facilities (see Appendix B), no future surface disturbances are proposed that would require the removal and storage of topsoil (page 3-56).

Area disturbed at any one time

Presently, there are 79 acres of disturbed area (Table 9-2, page 9-9). This area is principally associated with the preparation plant, other than mine related disturbance, and by roads, mine facilties and the evaporation lagoon. No additional disturbance is proposed (page 3- 56).

Compliance

UMC 817.21 General Requirements

Since no additional disturbance is planned, no topsoil will be recovered, segregated, stockpiled and redistributed. Topsoil substitutes will come from a borrow area (approved in connection with the Preparation Plant) and roads. Thus, the applicant is in compliance with this section.

UMC 817.22 Removal

As stated above, no topsoil removal is proposed. Thus, sections (a)-(d), (f), (g) are in compliance.

(e)The applicant proposes to use, as topsoil substitutes, materials from a borrow area (22,000 cubic yards, previously approved in Preparation Plant application), roads (17,000 cubic yards), the evaporation lagoon embankment (1,000 cubic yards) and the original soil surface. Additional information on the physical and chemical characteristics of these substitutes to substantiate their suitability as topsoil substitutes will be collected and submitted during the 1984 sampling season (DOC response p.4; January 20, 1984 Response to Technical Deficiencies). Thus, the applicant is in compliance with this section.

UMC 817.23 Storage

As stated above, no topsoil storage is proposed. Thus, the applicant is in compliance with this section.

UMC 817.24 Redistribution

The applicant proposes redistribution of approximately 40,000 cubic yards of materials and has detailed the redistribution procedures in the December 30, 1983 response to deficiencies. Thus the applicant is in compliance with this section.

UMC 817.25 Nutrients and Soil Amendments.

The applicant is committed (page 3-59 of the PAP) to the addition of soil amendments as needed based on a soil testing program as described in the January 20, 1984 Response to Technical Deficiencies. Thus, the applicant is in compliance with this section.

Stipulations

None.

References

Hodder, D., and Jewell, R. 1979. Reclaimability analysis of the Emery coal Field, Emery County, Utah. EMRIA Report No. 16. Bureau of Land Management, Denver, Colorado.

Surface Water Hydrology: UMC 817.41-.57

Existing Environment and Applicant's Proposal

Surface facilities for the Emery Mine are located at the confluence of Quitchupah Creek and its tributary, Christiansen Wash. The mine complex has been established in a relatively small area that is constructed by the stream channels and their valley walls. Flooding from both these streams in the past has necessitated the placement of riprap along the stream channels to prevent the erosion of dikes that comprise part of the surface water control system at the mine. While Quitchupah Creek could be affected by both the surface facilities area and the discharge pumped from the mine, Christiansen Wash could be affected solely by its proximity to the facilities site.

Quitchupah Creek, with a drainage area of 430 square miles, flows to the southeast from the mine complex, converging with Ivie Creek immediately above the confluence of that stream with Muddy Creek at Highway I-70. Muddy Creek, with a drainage area of 1,450 square miles, is one of the Major streams in the

Dirty Devil River watershed, a significant tributary to the Upper Colorado River. Flows in Quitchupah Creek and Christiansen Wash derive from three sources: direct runoff, ground water recharge from the upper and lower Ferron Sandstone and returning irrigation flows that are diverted out of Muddy Creek. Monthly measurements of stream flow collected during the year beginning October 1979 revealed that Quitchupah Creek has a mean flow of 8.6 cubic feet per second (cfs) below the mine, and Christiansen Wash has a mean flow of 2.28 cfs above its confluence with Quitchupah Creek (page 7-153 and 7-154 of the PAP).

Water quality in these two streams is characterized by high total suspended solids (TSS), total dissolved solids (TDS), sulfate and sodium. Calcium, magnesium and chloride are also present in high quantities, although these parameters exceeded the water quality standards of 250 milligrams per liter (mg/l) (NAS 1973), much more frequently in earlier monitoring programs than during the samples taken later in 1979 - 1980. Calcium, chloride, sodium and sulfate are picked up from the coal and rock dust in the mine and are responsible for the increased TDS levels in the mine discharge. Another constituent that characterizes the streams is bicarbonate, which can be used as a predictive value for ion balances. Monitoring data indicates that the water in both streams tends to become more saline in the downstream direction (PAP, page 7-149). TDS values in Christiansen Wash are higher than those in Quitchupah Creek, as demonstrated by the 1979 data that showed means of 3,871 and 2,233 mg/l for Christiansen Wash as opposed to means of 1,947, 1,329 and 1,424 mg/l for Quitchupah Creek. TSS values are higher in Quitchupah Creek, hovering between means of 1,094 and 1,447 mg/l, while Christiansen Wash is characterized by TSS means of 848 and 620 mg/l. Above the mine complex, TDS in Quitchupah Creek seems to increase in the fall and winter and decrease in the spring and summer. It remains fairly constant below the mine, which may be an effect of the constant mine discharge and reduced impacts from irrigation. The concentration of TSS in Quitchupah Creek is proportional to discharge, increasing in the spring and decreasing in the fall. Trends in Christiansen Wash are strongly tied to irrigation within its watershed north of the mine. Upstream, TDS is high as a result of the irrigation, while downstream, the dissolved constituents decrease as the stream receives flow from the Ferron Sandstone (PAP, page 7-133).

Both Quitchupah Creek and Christiansen Wash receive a minimal amount of flow from springs that occur immediately north of their confluence. The springs are issuing from the pediment gravels above the Bluegate Shale. To some extent, these springs are contributing additional dissolved solids to the streams because they appear to be recharged by irrigation water. The discharge, however, approaches a maximum flow of only 10 gallons per minute, so any impacts on the stream quality are actually small (PAP, Plate 7-1, page 7-158).

Precipitation at the mine site is low, 7.55 inches annually, and is diminished by the high rate of evaporation, approximately 60 inches a year (USDA, SCS). The 10 year, 25-year and 100-year' 24-hour storm events yield 1.5, 1.9 and 2.5 inches, respectively.

There are no surface water rights on streams in the vicinity of the Emery Mine that could be impacted by this operation. A check of information available in the Utah State Engineer's Office indicates that there are no water rights on Quitchupah Creek and Christiansen Wash near the mine, nor are there any on Quitchupah Creek downstream of the mine (PAP, page 7-163). Additionally, there are no water rights on Ivie Creek below its confluence with Quitchupah Creek (page 38, October 7, 1983 submittal). A further check indicates that there are no surface water rights on Muddy Creek for a distance of at least 15 miles downstream of its confluence with Ivie Creek (page 10, November 11, 1983 submittal). The only water use identified by the Utah Division of Water Rights pertained to cattle that drink from Muddy Creek when adjacent BLM lands are used for grazing. Refer to the Cumulative Hydrologic Impact Assessment of this analysis for a further discussion of impacts to the hydrologic balance.

The applicant has provided the surface facilities area with a sediment control plan that utilizes two sedimentation ponds, berms around the disturbed areas and collector ditches. A third sedimentation pond has been constructed solely to treat mine discharge as it is pumped from the underground workings. This pond is located west of the facilities complex and outlets into a tributary of Quitchupah Creek. These structures are currently existing.

The facilities area is located immediately adjacent to two streams, therefore, it was necessary to construct berms along the stream channels to prevent the uncontrolled discharge of runoff from disturbed areas. These berms have been stabilized and riprapped or revegetated to withstand flooding. The primary control berm along Quitchupah Creek has a 10-foot crest width and has almost 4 feet of freeboard above the 10-year, 24-hour design flood. Side slopes are a minimum of 2h:1v. The berms work in concert with the two sediment ponds to capture all runoff from the facilities area. To date, there has been no discharge from the sediment pond system, probably as a result of the high evaporation rates that characterize this region. Pond No. 2, an embankment structure, is referred to as the main pond, and Pond No. 3, an incised structure, is a secondary pond because all of its discharge passes to Pond No. 2. The ponds are connected via a buried six-inch pipe equipped with a clean-out section. The rate for discharge expected from a 25-year, 24-hour storm event at Pond No. 3 is 0.98 cfs, and the pipe has been sized to carry this to Pond No. 2. The area contributing to Pond No. 2 is 31.2 acres, which includes coal stockpiles, tipple, service buildings, roads and access areas to the underground workings. Some of the contributing area above the portals is undisturbed. Pond No. 3 was designed to receive runoff from 6.4 acres that includes a coal stockpile, an explosives storage area and a scrap yard.

Sediment pond volume is calculated from the 10-year and 25-year, 24- hour peak flows and the sediment volume that can be expected from the disturbed area. Sediment values are derived from the Universal Soil Loss Equation (USLE). A soil erodibility factor (K) of 0.35 was utilized, which is weighted between the gravels covering much of the facilities area, and the soils

present at the site (page 42, October 7, 1983 submital). A rainfall factor (R) of 0.20 was used (Barfield et al., 1982, page 314). A cover factor (C) of 1.0 was used for coal storage areas, 0.3 was used for vegetated areas and 0.39 was utilized for other disturbed areas. An erosion control practice factor (P) of 1.0 was checked by the regulatory authority and found to be acceptable. Soil weight factors varied from 66.8 pounds per cubic foot for the Pond No. 2 watershed and 68 pounds per cubic foot for the Pond No. 3 watershed. These are weighted figures based on the values for coal and soil and the relative percentage of each occurring in the watershed. A sediment pool volume of 1.22 acre feet was designated for Pond No. 2, which represents five years of accumulation from 31.2 acres. similarly, a sediment pool of 0.88 acre feet was provided, based on five years of accumulation from 6.4 acres. Sediment is removed from the pond when it reaches 60 percent of the design sediment storage volume as measured from a permanently installed staff guage (PAP, page 7-164). Any sediment removed from the ponds is stored within the watershed of Pond No. 3. This material will be used for reclamation of that pond and excess material will be transported to the coal storage area in the mine yard where it will be placed in uniform layers and compacted (page 42, October 7, 1983 submittal).

Above the sediment pool elevation, the ponds have been designed to store runoff from a 10-year, 24-hour storm event while permitting dewatering within 10 days. Since Pond No. 3 outlets only into Pond No. 2, the spillway system in that pond serves both structures. The principal spillway is a 12-inch diameter corrugated metal pipe (CMP) with inlet invert elevation set at 5,906 feet, msl. This is one foot below the elevation of the 10-year, 24-hour runoff storage volume. The pond is equipped with a slide gate that is closed to provide adequate detention times except in the event that decanting is required to dewater the pond within 10 days (page 43, October 7, 1983 submittal). The emergency spillway is a riprapped trapezoidal channel with 2h:1v side slopes. A check of the spillway capacity using the broad-crested weir equation demonstrated that the channel could easily carry the discharge from a 25- year, 24-hour storm event, which is 2.14 cubic feet per second (cfs). These discharges were calculated using a flood hydrograph program, and were checked against peak discharges derived from the SCS-TR55 method (Barfield et al., 1981). The pond is designed so that the 25 year, 24-hour runoff storage volume has a depth of 0.7 feet in the emergency spillway. This leaves 1.3 feet of freeboard to the top of the dam. The embankment as shown on Plate 13-4 has a crest width of 10 feet, a height of 11 feet and 3h:1v side slopes. The downstream slope is riprapped.

In order to efficiently channel flow to Pond No. 2 from the portal area, ditches and culverts have been installed. This drainage plan is shown on Plate 3-3 of the PAP. A ditch has been provided adjacent to the east side of the auxiliary intake portal to divert flow around that area and route it into a 150-foot length of culvert placed beside the mine yard road. This culvert is located in the berm between the road and Christiansen Wash. The ditch and culvert are both sized to carry a 10 year, 24-hour design flow from 3.9 acres or 4 cfs. The culvert is a 12-inch diameter CMP which can easily carry the required discharge (Bureau of Public Roads, 1965). The ditch is a riprapped

triangular ditch with 3h:1v side slopes and sufficient depth to provide 0.3 feet of freeboard. The culvert outlets into a roadside ditch that carries the flow to Pond No. 2. This ditch is also triangular, with 2h:1v and 12h:1v side slopes. The depth is a minimum of 0.75 feet.

Flow from other areas of the facilities complex is directed to the pond by the berms and through swales constructed at road crossings and at other areas to provide positive drainage. Ditches are not utilized as the mine yard area is sloped toward the streamside berm, and runoff is routed to the pond via overland flow. The western section of the complex does not drain into the pond, although it appears that the acreage was included in the pond design. This 4.7 acre area drains into a catchment basin adjacent to the berms along Quitchupah Creek and includes a portion of the coal stockpile, service buildings, a scrap yard and roads.

The mine discharge sedimentation pond, Pond No. 1, is located away from the main facilities area and serves only to provide an adequate settling basin for discharge pumped from the mine, although the reverse osmosis process has also contributed brine to the pond in the past at a rate of 6,000 gallons per day (PAP, page 13.2). A berm completely surrounds the structure, thereby preventing any runoff from adjacent areas from entering. Contribution from direct precipitation is minimal. The surface area of the pond is 2.2 acres and 1.5 inches of rainfall falling on that area yields 0.27 acre feet.

The discharge pumped from the mine flows through an eight inch pipeline that inlets into the rectangular pond at the end opposite the outlet. The amount of discharge has varied over the seven years the pond has existed. Currently, the discharge is averaging 800,000 gallons per day (gpd) although the pond was sized with a design discharge of 2,655,265 gpd (PAP page 13-3). A detention time of 36 hours has been provided in the pond design pursuant to a laboratory analysis of the total suspended solids contained in the influent. Pond volume at the outlet is 19.3 acre feet, and under current discharge conditions (800,000 gpd) only 3.68 feet of that is required for settling. According to recent measurements, approximately 3.2 acre feet of sediment has accumulated in the pond. Consequently, 12.2 acre feet is available as sediment storage volume. The pond will not be cleaned for approximately 16 years at the current rate of discharge, therefore, no plans have been made for handling the sediment.

The pond outlet is a rectangular channel with a wingwall and concrete bottom. Spillway capacity is designed to allow the maximum water surface elevation to remain three feet below the top of the berms. A NPDES permit has been issued for this pond, as well as Pond No. 2, and samples are taken at the outlet twice each month. Daily maximums for effluent are 70 mg/l for TSS, 2.0 for iron and 5,000 mg/l for TDS. Oil and grease cannot exceed 10 mg/l and pH must range between 6.5 and 9.0. Samples collected at the pond outlet since 1976 have shown great variation. Average quarterly discharge has varied from 0.01 to 0.41 cfs and TDS has varied from 5,298 to 3,763 (The NPDES limitation is 5,000 mg/l). Iron was measured in relatively high quantities of 4.5 mg/l in 1976, but has since been present in only low concentration. TSS, oil and grease and pH have all been well within an acceptable range.

The surface water monitoring plan proposed by the applicant involves 10 sites. Two sites will be maintained on Christiansen Wash, one above the mine, and one at its confluence with Quitchupah Creek. Two NPDES sites are included, at Pond No. 2 and the mine discharge pond. Three sites are located on Quitchupah Creek, one above the mine, one below the mine complex and one below the mine discharge pond. To determine the relative impacts from that pond, one site will be maintained on the tributary above the pond outlet. Two sites are located away from the impact area for the mine, but may be utilized in the future for potential mine expansion. These sites are located on Ivie Creek above its confluence with Quitchupah Creek and one is located on Ivie Creek above its confluence with Oak Spring Creek. Samples will be taken from these sites on a monthly basis and analyzed for the parameters listed on page 7-183 of the PAP. Parshall flumes and/or crest-stage gages have been provided at several of the monitoring sites, and bubble gage type continuous recorders are installed at two sites, one on Christiansen Wash and one on Quitchupah Creek where the USGS established monitoring stations. After sealing of the portals, any effluent from the mine will be directed to the sedimentation pond via an eight inch diameter drain where water quality will be tested.

Compliance

UMC 817.41-.42 Hydrologic Balance: Water Quality Standards

Surface water quality at the Emery Mine will not be adversely impacted by an influx of TSS because the sediment control system is adequate to prevent uncontrolled runoff from entering the streams. Furthermore, the mine discharge pond is treating the influent so effectively that in-mine TSS levels of 213 mg/l (PAP, page 13-2) are reduced to concentrations well below 70 mg/l as water is discharged from the pond. The primary concern is the contribution of TDS to the streams from mine discharge. The average TDS concentration in the mine discharge water has been 4,040 mg/l, which has varied, although no discernible patterns of occurrence have been observed. TDS levels in Quitchupah Creek are generally below 2,000 mg/l, therefore, the mine discharge will be increasing the salinity levels in that stream. The applicant complies with this section.

UMC 817.43 Diversions of Overland Flow

The ditches, culvert system and swales that route flow to Pond No. 2 were checked and are adequate. Berms will direct most of the flow to the pond. These berms are approximately 2 feet high and design flow depth is such that one foot of freeboard will be available to the top of the berm (January 20, 1984 submittal). The applicant complies with this section.

UMC 817.44 Stream Channel Diversions

Not applicable.

UMC 817.45-.46 Sediment Control Measures: Sedimentation Ponds

Design data for the surface water control structures were checked by the regulatory authority in February 1984 and found to be adequate with only minor exceptions that will not affect the performance of the structure. Pond No. 3 designs, for example, do not provide freeboard between the 25-year, 24-hour runoff and the top of the pond. While this is generally not a desirable situation, the pond is incised, therefore, there is no danger that an embankment will fail if the pond is overtopped. Additionally, a conservative sediment pool was factored into the design, allowing for five years of accumulation. In reality, much of this volume is usually available for runoff storage. If sediment is cleaned out of the pond at 60 perent accumulation, the 25-year, 24-hour runoff storage elevation will be at a lower elevation, thereby providing freeboard to the top of the pond.

Pond No. 2 has been designed to receive sediment and runoff from 31.2 acres, which includes the entire mine yard complex. Plate 13-3 of the PAP, however, illustrates that not all the drainage from the facilities area flows into the pond. Runoff from the western part of the yard, which includes a portion of the coal stockpile and service areas, flows into the catchment basin above the berms along Quitchupah Creek. This area comprises approximately 4.7 acres as measured from Plate 15.8. Consequently, Pond No. 2 has been conservatively designed to include runoff and sediment from areas that are not contributing to it. The applicant has taken advantage of the topography and provided dikes to form an evaporation lagoon. The catchment basin is, in effect, serving as a sediment basin for the western part of the yard. These dikes, or berms, have a crest elevation of 5'920 and 4,915 feet msl, providing a minimum of 2 feet and as much as 10 feet of height above the natural ground surface elevation. Since these berms are not allowing any flow to enter Quitchupah Creek (page 41 and Plate 3, October 7, 1983 submittal), the runoff is isolated in this part of the mine yard, which is still considered to be within the Pond No. 2 watershed. Given the limited amount of acreage involved and the height of the berms, the existing drainage plan is in compliance with this section of the regulations, as an alternative sediment control structure.

A check of that design sediment storage volume for the mine discharge pond revealed that, at 800,000 gallons per day, the sediment accumulation over seven years should have been 2.09 acre feet. The applicant has stated that the actual accumulation is 3.2 acre feet. It appears that sediment may be collecting in the pond more quickly than anticipated, but the only consequence of that will be a more frequent clean-out. Currently, pond clean-out is not anticipated for another 16 years, therefore, this difference will not affect the plans for the pond. The applicant is in compliance with this section.

UMC 817.47 Discharge Structures

Sediment pond spillways and ditch channels have been riprapped to prevent erosion in areas where high velocities occur. The applicant is in compliance with this section of the regulations.

UMC 817.48 Acid-forming and Toxic-forming Materials

See the discussion on this regulation in the compliance section of the Ground Water section of this TA under the same regulation heading.

UMC 817.49 Permament and Temporary Impoundments

The temporary impoundments constructed at the minesite are constructed according to standard engineering practice. There are no permanent structures. The applicant is in compliance with this section of the regulations.

UMC 817.50 Underground Mine Entry and Access Discharges

The applicant has provided a plan to minimize disturbance to the hydrologic balance when the portals are sealed by directing discharge from the mine to the sedimentation pond where it will be tested for quality standards. The applicant is in compliance with this section of the regulations.

UMC 817.52 Surface Water Monitoring

The surface water monitoring program will provide a continuum of data at the minesite that will add to the collection of previous water quality data to provide valuable insight on the impacts of mining and its significance in areas where irrigation contributes high amounts of dissolved solids to the streams. The monitoring sites are located in areas where degradation from mining activities will be detected and above the mine to provide control data. The applicant is in compliance with this section of the regulations.

UMC 817.54 Water Rights and Replacement

Surface water quantity will not be adversely affected by the sediment control structures since the runoff that will be stored represents flow from a very small percentage of the Quitchupah Creek and Christiansen Wash watersheds. Underground mining may, however, impact stream flow since both streams are recharged by the upper Ferron Sandstone. The applicant has presented information to the effect that the discharge from the upper Ferron Sandstone aquifer to the streams is less than 0.1 cfs. This is based on a USGS model used to simulate ground water flow in the vicinity of the mine (page 10, October 7, 1983 submittal). Currently, the potentiometric surface of the upper Ferron is changing with alterations in the mine plan and this change will affect the degree to which the stream recharge is impacted. The applicant complies with this section of the regulations.

UMC 817.55 Discharge of Water into an Underground Mine

Not applicable.

UMC 817.56 Postmining Rehabilitation of Surface Water Control Structures

The reclamation plan provides for the adequate reclamation of surface water control structures (PAP Chapter 3, page 3-55). The applicant is in compliance with this section of the regulations.

UMC 817.57 Stream Buffer Zones

The pre-Law status of these facilities is such that no buffer zones were provided along Quitchupah Creek and Christiansen Wash. Grandfathered areas (Sections 28, 29, 32, and 33) are shown on Figure 1, Potential Alluvial Valley Floors, of the PAP.

Summary of Compliance

The applicant is in compliance with the sections of the regulations dealing with the protection of the surface water regime.

Stipulations

None.

Ground Water: UMC 817.41-.54

Existing Environment and Applicant's Proposal

Regional Geologic Setting

The applicant's description of the geology of the area with accompanying maps and cross sections is contained in Chapter 6 of the PAP, and a description of the hydrogeology is contained in Chapter 7. The salient physical and hydrogeolgic characteristics of the geologic formations of interest in the mine area are summarized here. For more detail, the reader is referred to the appropriate sections of the PAP.

The Emery Mine plan area is located in the Castle Valley portion of the Emery coal field in central Utah. The mine is located about four miles south of the town of Emery, at the confluence of Quitchupah Creek and Christiansen Wash. In the area of study, three geologic units are of principal importance. In ascending order these units are the Upper Ferron Sandstone member of the Mancos shale, the Bluegate shale member of the Mancos shale and, the Quaternary colluvial and alluvial deposits present in the area (Pages 7-3 and 6-2 of PAP). The coal seam to be mined at the Emery Mine, known as the I-J zone, occurs in the Upper Ferron Sandstone. The geologic formations in the region all dip to the west, towards the escarpment of the Wasatch Plateau. At the base of the escarpment, the formations are truncated by the Joe's Valley-Paradise Fault Zone, located immediately northwest of the Emery Mine permit area. A generalized geologic

cross section is showing page 7-14 of the PAP. A generalized surficial geology map of the study area can be found in the PAP on Plate 6-30 and Figure 7-2 page 7-4.

Quaternary Deposits

Colluvium and alluvium occur on toe slopes, along the drainages and on the high terraces present in the area. The alluvium occurs as unconsolidated deposits of partly stratified silt, sand and gravel deposits in and adjacent to Quitchupah Creek and Christiansen Wash. A maximum thickness of 75 feet of this material was reported in the study area, along Quitchupah Creek above its confluence with Christiansen Wash. Along benches above the Quitchupah Creek channel, sand and gravel deposits up to 40 feet in depth are reported. The colluvium in the area is reported as bouldery, loamy sand below sandstone outcrops in the area, and as a silty clay below the shale hills in the area.

Bluegate Shale

The Bluegate shale outcrops west of Christiansen Wash and west of Quitchupah Creek, south of the Emery Mine office. The Bluegate also underlies most of the alluvial deposits present in the central and western portions of the permit area. The Bluegate is a soft blue-gray shale unit of marine origin, composed of irregularly bedded mudstone and siltstone. Rare thin sandstone lenses occur in the formation. Where the Bluegate Shale is exposed at the surface, it forms barren shale hills. In the vicinity of the Joe's Valley Paradise fault zone, the Bluegate shale is approximately 700 feet thick; across the permit area, the Bluegate varies from 0 to 70 feet in thickness.

Ferron Sandstone

The Ferron Sandstone is divided for descriptive purposes into three units: the Upper Ferron; the Middle Ferron; and, the Lower Ferron. Collectively, the three units average about 400 feet in thickness. The portion of the Ferron Sandstone including the I-J zone and above as designated the Upper Ferron. The portion lying stratigraphically between the base of the I-J zone and the base of the A zone is designated the Middle Ferron. The portion below the A zone coal is designated the Lower Ferron. The Upper Ferron is of primary importance, as it contains the coal zone being mined and is also responsible for the majority of the water made within the mine. The Ferron Sandstone occurs generally less than 1,000 feet below the land surface in the Emery area. Due to the westward dipping nature of the beds, the Upper Ferron outcrops within and also just east of the permit area, near the channels of Quitchupah Creek and Christiansen Wash. The Upper Ferron also subcrops beneath the veneer of alluvium which exists in the Christiansen Wash and Quitchupah Creek valleys towards the southeastern margin of the permit area. Eastward from the permit area, towards Muddy Creek the Middle and Lower units of the Ferron outcrop. Figure 7-2 and Plate 6- 30 of the PAP denote the generalized outcropping and

subcropping of the Ferron Sandstone.

The Upper Ferron consists of lenticular beds of fine to coarse sandstone, and lenses and intercalated beds of shale, siltstone and coal. The Middle and Lower units of the Ferron consists of medium to fine grained calcareous sandstone. In some areas, tests indicate that fractures may be present in the Ferron Sandstone; however, on a large scale, the formation is thought to act as a porous medium (USGS 1980).

Hydrology of the Study Area

Ground water is present in all three principal formations of interest at the study area, although the Ferron Sandstone is the principal aquifer in the region. The aquifer and water quality characteristics of each of the three geologic units are highlighted below.

1. Quaternary Deposits.

The alluvium along the principal drainages and on the sediment terraces contain shallow, unconfined aquifers which are generally less than 50 feet thick. Their boundaries are defined by the limits of the Quaternary deposits. Recharge to the Quaternary pediment terrace aquifers occurs via the almost constant irrigation and leaching applications by local farming operations, using water diverted predominantly from Muddy Creek east of the permit area. Recharge to the alluvial aquifers along Christiansen Wash and Quitchupah Creek occurs via irrigation return flow, and also via discharge from the Upper Ferron Sandstone aquifer. Where the Quaternary pediment deposits overlie the Bluegate Shale, water moves through the deposits and exits from numerous springs at the contact with the relatively impervious Bluegate Shale. Water flowing from some of these springs becomes trapped in swales, forming alkali swamps. The springs which had measurable flow were found to be issuing at less than 10 gpm. At the time the PAP was submitted, there were no wells completed exclusively in the Quaternary deposits. Water quality was, therefore, determined from data collected during a spring and seep inventory conducted during October 1979 and June 1980 (see Section 7.2.3.2 of the PAP). The conductivity of the spring waters ranged from 658 to 2,015 Mhos/cm at 20 degrees C; pH ranged from 6.3 to 8.3 with an arithmetic average of 7.6 reported. With the exception of one small irrigation diversion, water from the springs is used for stockwatering purposes only.

2. Bluegate Shale.

Although the Bluegate Shale is waterbearing, it is considered an aquitard, separating the Quaternary and Ferron Sandstone aquifers (see page 7-55 of the PAP). Water in the Bluegate Shale is possibly contained in fractures and may be localized. The ability of the Bluegate Shale to act as a confining layer is evidenced by the existence of flowing artesian wells which are completed in the Upper Ferron aquifer. For example, monitoring wells AA and R2 both flow at the land surface, and are completed in the Upper Ferron (see page 7-55 of the PAP).

The ground water within the Bluegate Shale is saline, with high amounts of sodium, sulfate and chloride, as evidenced by a sample collected from the Bluegate #3 Well with a total TDS value of 19,800 ppm (see Table 7-4 of the PAP). Gypsum cyrstals have also been observed in hand samples. Water levels in Bluegate wells showed seasonal variations during the 1979-1980 baseline monitoring records.

3. Ferron Sandstone Aquifers.

The waterbearing Ferron Sandstone formation is the principal ground water body in the area of the Emery Mine. Data assembled from field investigations at the site indicate that within the Ferron Sandstone, two aquifer zones exist. These zones are refered to as the upper and lower Ferron aquifers (see pages 7-13 to 7-55 of the PAP). Multiple completion wells installed at the site indicate a difference in hydraulic head between the Lower Ferron (below the I-J zone coal) aquifer and the Upper aquifer. Also, water levels in the Upper aquifer appear stressed as a result of present mining, while those in the Lower aquifer do not, indicating a degree of hydraulic isolation.

Ground water movement throughout the Ferron Sandstone is in an updip direction, towards the mine and areas of outcrop. Generally this is to the southeast. Recharge to the Ferron Sandstone is believed to take place to the west, on the Wasatch Plateau and along the Joe's Valley - Paradise fault zone. Discharge of the two aquifer zones in the area is to Muddy, Ivie and Quitchupah Creeks, Christiansen Wash and Miller Canyon. In the immediate minesite area, the Upper Ferron aquifer is primarily responsible for subsurface outflow to Christiansen Wash and Quitchupah Creek.

The USGS has modeled the Ferron Sandstone aquifers, within and adjacent to the study area, using the USGS three-dimensional computer model (USGS 1980). The model was used to estimate hydraulic head relationships and subsurface outflow of the Ferron Sandstone waterbearing zones. The results indicate that the Ferron Sandstone, in its entirety, discharges approximately 0.4 cfs of outflow to streams in the general mine area. The modeled area investigated by the USGS involved an approximate 2.5 mile segment of Muddy Creek (north of Miller Canyon), a 1.75 mile segment of Ivie Creek (west of its confluence with Quitchupah Creek)' a 1.5 mile reach of Christiansen Wash (above Quitchupah Creek) and an approximately 0.5 mile segment of Quitchupah Creek near and below the Christiansen Wash. The thickness of the Upper Ferron aquifer is approximately 1/5 that of the total Ferron Sandstone; on this basis, it is reasonable to assume that the Upper Ferron discharges less than 0.1 cfs to the streams in the modeled area. Alternatively, if it is assumed that the Upper Ferron discharges to the Christiansen Wash-Quitchupah Creek segment of the modeled streams (as indicated by geologic relationships) and the Lower Ferron is responsible for discharges to the remaining segments modeled, it would appear that the Upper Ferron aquifer accounts for slightly less than 0.2 cfs of subsurface outflow in the modeled area.

Both the Upper Ferron aquifer and the Lower Ferron aquifer exhibit confined aquifer characteristics. Wells completed in both the Upper and lower Ferron Sandstone aquifers, in many locations throughout the study area, exhibit the ability to flow at the land surface. This is especially true for areas upgradient of the existing mine operations. The hydraulic head relationships between the Upper and Lower Ferron aquifers indicate that under undisturbed conditions, ground water generally has the hydraulic potential to migrate upward, from the lower aquifer zone to the Upper.

A similar hydraulic relationship is generally thought to exist between the Upper Ferron aquifer and the Bluegate shale in the area, although in some locales, the Upper Ferron has been depressurized as a result of mining, reversing the upward relationship.

Transmissivity values were determined for the Ferron Sandstone aquifers at the site, and values of about 406 ft^2/day and 511 ft^2/day were reported for the Upper and Lower aquifers, respectively.

Ground Water Quality

The ground water quality of the Ferron Sandstone aquifer (undifferentiated), as measured in baseline investigations prior to 1979 from 21 wells in the area, indicates a TDS level of approximately 2,300 ppm (see page 7-57 of the PAP). Published information by Price (1972) indicates TDS levels of 250 to 1,000 ppm for Ferron Sandstone aquifer waters In the Castle Valley area. The baseline well samples may reflect saline waters from the overlying Bluegate shale (and terrace gravels, which experience saline irrigation return flow). The lower values stated in the Price study may, therefore, be more representative. Further support for the lower levels is given by the fact that TDS levels in five samples collected immediately from roof falls in the existing mine are on the order of 1,100 ppm, considerably less than the values cited for the ground water wells (see page 7-57 of the PAP). A background TDS level of 1,100 ppm is, therefore, thought to be most representative of Ferron Sandstone waters.

Ground water use

Two private wells, the Bryant well and the Lewis well, are registered in the permit area. Both withdraw water from within the Ferron Sandstone, presumably from the Upper aquifer (see page 7-82 of the PAP and Table 7-8). The town of Emery also maintains a supply well, approximately 2.5 miles north of the permit area. The Lewis and Bryant wells withdraw about 30 gpm, while the Emery town well withdraws about 50 gpm. In addition to the numerous springs which exist in the terrace gravels overlying the Bluegate Shale (discussed earlier), two springs were identified as issuing from the Ferron Sandstone. The Christiansen Spring, located at the head of Miller Canyon (Spring #SP-16), discharges from the Upper Ferron Sandstone. The spring flows at a rate of six gpm and is appropriated at 0.1 cfs for stock- watering purposes. Spring SP-16 is believed to discharge from the Lower Ferron aquifer and is unappropriated. The spring is located about one mile northeast of SP-15, in the Muddy Creek Valley. The SP-16 spring issues at 5 gpm.

Existing impacts

The applicant has been mining coal at the site since prior to 1977. Presently, approximately 1/3 of the permit area has been mined. Measurable disturbances to the ground water regime have already been realized. Most notably, between 0.6 cfs and 1.2 cfs of ground water is removed from the mine, conveyed to the existing sediment pond and discharged to a tributary of Quitchupah Creek. Between 1980-1982, the flow as measured at 0.6 cfs, and between 1982-1983, the flow was measured at 1.2 cfs (see page 44 of the ACR response).

Significant drawdown has also occurred within the Upper Ferron aquifer, although only minor effects in the Lower Ferron aquifer have been realized, based on current water level measurements. Most of the water made in the mine occurs via three major roof-falls; very little flow into the mine through the mine floor has been realized. Both the Bryant well and the Lewis well have been affected by mining; the depressurization of the Upper Ferron aquifer has resulted in the two wells no longer flowing at the land surface. Consol has furnished and installed pumps in these wells to mitigate the present effects of mining.

The existing drawdown level in the Upper Ferron aquifer is shown on a potentiometric surface map, produced in the fall of 1983 (see plate 7-5). The map indicates that a cone of depression exists adjacent to the mine, centered in section 29, Township 22 South, Range 6 East. The cone radiates outward for at least one mile. Approximately 300 feet of water level decline has been realized in section 29 since 1979, when a similar potentiometric map was prepared. The 1979 map also represented disturbed conditions; the amount of decline relative to conditions prior to any disturbance is unknown, as mining has occurred in the permit area since the turn of the century, before any site-specific water level monitoring actions were initiated.

The water quality of intercepted water has also been demonstrated to degrade in the mine. TDS levels of intercepted waters accumulating in the mine average 4,000 ppm, with values as high as 5,840 ppm reported (see Table 7-5 of the PAP). The principal constituents of the additional load of dissolved solids include magnesium, sodium, sulfate and chloride. SAR values of mine waters range from 4.6 to 64 units, with an average of 22 units reported.

Projected Impacts - Future Mining

The applicant proposes the following real or potential ground water impacts to the hydrologic balance resulting from future mining during the permit term:

1. Additional ground water declines in the Upper Ferron aquifer as mining progresses in the permit area.

2. Diminution of ground water quality within the Ferron Sandstone, owing to possible downward leakage of saline Bluegate Shale waters and irrigation return flows if subsidence cracking to the surface occurs.

3. Additional lowering of water levels in the Lewis and Bryant wells.

4. Potential dewatering of portions of the alluvial terrace aquifer (and accompanying springs) which overlie the Bluegate Shale.

5. Loss of subsurface outflow to Christiansen Wash and Quitchupah Creek within the area of disturbance.

6. Subsidence as a result of dewatering of the Upper Ferron Aquifer.

To date, approximately 800 acres of land area has been undermined by the applicant. Within the permit term, approximately 570 additional acres will be undermined. The applicant has prepared an estimate of the amount of drawdown which can be expected to occur in the Upper Ferron aquifer as a result of the next phase of mining. The drawdown is shown on Plate 7-5 of the December 1983 submittal. The applicant's model predicts that the five-year water level decline can be expected to be on the order of a maximum 350 feet below 1983 measured water levels. This corresponds to the 750 feet of drawdown below 1979 levels. This maximum drawdown level occurs in two areas: over the existing mine, in section 28, Township 22 South, Range 6 East; and over the new segment of mining in Section 29, Township 22 South, Range 6 East. In some instances, this maximum drawdown exceeds the saturated thickness of the Upper Ferron aquifer, and the aquifer will be completely dewatered. Near the edges of the permit boundary, the model predicts that drawdown of about 50 feet can be expected.

The applicant proposes that only the Lewis and Bryant wells will be impacted. The drawdown effects are not proposed by the applicant to reach as far as the Emery town well (2.5 miles north of the permit area) nor as far east as the Christiansen Spring.

The Office of Surface Mining (OSM) Western Technical Center conducted a complete modeling analysis (results attached in Appendix C) of the effect that mining will have on both the upper and lower Ferron aquifers over the life of the mine. The model results predict the following groundwater inpacts over the life of the mine (25 years):

1. Dewatering of the Upper Ferron Aquifer over the mine and permit area.

2. Drawdown of 400 feet in the upper Ferron aquifer potentiometric surface as far north as the Town of Emery and up to 1.5 miles south of the permit area.

3. Drawdown of 130 feet in the lower Ferron aquifer potentiometric surface at the Emery municipal well.

The OSM groundwater model simulated the effect of mining on the Ferron aquifer system over the 25-year life of the mine; however, the applicant's proposed monitoring system will provide factual information regarding effects on the groundwater system as mining proceeds. Any changes in interpretation of impacts resulting from the increase in data over time will be factored into mining plan changes, mitigation efforts as necessary, and future permitting approvals.

In regard to diminution of subsurface outflow to Christiansen Wash and Quitchupah Creek, the applicant proposes that the amount of water predicted to outflow to these streams in the study area, via the USGS computer model, is relatively minor. If the amount predicted by the model (0.2 cfs or less) is intercepted by the mine, it is proposed to have very little effect on the flow regime of either stream.

In addition to the projected ground water level declines, the applicant prepared projections of the anticipated levels of mine inflow over the permit term. The values are as follows (see ACR response, January 23, 1984):

Year	Level
1984	1.7 cfs (763 gpm)
1985	2.1 cfs (943 gpm)
1986	2.6 cfs (1,167 gpm)
1987	2.3 cfs (1,033 gpm)
1988	2.0 cfs (898 gpm)

As mining progresses downdip towards the recharge zone, higher levels of hydraulic head are encountered, resulting in an increase in intercepted flow. The rate will increase from 1.2 cfs (the current average rate) to 2.6 cfs in 1986. From there, the applicant projects that the rate will steadily decline to about 2.0 cfs, as the hydrostatic pressure is reduced following the removal of water from storage.

The applicant also identifies a potential impact to the terrace alluvial aquifer above the mine. Cave zones above the mined-out seam are expected to produce fracturing and rubblization of strata up to as much as 200 to 300 feet above the mined-out zone. It is possible that in areas where the depth of cover is less than 300 feet, the fracturing and rubblization could extend through the Bluegate Shale and produce some potential for downward movement of alluvial water through the rubblized zone into the mine. This could serve to lower alluvial ground water levels in the terrace alluvial aquifer. The applicant proposes that for the most part, areas which are subject to this condition have already been mined, and no serious consequences have been observed to date. The applicant further proposes that continued monitoring will be necessary to fully evaluate this potential.

A related impact to that above was identified by the applicant on page 7-91 of the PAP; the potential for saline Bluegate Shale waters to mix with

higher quality, Upper Ferron Sandstone waters. This phenomenon could be induced by two mechanisms. One is the reversal of hydraulic potential between the waterbearing zone in the Bluegate Shale and the Upper Ferron aquifer. Under undisturbed conditions, piezometric levels in the Upper Ferron are generally above those in the Bluegate Shale. Mining could reverse this relationship. Two is rubblization and fracturing of the Bluegate Shale, leading to increased hydraulic communication between the Upper Ferron aquifer and the Bluegate Shale over that which existed prior to disturbance.

Postmining effects

The applicant proposes that in the postmine environment, ground water levels in the Upper Ferron aquifer will reestablish themselves to levels that existed in the premining condition. Hydraulic head within the Upper Ferron aquifer would be expected to rise above that of the Bluegate to its premining condition, precluding the downward leakage of poor quality Bluegate water in the long term. The rubblized sections of the upper Ferron Sandstone and Bluegate Shale would have higher permeabilities in the postmine environment, and ground water flow rates would be expected to be higher than existed prior to disturbance. The original potentiometric surface may, in turn, be slightly altered on a local scale. However, direction of flow, recharge characteristics, and points of discharge are proposed by the applicant to generally be uneffected in the long term.

Following mining, ground water can be expected to accumulate in the mine as the pressure regime in the Upper Ferron aquifer attempts to reestablish itself. The applicant has proposed a plan for sealing mine entrances and for placement of a discharge pipe in the portals. If pressures in the mine rise to the level where discharge from the portal is possible, the applicant plans to route the discharge to the existing sedimentation pond and manage the discharge under the NPDES discharge requirements. Following complete cessation of mining at the site and removal of the sediment pond, the applicant proposes to allow the portal drainage to flow unmanaged.

Due to the total dewatering of the Upper Ferron aquifer above some areas of the mine, subsidence of the aquifer and the land surface may result. The subsidence of the land surface as a result of dewatering will be minor compared to the subsidence as a result of mining. In addition, this subsidence will generally be even, whereas subsidence due to mining will be irregular (see the Subsidence Section of this analysis). Also as a result of subsidence, the permeability of the aquifer may be reduced by the loss of pore water pressure. However, due to the potential fracturing of the sandstone due to the caving of the overlying strata from the underground operation, a secondary permeability may be established. The overall postmining permeability of the Upper Ferron aquifer is not known at this time. If the permeability is significantly diminished, base flows to the streams from the Upper Ferron may not be reestablished along with discharge to Christiansen spring. Alternatively, the water will flow around the area of decreased permeability and ultimately recharge these same areas. Also, the coal seam will have an increased permeability and water will flow through this zone.

Compliance

UMC 817.41 Hydrologic Balance: General Requirements

The applicant has provided sufficient information to identify the probable hydrologic consequences (PHC) of mining on ground water resources, and the uncertainties which exist therein. Additional information regarding hydrogeologic conditions, water use and surface water ground water relationships is not necessary at this time.

The applicant prepared the estimate of ground water level decline and mine water inflow using their own computer model identified as CONOSIM. The CONOSIM model was examined and found to be flawed. Subsequently, the OSM Western Techmical Center modeled the effects of mining on the Ferron aquifer system using OSM's groundwater computer model. The results are attached to the TA as Appendix C.

The uncertainties which exist in the definition of the PHC on ground water can be identified as follows:

> The possibility for, and overall effect of, the mixing of Bluegate Shale waters with Upper Ferron aquifer waters is imperfectly understood. As a result, ongoing monitoring efforts must be targeted at this potential.
>
> The potential for drawdown effects reaching the Christiansen Spring (SP-15 on Map 6-30) remains unclear. The applicant proposes that drawdown will not extend to that distance; however, the PHC information indicates that this spring may still be within the radius of influence. The applicant has included this spring in the monitoring plan with samples taken quarterly for flow and water quality (February 2, 1984 Submittal).
>
> An additional uncertainty exists in the potential for roof and cover fracturing extending upwards through the cover and affecting the alluvial terrace aquifer. The applicant has presented supportive evidence for the fact that the most critical areas where this phenomenon might occur have already been mined in the past. However, given that the effect on the terrace aquifer may be time dependent (e.g., the impacts may not yet have been realized) it is important that the applicant pay particular attention to this potential in his monitoring efforts. Fourteen springs were identified by the applicant as issuing from the terrace aquifer, resulting primarily from irrigation return flow. Two of these springs, the Anderson Spring and the Jensen Spring, are shown in Table 7-8 of the PAP as appropriated.

The applicant has demonstrated that if further impacts to the Lewis and Bryant wells are realized during this permit term, an alternative water supply

is available. It is possible that both wells may be fully dewatered, based upon the drawdown projections made. The applicant has included in his bond amount an allowance for drilling two wells deeper into the Lower Ferron Sandstone Formation.

The applicant has presented supportive calculations to show that flow depletions to Quitchupah Creek and Christiansen Wash, as a result of intercepted ground water, should not be significant to the drainages. The amount of intercepted flow (0.2 cfs or less) is about three percent of the mean discharge of the Quitchupah Creek-Christiansen Wash drainage system above Ivie Creek. Additionally, the water will be routed through the mine and discharged back to the Quitchupah Creek watershed, albeit at lesser quality (this topic is treated in the Surface Water section). From a quantity perspective, however, the disturbance is not significant. The applicant is in compliance with this section.

UMC 817.48 Hydrologic Balance: Acid-forming and Toxic-forming Materials

The applicant has not identified any materials which could be considered acid- or toxic-forming with respect of ground water contamination in the facilities area. Material, such as coal, which will not support vegetation, is to be removed from the facilities area and backfilled in the mine. This will not cause any further degradation to the ground water since the volume of material to be backfilled is extremely small compared to the volume of coal material which will remain in the mine. Once this material is removed, the applicant will have excavated to the previously existing surface materials (see page 28 of the ACR response). The applicant is in compliance with this section.

UMC 817.50 Hydrologic Balance: Underground Mine Entry and Access Discharges

The applicant has prepared a plan for controlling discharge from the portals in the event reestablished pressures in the Upper Ferron aquifer generate such discharge. The portal closure plan includes the placement of a pipe of sufficient size in the portal backfill which will allow for the discharge of 0.4 cfs from the mine. This water will be routed through a sediment pond during reclamation. Subsequently, the pond will be removed and the discharge will flow unmanaged. For a discussion of the effect of mine discharges on the surface water, see the Surface Water section of this TA. The applicant is in compliance with this section.

UMC 817.52 Hydrologic Balance: Ground Water Monitoring

At present, the ground water monitoring plan is sufficient to satisfy the requirements of UMC 817.52. The Christiansen Spring, issuing from the Upper Ferron aquifer down-gradient from the mine, is monitored for flow and water quality as part of the quarterly operational monitoring program. The Anderson and Jensen springs, located in the alluvial terrace aquifer overlying the mine, shall be monitored for flow only on the same quarterly basis. The applicant has committed to monitor these springs if access can be gained from the private landowners (February 2, 1984 submittal).

There are at least 41 wells in the study area, referenced in the PAP. Due to the uncertainty of the condition of some of these wells, the applicant has revised the wells to be monitored, and will be obtaining access to different wells in the mine area along with repairing others (see information submitted on February 2, 1984).

This new monitoring program will provide sufficient monitoring data over the next five years to identify the effects on the aquifers. However, after that time some of the wells will be dewatered by mining, and should be replaced. The applicant has committed to develop alternative plans for monitoring should access to some of the proposed wells be denied or if repair work is not successful (see May 18, 1984 submittal).

UMC 817.53 Hydrologic Balance: Transfer of Wells

The applicant plans to plug all wells associated with the mining process at cessation of mining. Therefore, no wells will be transferred. The applicant complies with this section.

UMC 817.54 Hydrologic Balance: Water Rights and Replacement

The applicant has provided mitigative measures for existing impacts to two domestic wells - the Bryant well and the Lewis well. A mitigative plan for future impacts has also been provided. The applicant is in compliance with this section.

UMC 817.13-.15 Casing and Sealing of Exposed Underground Openings

The applicant has provided sufficient information regarding the sealing of exploration holes and monitoring wells. Past actions and statement of intent regarding future actions are adequate. The portal closure plan proposed by the applicant is adequate. The portals will be backfilled at least 25 feet from the opening. The applicant is in compliance with this section.

Stipulations

None.

References

USGS. 1980. Three dimensional digital computer model of the Ferron Sandstone aquifer near Emery, Utah. WRI 80-52.

Price, Donald. 1972. Map showing General Chemical Quality of Grand Water in the Salina Quadrangle, Utah: USGS Map I-591-K, 1:250,000.

Owili-Eger, A. 1980. Modeling immiscible gas-water flow in deforming mining environments. Conoco, Inc., Ponca City, Oklahoma. Presented at the SMC-AIME Fall Meeting October 22-24, 1980.

UMC 822: Alluvial Valley Floors

Existing Environment and Applicant's Proposal

The upper Quitchupah Creek valley contains unconsolidated stream-laid deposits (Plate 8 of the PAP) and has sufficient water for flood irrigated agricultural activities as evidenced by on-going irrigation activities which utilize Quitchupah Creek water. An assessment of the annual runoff indicated that sufficient water could be available to flood irrigate 300 to 400 acres along the Quitchupah Creek valley. The initial alluvial valley floor (AVF) investigations (Watec, Inc., 1980) did not identify any areas of subirrigation along the Quitchupah Creek Valley.

Based upon this information (that relating to the application of AVF geomorphic and water-availability criteria) and that available from soil surveys, discrete areas of the upper Quitchupah Creek valley have been determined to be a potential alluvial valley floor. These areas of potential alluvial valley floor either presently support or have the capability of supporting flood irrigated agricultural activities. The areas of potential alluvial valley floor along the upper Quitchupah Creek valley are shown on Figure 1 (March 2, 1984 submittal). Appendix I contains soil and agricultural use information pertinent to the precise definition of the potential AVF areas.

Portions of the areas of potential alluvial valley floor in Section 30 north of the Quitchupah Creek channel (Area II shown on Figure 1) are currently flood irrigated with water supplied from Muddy Creek and delivered by the Emery Ditch. Consol does not agree (May 18, 1984 submittal) that Area II (shown in figure 1) qualifies as an active flood irrigated alluvial valley floor. However, to avoid delays in permit approval Consol adopts the plans illustrated in Plate 3-7 (May 18, 1984 submittal) which calls for no mining under Area II (Figure 1). Plans to mine under portions of Area II may be presented in a future permit modification.

Only one portion of the potential AVF area is actively flood irrigated with Quitchupah Creek water. This is Jack Lewis' field located to the south of the Quitchupah Creek channel. (This area is identified as Area III on Figure 1.) For this area (Area III), it is necessary to show that: 1) the proposed operations would not interrupt, discontinue, or preclude farming on the alluvial valley floor; and 2) the proposed operations would not materially damage the quantity and quality of water in surface and ground water systems that supply the alluvial valley floors. In addition, the performance standard requiring that the essential hydrologic functions be preserved during the mining and reclamation process also applies.

The proposed mining and reclamation operations would not interrupt, discontinue, or preclude farming operations in the Jack Lewis' field. No surface disturbance would occur in this area. The proposed operation is an underground mining operation and the surface facilities associated with the

mine are located at the confluence of Quitchupah Creek and Christiansen Wash, downstream from any areas identified as potential alluvial valley floors. Portions of Jack Lewis' field would be undermined by the proposed operation. As shown on Figure 1 a sub-main would be driven along the southern boundary of Jack Lewis' field. Access along the sub-main would be maintained by limiting the extraction of coal. As a result, no subsidence effects are expected in this area. During the 5-year permit term, no other mining activities would occur beneath this portion of the potential alluvial valley floor. In other portions of the permit area, coal would be extracted using partial pillar recovery methods. Subsidence could occur in these areas. However, a sufficient buffer would be maintained to avoid disturbing the non-exempt portions of Jack Lewis' field (AVF submittal Feb 27, 1984).

The proposed operations would not materially damage the quantity and quality of water in surface and underground water systems that supply the non-exempt portions of Jack Lewis' field.

Quitchupah Creek is the partial source of water used for flood irrigation in Jack Lewis' field. This water is diverted from Quitchupah Creek upstream to the proposed permit area, and is brought to the irrigated fields by way of a diversion ditch (shown on Figure 1). The delivery ditch crosses an area of a mine panel where extraction will be limited to protect an occupied structure and, as a result, no subsidence is expected to occur (AVF Submittal Feb. 28, 1984). Therefore, mining activities would not be expected to affect either the grade or the integrity of the delivery ditch.

Both the subcrop area of the upper Ferron aquifer and the mine water discharge pond are located downstream from the point where water is diverted from Quitchupah Creek, and downstream from the non-exempt portion of Jack Lewis' field. As a result, neither the quantity nor the quality of water supplied to the field would be affected.

Coal mining operations are required to preserve throughout the mining and reclamation process the essential hydrologic functions of alluvial valley floors. However, as stated in OSM's AVF Guidelines (U.S. Department of Interior, 1983, pIII-10), "the term 'preserve' is understood (based on legislative history) to have two meanings, depending on whether the alluvial valley floor is within or outside the affected area. For alluvial valley floors within the affected area, the term 'preserve' means that the essential hydrologic functions must be reestablished during reclamation." For alluvial valley floors outside of the affected area, the essential hydrologic functions must be maintained. The essential hydrologic functions of the non-exempt portions of Jack Lewis' field would be maintained throughout mining and reclamation. If the essential hydrologic functions in other areas of potential alluvial valley floor are affected by the proposed mining operations, they will be reestablished during reclamation.

In the Jack Lewis' field the essential hydrologic functions of the potential alluvial valley floor would be preserved throughout the mining and reclamation process. No surface disturbances are proposed in this area, and

the valley bottom soils would not disturbed. Coal extraction along the proposed sub-main would be limited, and no subsidence is expected in this area. Therefore, the geometry and physical character of the field would not be affected by the proposed mining operation and would continue to support flood irrigation. Additionally the quantity and quality of the water which supplies irrigation water to the field would not be affected by the proposed operations.

If the essential hydrologic functions of the remaining areas of potential alluvial valley floor are affected by the proposed mining operation, they would be reestablished as a part of reclamation. However, it is not expected that the essential hydrologic functions would be affected. A subsidence buffer zone has been established along the course of Quitchupah Creek. As a result, the integrity of the stream channel would be maintained, and no changes in stream channel gradient are expected.

Consol has submitted a hydrologic monitoring plan and a subsidence monitoring plan. (These are included in Chapters 7 and 12 of the PAP, respectively.) Much of this monitoring would occur in or adjacent to areas of potential alluvial valley floor and would serve to demonstrate that the alluvial valley floor performance standards are being met. In addition, specific aspects of areas of potential alluvial valley floor would also be monitored.

In order to ensure that farming on the Jack Lewis' field is not interrupted, discontinued, or precluded, agricultural activities would be informally monitored by mine personnel. If any change in agricultural activities is observed, the operator will investigate the cause, and the Utah State Division of Oil, Gas and Mining will be notified (AVF Submittal February 27, 1984).

To ensure that the supply of water to the Jack Lewis' field is not materially damaged, the Quitchupah Creek irrigation ditch will be visually inspected before and during the growing season. This will ensure that the structural integrity and the grade of the ditch will not be adversely affected. In addition, the mine operator will maintain communication with the operator of the irrigated field in order to quickly identify suspected problems.

Finally, to demonstrate that the essential hydrologic functions are reestablished as a part of reclamation, the operator will conduct a topographic survey of potential AVF areas in the upper Quitchupah Creek valley bottom prior to bond release. This will ensure that the physical character (topography) of these areas are capable of supporting flood irrigated agriculture.

Compliance

In determining the potential for Alluvial Valley Floors (AVF's) on and adjacent to Consolidation Coal Company's Emery Deep Mine the regulatory

authority evaluated areas along Quitchupah Creek and Christiansen Wash in sections 19 - 22, 28 - 30, 32 and 33 of T22S, R6E Salt Lake Meridian.

Section 510(b)(5) of the Surface Mining Control and Reclamation Act (SMCRA) provides specific protection for AVF's. A proviso in Section 510(b)(5) of SMCRA exempts from the requirements of Section 510(b)(5) those surface coal mining operations which in a year preceeding the enactment of the Act (August 3, 1977) produced coal in commercial quantities and were located within or adjacent to AVF's or had specific permit approval from the State regulatory authority to conduct surface coal mining operations on AVF's.

Consol meets the requirements provided in this proviso for land sections 28, 29, 32, and 33 since a state permit was in affect and they were mining commercial quantities of coal prior to August 3, 1976.

Consol will be required to provide mitigating measures to areas within the exempted area where subsidence from mining operation occurs. Consol has provided plans in their March 2, 1984 submittal which detail the measures they will implement if subsidence should take place.

The regulatory authority determined that AVF's do not exist along Christiansen Wash. Information provided by the applicant points out that the flow in Christiansen Wash is produced mainly by flood irrigation return from fields that are initially supplied by Mudddy Creek, a stream in an adjacent drainage basin. The water in Christiansen Wash has not historically been used for irrigation, and it could not be delivered to the irrigated lands by practices currently used in the region. The valley of Christiansen Wash is too incised and deep to utilize water directly from the wash. The amount of ditching required would not be justified given the limited amount of water available form the small watershed.

According to Mr. Clyde Mortenson, Muddy Creek Irrigation Company (AVF Submittal Feb. 27, 1984), it is not the regional practice to pump water from the streams. He was unaware of any area in the region where pumping occurred. Although there are unconsolidated alluvial deposits which constitute part of the criteria for an AVF, there lacks sufficient water available to support farming if no transfer of water from Muddy Creek existed.

The regulatory authority has determined that AVF's exist in sections 19 and 30 of the 5-year permit area which must be protected according to the established regulations governing AVF's. The applicant has committed to protecting that area known as Jack Lewis field shown as area III in Figure 1, (March 2, 1984 submittal) and has supplied the necessary information for its protection as an AVF. The regulatory authority has determined that the hatched area outlined in the accompanying map must be protected as AVF. Historically irrigation water has been diverted from Quitchupah Creek and there exists the potential that area II as well as other areas outlined in the accompanying map could be flood irrigated and subirrigated with waters from Quitchupah Creek. Since no mining will occur in Area II, no adverse impacts should effect the deliniated alluivial valley floor.

The applicant meets all requirements of this section.

Stipulation UMC 822

None.

Miscellaneous Compliance

UMC 817.11 Signs and Markers

Consolidation Coal Company has provided information on the signs and markers to indicate their size, lettering and location (see page 19 of the ACR response). Provisions have been made for mine and permit identification signs, which will be displayed at all points of access from public roads. Perimeter markers will designate the permit area boundary. Blasting signs, buffer zone markers and topsoil markers will be placed as required at the site. The applicant is in compliance with this section.

UMC 817.59 Coal Recovery

The applicant has submitted coal seam, overburden, and interburden isopachs for the mine area. Mine maps have been supplied showing the layout of the mine and mining progression. Recovery or non-recovery of each of the seams was disussed based upon seam quality, thickness and proximity to other seams. (Chapter 6 Permit application) The applicant has not yet obtained a letter of concurrence from the BLM that coal recovery is being optimized. Therefore, a determination of compliance with 817.59 cannot be made.

UMC 817.61-.68 Use of Explosives

Explosives are used underground to a minor extent, and are used and handled as required by MSHA. Since all of the facilities for the Emery Deep Mine are currently in-place, there will be no surface construction requiring the use of explosives. Therefore, regulations 817.61-.68 are not applicable.

UMC 817.71-.74 Underground Development Waste

There are no plans for the disposal of underground development wastes on the surface from the Emery Deep Mine. The operation is conducted within one coal zone, the I-J zone, so that in-mine ramps are not required to obtain access to other seams. The portals are already constructed and there are no plans during this permit term for any additional portal construction. The applicant is leaving both top and bottom coal for stability reasons, therefore, no rock waste is being developed from taking roof or floor rock. Therefore, regulations UMC 817.71-.74 are not applicable.

UMC 817.81-.93 Coal Processing Waste

Disposal of coal processing waste was reviewed and approved for the Emery Deep Mine Preparation Plant and Loadout Facilities on September 21, 1982 (See

The applicant meets all requirements of this section.

Stipulation UMC 822

None.

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UMC 817.81-.93 Coal Processing Waste

Disposal of coal processing waste was reviewed and approved for the Emery Deep Mine Preparation Plant and Loadout Facilities on September 21, 1982 (See

Appendix B for the TA on this facility). Therefore, evaluation of regulations 817.81 to 817.93 are not appropriate to the Emery Deep TA.

UMC 817.89 Disposal of Noncoal Wastes

Noncoal wastes such as trash, oil cans and timbers are temporarily stored at the minesite in two pits which measure 20 X 40 X 10 feet. The material is periodically hauled by Consol to a local landfill not controlled by Consol. The pits are located within the drainage system for the facilities area. The applicant is in compliance with this section.

UMC 817.131 Cessation of Operations: Temporary

Provisions for temporary cessation were stated on page 19 of the ACR response. The operator will submit a notice of temporary cessation to the Division of Oil, Gas and Mining if operations will be shut down from more than 30 days. The applicant is in compliance with this section.

UMC 817.132 Cessation of Operations: Permanent

At the conclusion of mining activities, all affected areas will be closed, backfilled and permanently reclaimed. All equipment, structures and other facilities will be removed. These areas shall then be reclaimed (see the proposed reclamation plan, Section 3.5 of the PAP). The applicant is in compliance with this section.

UMC 817.180 Other Transportation Facilities

An existing conveyor at the minesite is used to transport coal from the mine to a crusher and hopper on the portal bench. The coal on the belt and at all transfer points is sprayed with water to control dust. Any coal escaping into the water system from this conveyor is routed into the sediment pond. This facility will be removed and reclaimed when mining is complete. The applicant is in compliance with this section.

UMC 817.181 Support Facilities and Utility Installation

Support facilities at the Emery Deep Mine consist of water tanks, an office, bathhouse, fan, substation, sediment ponds, conveyor, roads and other facilities as identified on Plate 3-2 in the PAP. Drainage and sediment control plans have been provided for all surface facilities. All structures will be removed and reclaimed upon completion of mining.

Several facilities have been approved by the regulatory authority independently from the PAP. These facilities and the approval dates are:

Borehole Road - Pump Access Road	October 1, 1981
Use of Borrow Area	February 3, 1982
Bathhouse and power Mine	February 12, 1982
New Coal Stockpile	August 3, 1982
Preparation Plant and Loadout Facility	September 21, 1982

A TA for the Preparation Plant and Loadout Facilities was prepared and is attached as Appendix B.

Compliance

The applicant is in compliance with all these miscellaneous sections of the regulations.

Stipulations

None.

Backfilling and Grading: UMC 817.99-.106

Existing Environment and Applicant's Proposal

The facilities area for the Emery Mine is primarily located at the base of a cliff formed by the Ferron Sandstone at the junction of Quitchupah Creek and Christiansen Wash. The area has been mined for over 50 years beginning with the old Browning Mine. There are no available maps showing the premining topography of the site, however, it is likely that the original land configuration was not much different then it is now. The portals drift into the I-Zone coal seam which occurs naturally at the base of the cliff. Four portals are utilized and consist of a coal haulage portal, mine access portal, auxiliary intake portal and return air portal. Other facilities in the mine area are identified on Plate 3-2 in the PAP.

Facilities which would require grading in the mine area are the berms and dikes, sediment ponds, roads and outside of the facilities area the evaporation lagoon and the mine discharge sediment pond. Except for the evaporation lagoon and the mine sediment pond, this grading will not require extensive effort. At the evaporation lagoon, 1,000 cubic yards of material will be removed from the bottom of the pond, where salts have accumulated, and hauled to the refuse disposal site (see page 16 of the ACR response). The berm around the lagoon will be used to backfill the depression. The mine sediment pond will be graded to approximate original contours. The amount of material which must be handled is 11,400 cubic yards.

In the facilities area, the surface layer which is contaminated with coal fines will be removed and backfilled into the mine upon closure. The applicant has figured that an average of one foot of material will have to be removed over 24 acres in the facilities area. This will require that 39,527 cubic yards be placed in the mine (see page 18 of the ACR response). In addition, it will require 500 cubic yards to backfill the portals with a

lv:3h outslope. The portals will also be backfilled 25 feet from the entrance and a concrete wall placed 25 feet within the mine.

The applicant has submitted a postmining contour map in the ACR response (Plate 15-19). This map shows that there will not be substantial amounts of grading required to return the disturbed area to a suitable postmining topography which is most likely the approximate original contours. Due to the small amount of material being handled, it was not considered appropriate to determine a swell factor for handling or final swell. During reclamation, grading along the contours will occur where possible. A positive drainage away from the cliff will be maintained to prevent impoundment of water (see page 3-58 of the PAP). Regrading of rills and gullies has been provided for in the bond estimate.

Compliance

UMC 817.99 Slides and Other Damages

There are no steep slopes in the facilities area other than the cliff face above the portals which is a sandstone outcrop of the Ferron Sandstone. It is not expected that there would be any problem with slides in the facilities area. The applicant has committed to reporting slides in response to stipulations in the TA for the Preparation Plant and Loadout facility (see the July 26, 1982 letter from Consol to the regulatory authority). The applicant is in compliance with this section.

UMC 817.101 Backfilling and Grading: General Requirements

A plan has been submitted which shows that the mine area will be graded to a suitable postmining topography. All facilities will be removed and the portals will be backfilled (see section 3.5 of the PAP). Drainage will be established away from the cliff face and grading will occur along the contour. The applicant is in compliance with this section.

UMC 817.103 Backfilling and Grading: Covering Coal and Acid- and Toxic-forming Materials

The applicant has provided plans for the removal and underground disposal of all coal material, and likewise the removal of all saline material from the evaporation lagoon to the coal refuse disposal site (see pages 16 through 18 of the ACR response). The applicant is in compliance with this section.

UMC 817.106 Regrading or Stabilizing Rills and Gullies

The applicant has provided a specific plan for the regrading of rills and gullies, in the January 20, 1984 Technical Deficiencies Response. Therefore, the applicant is in compliance with this regulation.

Stipulations

None.

Protection of Fish and Wildlife: UMC 817.97

Existing Environment and Applicant's Proposal

Fish and wildlife information was provided by field studies of the permit area and consultation with the Utah Division of Wildlife Resources (UDWR). A total of 170 vertebrate species have been documented for the permit and adjacent areas (26 mammals, 133 birds, 6 reptiles, 1 amphibian and 4 fish). This includes 110 species (17 mammals, 5 reptile, 1 amphibian, 4 fish and 83 birds) recorded during field investigations of the permit area and 60 species listed by the UDWR as occurring in the surrounding Castle Valley.

NOTE: The following information is paraphrased from Chapter 10 of the PAP.

Riparian habitat is the only type which occurs on the permit area that is classified as crucial/critical to wildlife by UDWR. No threatened or endangered wildlife species are known to breed or otherwise extensively use the permit area. One Federally Listed (July 27, 1983) plant specie, Wright's fishook cactus (Sclerocactus wrightiae), is reported from the area; however, none have been located within the permit area (Biological Assessment of the Emery Deep Permit Application, Office of Surface Mining, attached). Golden eagles make considerable use of the area for hunting, but no nests were located within 1 km of areas to be affected. There is a potential for peregrine falcons and bald eagles to briefly visit or pass through the area during certain seasons. Blackfooted ferret habitat (prairie dog colonies) exists on the permit area. Nine active and two inactive prairie dog colonies are located entirely within the permit area boundary and two other active colonies lie on the boundary, but none are located within areas of proposed disturbance. No blackfooted ferrets or sign of their presence were recorded within the permit area.

Wildlife habitat types on the permit area include pinyon-juniper, agricultural land, riparian-wetlands, semi-desert shrub, rocky outcrops and mat saltbush.

Mule deer is the only big game species which utilizes the permit area throughout the year. Use is concentrated mainly on the agricultural lands and riparian-wetlands habitat types. The area is considered low value to deer because the UDWR has determined the native vegetation can support only 0.003 deer per hectare. Two deer were observed on the study area during field surveys. The nearest designated crucial/critical habitat for deer is winter range located about 2.4 km north of the permit area.

Upland game species that use the permit area are the ring-necked pheasant and mourning dove. A majority of the mine permit area is within year long pheasant habitat that is designated as crucial/critical by UDWR. Pheasants are common within the permit area and were frequently observed during surveys.

A total of 13 raptor species were observed on the permit area. The only nests found were those of the American kestrel and burrowing owl. The burrowing owl is a species of "high interest" to both the State of Utah and the Federal Government.

The following protection and mitigation measures will be implemented by the applicant:

1. No crucial/critical big game habitat will be disturbed nor will any prairie dog colonies be affected in any way (Volume 7, Chapter 10 pages 10-114 to 10-119). The burrowing owl nest site is far enough from proposed activities that no disturbance would occur. The permit areas contain crucial/critical year long pheasant habitat but the areas of proposed disturbance receive minimal use by pheasants. In addition, no agricultural lands will be disturbed (except by possible subsidence). Water quality monitoring will be done to assure protection against harmful effects to ecosystems (page 10-121). Monitoring will include both streams and ponds. Monitoring of terrestrial wildlife will also be conducted.

2. Employees will be advised not to harass or illegally take any wildlife. The applicant will cooperate with the UDWR to reduce or eliminate the illegal or unwarranted killing of animals on the permit area. Employees will be advised of the probabilities of vehicle-wildlife collisons to increase their awareness of that possibility. Employees will also be instructed to avoid stopping and observing wildlife as it may disrupt their natural activities.

3. Topography, if significantly altered, will be contoured to premining conditions to the extent possible. Rock piles will be established to provide perches and cover for predators, prey species, reptiles and amphibians (page 10-124).

4. Existing powerlines do not pose as a hazard to raptor species (U.S. Fish and Wildlife Service letter dated April 8, 1982).

5. Any hazards that are determined to impact wildlife that are associated with mining activities (except roads) will be appropriately fenced. Fences will be designed to minimize hazards to big game (page 10-120).

6. Minimal disturbance to riparian habitat has occurred. No other habitats of unusually high value will be altered as no future surface disturbance at the mine is planned..

7. The applicant presents a discussion on the species of plants to be used for reclamation, their value as food and cover for wildlife, and how they will be selected and used to duplicate or enhance premining habitat values (Page 10-119).

Compliance

UMC 817.97 Protection of Fish, Wildlife, and Related Environmental Values

The applicant's proposal is such that minimal impacts to wildlife will occur. No habitat of threatened or endangered species nor any crucial/critical winter big game habitat will be affected in any way. No significant impact to any year long pheasant habitat designated as crucial/critical is expected. The applicant will minimize human disturbance to wildlife by advising employees against harrassment (Volume 7, page 10-120). The applicant will consult with the regulatory authorities and UDWR to develop a terrestrial wildlife monitoring program within six weeks of final approval.

An adequate survey of threatened and endangered plants and wildlife was completed. No disturbance of any threatened or endangered plant or animal species is anticipated (Biological Assessment for the Emery Deep Permit Application, Office of Surface Mining, dated December 20, 1983, Appendix A).

No new powerlines are proposed and modification of existing powerlines is not recommended.

Riparian habitat has been identified. The small amount that will be disturbed will be restored (Section 3.5 of PAP).

The applicant presents a discussion of how revegetation will be accomplished to restore and enhance habitat for wildlife (Volume 7, page 10-119). A list of plant species that are beneficial to wildlife and sources of seed is included (Volume 7, Appendix C).

Stipulations

None.

Revegetation: UMC 817.100, .111-.117

Existing Environment and Applicant's Proposal

The Emery Deep Mine permit area is characterized by a semiarid, continental type of climate. Daily and seasonal temperatures vary over a wide range. The growing season is 110 to 130 days. Climate records show

3. Seeding will be performed using a drill specifically designed for handling seeds of varying sizes and weights (The seed mixes and rates to be used are shown on page 6 of the November 11, 1983 Technical Review Response). Seed Plan A will be seeded in the more arid sites of the Mixed Desert Shrub, Annual Forb and Rock Outcrop/Talus vegetation types; Seed Plan B will be seeded in the more mesic sites of the Greasewood Shrubland vegetation type; and Seed Plan C will be seeded in the Riparian Meadow type. Seeding will be during the early spring or late fall (page 3-55 and 3-59) to take advantage of the more favorable physical environment for germination.

4. Straw mulch will be blown onto all reclaimed areas at a rate of 2000 lbs./acre (4000 lbs./acre on areas with high erosion potential) and anchored by a straight disk crimper. Hydromulching with wood fiber (2000 lbs/acre) and curlex blanketing will be used to stabilize especially difficult erosion areas. (pages 32-33, ACR response).

5. Noxious plants will be controlled by selective hand spraying with approved herbicides.

Vegetation cover, density, and frequency by species and group will be monitored periodically (years 2, 3, 5 and 7) (Page 7 of the DOC Response). Reference areas will be managed in a manner similar to the revegetated areas (Page 30, ACR Response). Comparisons for revegetation success will be based on random sampling of cover, woody plant density, and productivity of the reference areas and reclaimed areas (Page 8 of the DOC Response).

Compliance

UMC 817.100 Contemporaneous Reclamation

The applicant has committed to reclamation of the minesite immediately upon completion of mining. In addition, reclamation activities at the site are an ongoing operation to stabilize the area (see section 3.5.1 of the PAP). The applicant is in compliance with this section.

UMC 817.111 General Requirements

The applicant has submitted a revegetation plan which will establish a diverse, effective, and permanent vegetative cover on all affected lands. The plan encourages a prompt vegetative cover and recovery of productivity levels compatible with a postmining land use of wildlife habitat and rangeland. Permanent seed mixes for revegetation of disturbed areas are capable of self regeneration and plant succession, and will be at least equal in extent of ground cover to the natural vegetation of the area. Thus, the applicant is in compliance with this section.

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UMC 817.112 Use of Introduced Species

The seed mixes proposed have been developed in consultation with the Regulatory Authority. Yellow sweetclover (Melilotus officinalis) is the only introduced species to be used. It is easily established though not persistent, provides erosion control, and is important as a nitrogen fixer. Thus, the applicant is in compliance with this section.

UMC 817.113 Timing

Seeding will be conducted during the first favorable planting season (early spring or late fall being the most favorable planting seasons) following final site preparation. Thus, the applicant is in compliance with this section.

UMC 817.114 Mulching and Other Soil Stabilizing Practices

The applicant has committed to mulching all reclaimed areas. Straw mulch, wood fiber mulch, or curlex blanket mulch will be used, depending on the potential for erosion and difficulty of erosion control. Thus, the applicant is in compliance with this section.

UMC 817.116 Standards for Success

The applicant proposes to measure revegetation success by comparing reclaimed areas to reference areas. The applicant has committed to comparison of cover, woody plant density and productivity at the 90% confidence level with success being considered at least 90% of the cover, productivity, and woody plant density of the reference area. Thus, the applicant is in compliance with this section.

Stipulations

None.

Roads/Transportation: UMC 817.150-.176

Existing Environment and Applicant's Proposal

There are several existing roads in the Emery Mine area. Three of these; the pump road, tank road, and pond road are outside of the immediate facilites area and have been approved under previous actions (PAP, page 13-80). The pond road is currently being reclaimed. The major crossing over Quitchupah Creek within the mine complex has also been approved. This multi-plate pipe arch bridge is immediately above the confluence with Christiansen Wash. The mine yard roads within the facilities complex are accessed from Highway 10 northwest of the mine.

The mine yard roads traverse the length of the facilities complex and are used to haul coal from the various stockpiles located there. The majority of roads are constructed of materials located in the mine area, however, approximately 700 feet from the gate up to the mine yard is paved with asphalt. The mine yard itself has about a 6-inch lift of gravel and the road crossing Quitchupah Creek has a sand and gravel base. The road leading to the portals has no base and was built from materials in that area.

The roads are essentially flat, although the entrance to the yard, approximately 150 feet, has a grade of 5.5 percent, and approaches to the Quitchupah Creek crossing have grades of 4.6 to 7.5 percent over a 400-foot section (PAP, Plate 13-3). Stability of the roads is adequate because they are, for the most part, at a flat grade, and all are built on a rock sub-base.

Given that the roads are not cut-and-fill structures and are generally at a flat grade, there are very few drainage structures required. The only roadside ditch associated with the mine yard roads is near the portal area where it catches flow from the culvert system and routes it to sediment pond no. 2. That ditch is a minimum of 0.75 feet deep and has 2h:1 and 12h:1 side slopes. Swales are provided at sections of the road to allow flow from above the mine yard to enter the sediment pond. In fact, it is evident from Plate 13-3 that the six-inch road base serves as a berm to direct flow to the pond.

Compliance

Roads in the surface facilities area are stable and require few drainage structures to allow unrestricted flow to the sediment control system. The topography of the mine yard is such that roadside ditches are not required to enhance the stability of the roads. The applicant is in compliance.

Stipulations

None.

Prime Farmland: UMC 823

Existing Environment and Applicant's Proposal

Mapping units considered prime farmland by the SCS include: Bebe Fine Sandy Loam, Billings Silty Clay Loam, Huntington Clay Loam, Michney Loam, Palisade Loamy Sand, Penoyer Loam, Ravola Loam, and Woodrow Silty Clay Loam (Page 8-57). The areas of prime farmland within the Detailed Mapping Area are shown on Plate 8-3. Table 8-1 outlines expected yields for a number of crops and pasture potentials for the major soils mapped in the permit area.

Table 8-2 lists land capability classes and subclasses. Most soils in the area have limitations which include shallowness, erosion hazard, wetness, or climatic features. Prime farmlands that occur within the permit area are irrigated fields used as cropland, pastureland, or for hay production.

There is no prime farmland in the areas now affected by surface operations, nor is any prime farmland proposed to be disturbed by surface operations in the future. There is, however, prime farmland overlaying present and proposed underground mining. The potential exists that prime farmland may be impacted by subsidence in the future (see subsidence section in this TA). Prime farmland that may be impacted is located in T22S, R6E: Secs 20, 22, 29, 30 and 31. These areas were identified by matching areas of prime farmland to areas of present or future underground mining.

The applicant has committed to mitigate any adverse impacts (Page 12-16). The mitigation proposed is grading to restore the natural drainage. Since the extent of future subsidence is unknown, the impacts are, at present, indeterminable. An allowance for the mitigation of adverse impacts to structures and features is included in the applicant's liability insurance policy.

Compliance

The applicant will comply with these sections for the following reasons:

1. The applicant does not intend to conduct surface operations on prime farmland.

2. The applicant has committed to mitigate any adverse impacts that result from subsidence (PAP Page 12-16 and letter dated March 1, 1984).

Stipulations

None.

Postmining Land-use: UMC 817.133

Existing Environment and Applicant's Proposal

The land use within the permit area is classified as native rangeland and is used primarily for livestock grazing and wildlife. The rangeland within this area is in fair range condition (Letter from the Soil Conservation Service, November 9, 1983). Six vegetation types and disturbed land are found on the permit area. These types are discussed in Volume 6, Chapter 9.

Within the permit area, land use includes pastureland, irrigated farmland and pasture. Most farmland consists of alfalfa and improved pasture. Table 4-1 shows the extent of the various land use categories within the permit area. At present, only the land uses in the vicinity of the surface facilities have been affected. There has been a mine at the present-day Emery Mine site since the 1890's. The continuation of mining is not expected to cause any further degradation of land use or land use potential (Page 4-13). The postmining land use is described in Chapter 4, page 4-13. The applicant's proposed postmining land use is to restore the premining land use of rangeland and wildlife habitat.

Compliance

Reclamation of disturbed land to the premining land uses of livestock and wildlife grazing lands will be accomplished by implementation of the reclamation plan. This involves regrading the land to its approximate original contour, application of topsoil substitutes, and seeding with the appropriate seed mixture for the designated vegetation type. Thus, the applicant is in compliance with this section.

Stipulations

None.

Air Resources Protection: UMC 817.95

Existing Environment and Applicant's Proposal

The vicinity of the Emery Mine experiences a semi-arid steppe climate characterized by low relative humidity, abundant sunshine, generallly low precipitation, and warm summer temperatures. Average annual precipitation in the area is less than 10 inches. The town of Emery receives 7.55 inches annually. Normally, 75 percent of the precipitation enters the soil, two-thirds of which is lost due to evapotranspiration. Temperature variations can be extreme, ranging from -16 to 85 degrees F in winter and from 11 to 98 degrees F in the summer, as measured over the period 1960-1978. Prevailing winds over the permit area are from the west and southwest. Winds are generally calm, but can gust to 25 miles per hour. Winds are strongest during spring months. Air quality is generally good (PAP, Chapter 11).

Monitoring -- The applicant does not propose to conduct an air quality monitoring program due to the lack of any significant point source discharge and small disturbed acreage.

Fugitive Dust Control -- Emissions from the coal handling and loading are controlled by spraying the coal with water as it is mined at the face

and at all transfer points on the conveyor system. When the coal exits the mine and enters the tipple, it is thoroughly wetted. Road traffic dust is controlled by regularly spraying the unpaved areas with water (in the summer at least three times a day, and in the winter about two times each week) (PAP, Chapter 11).

A letter of approval from the Bureau of Air Quality has been obtained for the preparation plant facility and is attached to the Technical Analysis for that facility.

Compliance

The climatological data is acceptable. The fugitive dust control plan is adequate. No air quality monitoring is required and the applicant has obtained a letter from the Bureau of Air Quality (see Appendix A). The applicant is in compliance with UMC 817.95.

Stipulations

None.

Subsidence Control Plan: UMC 817.121-.126

Existing Environment and Applicant's Proposal

The Emery Coal Mine is located in the Mancos Shale Formation. A generalized stratigraphic column of the geology in the mine area is shown on page 6-2 of the PAP. The Ferron Sandstone is the coal bearing unit in the Emery Field. It averages 400 feet thick and is composed of interbedded layers of sandstone,siltstone, shale, clay, and coal. The coal seam which is now being mined by Consol, the I-J zone, occurs in the Upper Ferron. The base of the Ferron is located below any currently proposed mining. Above the Ferron is the Bluegate Shale Formation. The Bluegate is a soft, blue-grey shale unit of marine origin. In the Emery area, where this formation outcrops, it forms barren shale hills. It is approximately 700 feet thick in the mine area. Above the Bluegate Quaternary alluvial deposits occur along with gravel deposits.

The portals for the Emery Mine are drift openings at the coal outcrop and are located at the base of a natural cliff formed by the Ferron Sandstone. The coal seam dips to the west-northwest at three to four degrees. The depth of cover ranges from less than 100 feet near the portal area to 800 feet near the northwestern boundary. The western boundary of the site is in the vicinity of the Joe's Valley Fault Zone west of the permit area. Mining is limited by this fault.

Renewable resources and structures exist in the vicinity of the mine. The I-J mining zone is situated between the upper and lower Ferron aquifers. Both are good quality aquifers with the lower Ferron providing a municipal water source to the town of Emery, located 2 mines north of the permit boundary. The upper Ferron provides primarily local irrigation and stock water. Portions of the surface above the mine are extensively farmed using flood irrigation practices. Irrigation ditches cross over much of the mine area.

Several structures were identified overtop of the mine including one occupied structure. The applicant has inventoried the structures and some of the renewable resources, such as the streams, and made a preliminary evaluation of their condition and what effects subsidence would have on these items. This evaluation can be found in Chapter 12, Appendix 12.1 in the PAP. The structures which will be undermined by the proposed operation are:

culinary well
utility line
several corrals
several ponds
many irrigation ditches
mine access road
log cabin
several sheds
gravel roads
barn

Privately owned surface lands of 15 landowners will be undermined during the proposed permit term.

Cultural Resources exist in the area of the mine. However, the entire area above the mine has not yet been surveyed. The applicant has committed to surveying of sites one year prior to any retreat mining during the permit term. If cultural resource sites are identified, then the appropriate mitigation measures will be taken. The applicant will provide 3 copies of the results of any cultural resource study to the regulatory authority within one month after completion of the study for incorporation into the permit by revision.

Alluvial valley floor areas exist in the permit area. These features are discussed in the Alluvial Valley Floor (AVF) section of this Technical Analysis. The extent of the AVF is defined by the areal extent of the alluvial material in the drainage of Quitchupah Creek for those areas that can be potentially flood irrigated. The extent of active farming in the AVF's is shown on Figure 1, submitted on March 2, 1984. All of the agriculture associated with the AVF's is conducted using flood irrigation practices. Water is diverted either from Muddy Creek or Quitchupah Creek.

In conjunction with the AVF's and in other areas over the mine, there are prime farmlands under which mining will occur. Most of these areas are being actively farmed.

Consolidation Coal Company is using a room and pillar technique of mining. Main and sub mains are developed during advance mining with development of production panels off of the mains. The company is planning to utilize partial extraction methods to recover coal at the Emery Mine rather than maximum extraction techniques. That is, no attempt will be made to entirely recover pillars, but rather only portions of the pillars will be recovered. The reasons for this are (1) the stability of the main roof is uncertain; (2) the personnel at the mine are inexperienced in full pillar recovery; and , (3) the effect of full pillar extraction upon the Ferron aquifer is uncertain (PAP, page 3-25). The pillars will be split during retreat mining in the production panels leaving irregularly shaped pillar stumps (PAP Figure 12-2). During final retreat mining, the company will also attempt to recover a portion of the pillars in the mains. However, plans have been made to leave areas entirely underlain by complete pillars to protect the surface from subsidence.

The result of partial extraction is that over time, the pillar stumps will deteriorate causing subsidence. This type of subsidence results in an uneven settling of the ground surface because the stumps will fail irregularly. The amount of subsidence which would be expected will depend upon many factors including the depth of cover, the thickness and strength of the strata above the area where the failure occurred, and the width of the opening in the area of the pillar failure. In the revised Chapter 12 of the PAP (November 8, 1983), the company has provided an analysis on the possible extent of the subsidence. Exact prediction of this type of information is impossible due to the many variables that affect subsidence.

The amount of subsidence predicted by the company ranged from 4.5 feet at 200 feet of cover to 1.7 feet at 800 feet of cover. The analysis was based upon failure of a 40 foot pillar; which was considered by the opeator to represent the average center to center pillar width left after mining within a panel; percent extraction in the panel, and a method developed by S. S. Peng and S. L. Cheng (May 1981) was utilized for analysis. The operator stated that this would be a worst-case analysis since failure of the entire panel width was assumed to have occured in the analysis, and this is highly unlikely. However, recently collected subsidence data refutes this conclusion. At a monitoring point identified as SM-K3 in the recently submitted monitoring data, a vertical subsidence displacement of 5.33 feet was measured. Upon evaluating the location of this point on the mine map and the UIO Seam Structure and Isopach Map, the depth of cover at this point appears to be 320 feet. Therefore, the maximum subsidence predicted by the operator at 200 feet of cover was exceeded in an area where the depth of cover was approximately 320 feet. This points out that the amount of subsidence expected at the mine is not yet understood, and that continued monitoring and revision of the approach used to predict subsidence is needed for this operation.

Additional analyses by the applicant indicated that the pillar stumps could be stable where the depth of cover does not exceed 107 feet. At this depth the pillars would essentially have a stability safety factor of one and at shallower depths the stability would increase and conversely, at greater depths subsidence would be expected to occur. However, as mentioned above, there are many unknowns in this type of analysis and continued monitoring will provide additional data.

The operator is currently planning to protect the drainages of Christiansen Wash and Quitchupah Creek from subsidence. A buffer zone approximately 500 feet wide is being left along the length of the channels reflecting an angle of draw of approximately 20 degrees. Within this zone, pillars will not be extracted. Pillars that will be left have been designed by the operator to be stable. The method that the operator used to evaluate the size of the pillars to be left closely follows the method proposed by Holland (1972) and is described in section 12.4.3 of the PAP. The application of the pillar design method in this section is more conservative than the application in the subsidence prediction section of the PAP (section 12.4.2). The applicant has used a more regularly shaped pillar and the tributary area is more reasonably applied. In the operators evaluation of the pillar size, it is stated in the November 11, 1983 response that a proposed safety factor of 1.75 will be used to design the smallest pillars to be left in the buffer zone. The size of the pillars will vary with the depth of overburden, seam thickness and extraction ratio.

The buffer zone for the drainages does not address the protection of AVF's. The alluvial deposits in Quitchupah Creek extend beyond the buffer zone and would be impacted by mining. The regulatory requirements protecting AVF's state that farming cannot be interupted on an AVF. If subsidence occurred, and ponding of water resulted, then farming would be disrupted.

Specific plans were submitted by the operator with respect to protection of other renewable resources and structures (Responses dated May 18, 1984 and June 1, 1984). The applicant will provide the regulatory agency 5 copies of a subsidence control plan for renewable resources and structures at least 3 months prior to mining under such structures or renewable resource lands. The operator has committed to mitigation of any subsidence impacts as outlined on page 16 chapter 12, November 8, 1983 response. These commitments include: a) restore, rehabilitate, or remove and replace, to the extent technologically and economically feasible, each materially damaged structure, feature or value; 2) purchase the damaged structure or feature for its pre-subsidence fair market value; or, 3) compensate the owner of any surface structure that has been materially damaged by subsidence.

The operator carries liability insurance which covers mining impacts associated with subsidence (the amount of coverage is $1,000,000 for each occurrence). This amount will cover the costs to purchase or repair

structures, or mitigate impacts to farmlands. With respect to farming, if depressions in the surface occur creating an area of ponding, the area would be graded or topsoil brought in if there was not enough material available in the immediate vicinity. Since the AVF's are flood irrigated, regrading of these farm areas would also occur.

The operator has proposed a subsidence monitoring plan on page 17 of Chapter 12, November 8, 1983 submittal. The plan is to install survey points in advance of mining and monitor at intervals specified in the plan. The monitoring will continue during the permit term for all areas which will be undermined during this permit term. At the end of the term, the program will be reevaluated and modified if necessary to reflect the newly obtained data. The applicant will provide 3 copies of a subsidence monitoring report to the regulatory authority within one month after completion of any subsidence monitoring field survey conducted pursuant to the approved subsidence control plan. Subsidence monitoring reports shall contain the following information:

1. Mine Maps showing where pillars have been pulled and the month and year that such pillars were removed or partially removed.

2. Maps showing the location of survey monitoring stations and tension cracks and/or compression features visible on the surface.

3. The differential level and horizontal survey summary.

4. Brief narrative explaining any "significant movement" and any action the applicant has taken to mitigate the effects of such movement or any tension or compression features visible on the surface.

Compliance

UMC 817.121 Subsidence Control: General Requirements and UMC 817.124 Subsidence Control: Surface Owner Protection

The applicant has provided a subsidence mitigation plan (Responses dated May 18, 1984 and June 1, 1984). This plan has been assessed by the regulatory agencies and was found to be adequate for permitting. The applicant is in compliance with this section.

UMC 817.122 Subsidence Control: Public Notice

Consol will submit written notice to surface landowners at least six months prior to mining under or adjacent to their property. Such notice shall include:

1. Identification of the specific areas in which mining will occur.

2. Measures to prevent, minimize or control subsidence.

The applicant is in compliance with this section of the regulations.

UMC 817.126 Subsidence Control: Buffer Zones

The operator has stated that a buffer zone will be left under Quitchupah Creek and Christiansen Wash. These buffer zones are approximately 500 feet wide and are wide enough to prevent subsidence impacts to the streams as defined by the angle of draw of 20°.

OSM's groundwater model predicts (see CHIA and Appendix C to the TA) that the upper Ferron will be essentially dewatered in the vicinity of the underground mine, and that there will be no effect on the aquifer system from the proposed surface mine. The applicant has achieved a water replacement and mitigation agreement with the owners of the wells which may be impacted by the dewatering; therefore, the impact to the upper Ferron is considered insignificant. The applicant's monitoring program commitments will provide a gauge for other impacts and appropriate mitigation if any occur.

The OSM model also indicates that drawdown in the static piezometric level of the lower Ferron will eventually reach about 140 feet. This represents a reduction of 12 percent in current piezometric levels. A piezometric reduction is not considered significant until it reaches at least 25 percent. The greatest impact of the predicted drawdown will be at the Emery municipal well where slightly more electrical power will be required to pump water.

The applicant has provided a determination of the extent of the AVF's above the mine currently being farmed. These areas are covered by the Grandfather clause and are exempt from this requirement, although the subsidence impacts must still be mitigated (See the AVF section UMC 817.22 of this TA for an evaluation of the areas which must be protected).

According to UMC 761.12(e), where the surface effects of undergound mining would be conducted within 300 feet measured horizontally of any occupied structure, the operator shall submit with the application a written waiver from the owner of the dwelling consenting to these activities. The applicant has not obtained this waiver, therefore mining will not be permitted under the occupied structure and in an area defined by the 300 foot perimeter around the structure. Also, mining will be limited in the area within the angle-of-draw around the structure to first mining only (i.e. no pillars will be pulled). If at a later date a waiver is granted, then mining may occur in this area. The applicant is in compliance with this section.

Stipulations

None.

REVISED RECLAMATION BOND SUMMARY

Consolidation Coal Company
Emery Deep Mine
Act/015/015, Emery County, Utah
February 26, 1985

The bond summary for Emery Deep Mine has been revised as follows to reflect indexed inflation costs since the bond summary was made and to include inflation considerations.

Based on Means Historical Cost Index the Division has adjusted the bond amount as follows:

Year	Index
1982	157.5
1983	172.3
1984	174.1
1985	175.7

1. Convert GRAND TOTAL BOND AMOUNT to 1985 Dollars.

$$\frac{175.7}{174.1} \times \$681,222 = \$687,483 \text{ (1985\$)}$$

2. Inflate the Bond amount for the 5 year permit term. The Division uses the average inflation of the 3 past indexes in determining and inflation factor for the next five years.

Year	Index	
1982	157.5	
		9.40%
1983	172.3	
		1.04%
1984	174.1	
		0.92%
1985	175.7	
		11.36% / 3 = 3.79% per yr

At an average of 3.79% per year on the average for inflation for the 5 year permit term, the calculation is:

$$(1.0379)^5 \times \$687,484 = \$828,000$$

3. REVISED TOTAL BOND AMOUNT = $828,000 (1990$)

DETAILED BREAKDOWN OF BOND ESTIMATE

Part I - Removal of Structures

A. Structure Removal Cost

1.	Stacker - Reclaim System 200 Ft X 180 lb/Ft. X ton/2000 lb. X $92/ton =	$ 1,656
2.	Tipple 54,000 c.f. X $.16/c.f. 175 Ft. X 180 lb/ft X ton/2000 lb. X $92/ton	$ 8,640 $ 1,449
3.	Tipple Control Station 1000 c.f. X $.16/c.f.	$ 160
4.	Stoker Oil Heater 1500 c.f. X $.16/c.f.	$ 240
5.	100,000 Gallon Water Tank 13,267 c.f. X $.16/c.f.	$ 2,123
6.	Fresh Water Treatment Building 4,500 c.f. x $.16/c.f.	$ 720
7.	Warehouse/Office Building 120,000 Cu. Ft. x $.16/Cu. Ft.	$19,200
8.	Bathhouses (3) 12,000 Cu. Ft. x 3 x $.16	$ 5,760
9.	Foreman's Office Building 8,000 Cu. Ft. x $.16/cf	$ 1,280
10.	Sampling Trailer 5,000 Cu. Ft. x $.16/cf	$ 800
11.	Storage Building 1,000 Cu. Ft. x $.16/cf	$ 160
12.	Storage Trailers (2) 5,000 Cu. Ft. x 2 x $.16/cf	$ 1.600
13.	Shift Change Building 6,000 Cu. Ft. x $.16/cf	$ 960

14.	Tipple Shop 5,000 Cu. Ft. x $.16/cf	$ 800
15.	Spare Office Trailer 5,000 Cu. Ft. x $.16/cf	$ 800
16.	PCB Storage Trailer 1,000 Cu. Ft. x $.16/cf	$ 160
17.	Mine Fan Building 18,000 Cu. Ft. x $.16/cf	$ 2,880
18.	Mine Substation 1,000 Cu. Ft. x $.16/cf	$ 160
19.	Borehole Pump Facility 10 tons x $92/ton	$ 920
	Sealing Hole	$ 500
20.	Truck Scales 20 tons x $92/ton	$ 1,840
	1,000 Cu. Ft. x $.16/cf	$ 160
21.	Explosive Storage 300 Cu. Ft. x $.16/cf	$ 48
22.	Gaging Stations (2) 175 Cu. Ft. x $.16/Cu. Ft.	$ 56
23.	Sewage Treatment System 1,000 Cu. Ft. x $.16/cf	$ 160
24.	Bridge on Quitchupah Creek Structure Removal 50 Cu. Yd x $92/Cu/Yd	$ 4,600
	Road Removal - 650 LF x 450 Sq Ft/LF x 1 cy yd/1=27 Cu Ft x $2.19/cu yd	$23,725
25.	Buried Tank Cleaning and Sealing Lump Sum	$ 2,000
	TOTAL FOR STRUCTURE REMOVAL	$83,557

B. Blockwall: 400 sq. ft. x 6.48 per sq. ft. = $ 2,592
Backfill: 870 yd^3 x $1.70 per yd^3 = $ 1,479
8" PVC Drian Pipe: 90 LF x $8.00 per LF = $ 720
Total Cost per Portal = $ 4,791
4 Portals = $19,164

Part II - Regrading: A Pond, Road and Berm Removal

1. Roadside Berms

3700 LF x 12 sq ft/LF x 1 cu yd/27 cu ft	=	1,644 cu yd

2. Dike Improvement

400 LF x 600 sq ft/LF x 1 cu yd/27 cu ft	=	8,889 cu yd

3. Main Sedimentation Pond

400 LF x 500 sq ft/LF x 1 cu yd/27 cu ft	=	7,407 cu yd

4. Secondary Sedimentation Pond

100 LF x 150 LF x 5 ft depth x 1 cu yd/27 cu ft	=	2,778 cu yd

5. Mine Discharge Sedimentation Pond

1900 LF x 162 sq ft/LF x 1 cu yd/27 cu ft		11,400 cu yd

6. Evaporation Lagoon

775 LF x 93 sq ft/LF x 1 cu yd/27 cu ft	=	2,675 cu yd
Material from bottom of lagoon	=	1,000 cu yd

7. Pond Road

1200 LF x 15 sq ft/LF x 1 cu yd/27 cu ft	=	667 cu yd

8. Pump Road

1100 LF x 22.5 sq ft/LF x 1 cu yd/27 cu ft	=	917 cu yd

9. Tank Road

2100 LF x 7.54 sq ft/LF x 1 cu yd/27 cu ft	=	583 cu yd

10. Mine Yard Roads (except road across the bridge)

3,350 LF x 36 sq ft/LF x 1 cu yd/27 cu ft	=	4,467 cu yd
TOTAL MATERIAL FOR ROADS, PONDS & BERMS	=	42,472 cu yd
Total Cost for Regrading the Roads, Pond & Berms 38,360 cu yds x $2.19/cu yd	=	$84,008

B. Backfilling and Grading

A grading unit cost of $2.19/cu. yd. is taken form 1984 means Building Construction Data. It is assumed that the work will be performed by self-propelled scrapers withan average haul distance of 1,000 ft. at a rate of 95 cubic yards per hour.

24 acres x 43,560 sq. ft./acre x 1 ft x 1 cu. yd./27 cu. ft. = 38,720 cu. yds.

38,720 cu. yds. x $2.19/cu. yd. = 84,797

Part III - Revegetation

	Cost/Acre	# of Acres	Cost
Seedbed Preparation	$ 60.00	32. 7 acres	$1962
Fertilizer	$100.00		$3270
Seed			
A. 29 acres @ $292.82/acre			$8492.00
B. 2 acres @ $330.13/acre			$ 660.00
C. 1.7 acres @ 128.55/acre			$ 218.00
Seeding			
(labor & equipment)	$150.00		$4905
Mulch	$135.00		$4414
			$23,921

Seed Plan A
(Arid - 29.0 acres)

Species	Cost/LB(PLS*)	Lbs. of PLS*/Acre	Total Cost
Indian ricegrass	7.25	3.0	$ 21.75
alkali sacaton	2.90	0.5	$ 1.45
galleta	25.00	2.5	$ 62.50
western wheatgrass	2.90	3.0	$ 8.70
winterfat	13.95	4.0	$ 55.80
4-wing saltbush	4.00	4.0	$ 16.00
rubber rabbitbrush	57.60	1.0	$ 57.60
yellow sweetclover	.48	1.5	$ .72
desert globemallow	41.60	0.5	$ 20.80
blueleaf aster	95.00(bulk)	0.5	$ 47.50
TOTAL		20.5	$292.82

*Pure Live Seeds

Seed Plan B
(Greasewood - 2 acres)

Species	Cost/LB(PLS*)	Lbs. of PLS*/Acre	Total Cost
blue grama	3.25	0.75	$ 2.44
streambank wheatgrass (thickspike)	3.90	3.0	$ 11.70
sand dropseed	2.45	.25	$ .61
winterfat	13.95	4.0	$ 55.80
4-wing saltbush	4.00	4.0	$ 16.00
rubber rabbitbrush	57.60	1.0	$ 57.60
big sagebrush	40.00	.25	$ 10.00
greasewood	61.00	2.5	$152.50
yellow sweetclover	.48	1.0	$ .48
blue flax	13.00	1.0	$ 13.00
evening primrose	20.00	0.5	$ 10.00
TOTAL		18.25	$330.13

Seed Plan C
(Riparian - 1.7 acres)

Species	Cost/LB(PLS*)	Lbs. of PLS*/Acre	Total Cost
western wheatgrass	$ 2.90	5.0	$ 14.50
slender wheatgrass	3.35	3.0	$ 10.05
alkali sacaton	2.90	0.25	$ .72
Spike muhly (only one available)	7.65	0.25	$ 1.91
akalaigrass	3.50	0.5	$ 1.75
yellow sweetclover	.48	1.5	$ .72
blueleaf aster	$95.00 (bulk)	0.5	$ 47.50
Indian blanket	$51.40	1.0	$ 51.40
TOTAL		12.0	$128.55

Part IV - Well Replacements

Two water wells may be impacted by mining during this permit term. It is estimated tht replacement of the wells will cost about $70,000 each therefore $140,000 has been included in the bond estimate for well replacement.

Part V - Monitoring and Maintenance

A. After mining has been completed it is anticipated that the sedimentation ponds would require rather infrequent discharge sampling and maintenance because of the infrequent precipitation. A lump sum amount of $10,000 has been included for pond sampling and maintenance.

B. Reseeding is 25% of revegetation cost:

25% of 23,921 = $5980.00

C. Rills and Gullies:

10 yrs. x [(8 hrs/day x 1 day/yr x $20/hr. for inspection) + $600 for miscellaneous equipment and supplies] = $7,600.00

D. Erosion Control:

$37.63/acres x 32.7 acre = $1231.00

E. Vegetation Monitoring:

$108.23/acre x 32.7 acre = $3539

Part VI - Backfilling in the Mine

1. The conveyor would have to be placed beneath a hopper and the drive mechanisms reversed. It is estimated that this would take 2 labors 3 days, and a crane and crane operator 3 days. 2 labors (@ $21.95/hr) 3 days - 6 days = 48 hrs x $21.95 = crane.

   (2 x 24 hr x $15.00/hr) + (24 x $132.25/hr) = $3,894

2. A front end loader would be used to load the hopper. Productivity, assuming that essentially no haul is required. (7 CY bucket) = 840 CY/hr, cost per hour plus operator is $175.08, total hours required is 46. Total cost of operation is $8,054.

3. The total volume which will require disposal in the mine is 38,720 CY. Assuming that a diesel scoop will load the material in the mine, the material will only be stacked about 5 feet high. Given and average entry width of 20 feet, then 10,454 feet of entry need to be backfilled. There appears to be sufficient entry length available between 1st and 2nd north. Using an average haul of 600 feet (cycle time of 3.37 min.), and a bucket capacity of 5 yards, the hourly production is 71 CY. Time required for the machine is 545 hours. Hourly costs including an operator and one helper are $97.50. Total cost for backfilling with the scoop is $53,138.

4. The ventilation system will need to be modified to meet MSHA standards for the operation. Use a cost of $5,000 for supplies and labor.

   Total cost for this operation is $70,086.

Part VII - Placement of Soil Material

39,000 cy X $2.19/cy = $85,410

TOTAL RECLAMATION COST	$619,293
10% contingency	$ 61,929
	$681,222(1984 dollars)

APPENDIX A
SUPPORTING DOCUMENTATION

Consolidation Coal Company
Emery Deep Mine
ACT/015/015, Emery County, Utah
February 26, 1985

I. Letter from Bureau of Air Qualilty, dated January 22, 1982.

II. Letter from U. S. Fish and Wildlife Service, dated April 8, 1982.

III. Letter from Division of Wildlife Resources, dated May 24, 1982.

IV. Biological Assessment for the Emery Deep Permit Application, dated January 5, 1984.

V. Letter from Division of State History, dated October 24, 1983.

VI. Letter from Division of Water Rights, dated September 25, 1981.

VII. Memo from U.S. Bureau of Land Management, dated March 30, 1984.

VIII. Memo from BLM regarding coal recovery, dated June 25, 1984.

IX. Memo from the U. S. Fish and Wildlife Service, dated January 20, 1984.

(File ACT/015/015
~~Copy to Sally, Lyn~~
JIM
FEB 03 1982

Scott M. Matheson
Governor

STATE OF UTAH
DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
150 West North Temple, P.O. Box 2500, Salt Lake City, Utah 84110

Alvin E. Rickers, Director
Room 426 801-533-6121

James O. Mason, M.D., Dr.P.H.
Executive Director
801-533-6111

DIVISIONS
Community Health Services
Environmental Health
Family Health Services
Health Care Financing and Standards

OFFICES
Administrative Services
Health Planning and Policy Development
Medical Examiner
State Health Laboratory

533-6108

January 22, 1982

RECEIVED
JAN 28 1982
DIVISION OF
OIL, GAS & MINING

Mr. Richard Dawes
Office of Surface Mining
Region V
Brooks Towers
1020 Fifteenth Street
Denver, CO 80202

Re: Consolidation Coal Company;
Preparation Plant and Loadout
Facility.

Dear Mr. Dawes:

The Bureau of Air Quality issued an air quality approval order to Consolidation Coal Company on January 8, 1982. The order authorized the construction and operation of a replacement coal preparation plant, a new stoker loadout, and a coal fired furnace for their office/warehouse. A copy is enclosed for your reference. You will note that an air monitoring program was not required and thus not included in the permit conditions. No modeling nor monitoring were done for this approval order because an increase in emissions is not expected. Thus, no modeling or monitoring is required under either State or Federal air statutes. However, fugitive dust control practices are included in the permit conditions.

The issue of air monitoring and other requirements came to our attention through a letter addressed to you from the DOGM dated January 7, 1982. Attached to the letter was a section of OSM regulations Section 784.26a requires an air monitoring program. Please refer to letters dated September 26, 1980 and November 17, 1980 which I sent to Mr. Donald A. Crane of your office regarding a similar situation with Arco Coal Company. In the letters I suggested that OSM and EPA discuss the matter of responsibility conflicts in OSM and EPA regulations and resolve the issues in a manner consistent with the Clean Air Act.

I also stated in the letters that the Clean Air Act gives the State the primary responsibility for controlling air pollution. The State of Utah takes responsibility quite seriously.

I suggest you consider the State's approval order and this letter as sufficient to meet the requirements of your regulation 784.26 (Air Pollution Control Plan). The cost to the company to pursue the monitoring program for this project is unnecessary since the program is not required by the Federal PSD program nor the State regulations.

If you have any questions, please feel free to contact me at (801) 533-6108.

Sincerely,

Brent C. Bradford
Executive Secretary
Utah Air Conservation Committee

DR:il

cc: Oil, Gas & Mining Division (J. Smith)
EPA Region VIII (R Duprey)

Enclosure

To Jim Copy to Lynn & Sue
File
ACT/007/012
ACT/015/015
ACT/007/007

United States Department of the Interior
FISH AND WILDLIFE SERVICE
AREA OFFICE COLORADO—UTAH
1311 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138

IN REPLY REFER TO: (ES)

April 8, 1982

RECEIVED
APR 19 1982
DIVISION OF
OIL, GAS & MINING
JIM
APR 23 1982

Cleon Feight, Director
Division of Oil, Gas, and Mining
4241 State Office Building
Salt Lake City, Utah 84114

Dear Mr. Feight:

On March 24, 1982, Ron Joseph of my staff examined the various powerlines of two coal companies on a recent trip to Price, Utah. The purpose of this letter is to apprise you of his findings.

Mr. Joseph met with Mr. William Kurkwood of U.S. Steel and examined the 2 phase and 3 phase company lines at their Wellington Coal Preparation Plant. Although these lines do not conform to raptor protection specifications, we do not recommend correcting the lines because they are not being used by raptors. The lack of raptor use of the crossarms is due, in part, to the close proximity to the preparation plant and the poor habitat conditions near the site.

In the afternoon, Mr. Joseph met with Dean Bray of Consolidated Coal Company and was escorted to the field to examine the 3 phase powerline at the Emery Deep Mine site. This short east-west powerline traverses shadscale habitat which is not used extensively by eagles. No eagle carcasses, bone piles, excrement, or other use was noted. Consequently, we do not recommend any modification of the Emery Deep Mine site powerline.

For your information, Mr. Joseph examined, by helicopter, the potentially hazardous powerline in Clark Valley which was reported in our October 9, 1981 letter to you. The Clark Valley line is maintained and operated by Utah Power and Light (UP&L) and this line supplies power to Kaiser Steel Company's Sunnyside Coal Mine. However, the problem sections identified traverses BLM land and is not within any coal company permit boundaries. The UP&L line to Kaiser's Sunnyside mine was examined and no eagle carcasses were discovered primarily because the line crosses pinyon-juniper land; habitat not extensively used by eagles. However, six eagle carcasses were collected along a 10 mile segment of the Clark Valley line in sagebush habitat. We will be working with UP&L to modify the segment of line through prime eagle habitat to reduce future losses.

Mr. Joseph will continue these field investigations of coal company powerlines when requested and we will keep you informed accordingly.

Sincerely yours,

Robert D. Joseph

Area Supervisor

cc: Larry Dalton, DWR - Price, Utah
Dave Mills, BLM - Price, Utah
OSM - Denver, Colorado ATTN: Shirley Lindsey
Marty Phillips, LE - Salt Lake City, Utah
Clark Johnson, EOS - Salt Lake City, Utah

state of utah

DIVISION OF WILDLIFE RESOURCES
EQUAL OPPORTUNITY EMPLOYER

DOUGLAS F. DAY
Director

1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

File
ACT/015/015
~~Copy to Lynn~~

JIM

MAY 27 1982

May 24, 1982

Mr. Cleon B. Feight, Director
Division of Oil, Gas and Mining
State Office Building
Salt Lake City, Utah 84114

Attention: James Smith

Dear Jack:

We have reviewed the Mining and Reclamation Plan (MRP) submitted by Consolidation Coal Company for the Emery Deep Mine. The MRP as it relates to wildlife is well done. Our only criticism is of section 4. The MRP's discussion of land use attempts to separate various land uses into broad general categories. Such an approach is acceptable; however, each of the broad categories experience various levels of use by wildlife. Thus, all uses of the land provide various qualities or aspects of wildlife habitat. Section 4 and table 4-1 (page 4-12) need to be corrected to properly illustrate this situation. The entire 5,180 acre permit area is a mosaic of various wildlife habitats.

Thank you for an opportunity to review this MRP.

Sincerely,

Douglas F. Day
Director

RECEIVED
MAY 27 1982
DIVISION OF
OIL, GAS & MINING

GOVERNOR
Scott M. Matheson

DEPT. OF NATURAL RESOURCES
Gordon E. Harmston
Exec. Director

WILDLIFE BOARD
Roy L. Young — Chairman
Lewis C. Smith L. S. Skaggs
Warren T. Hanward Chris P. Jouflas

United States Department of the Interior
OFFICE OF SURFACE MINING
Reclamation and Enforcement
BROOKS TOWERS
1020 15TH STREET
DENVER, COLORADO 80202

JAN 5 1984

MEMORANDUM

To: Mr. Fred Bolwahnn, USFWS
Endangered Species Section

From: Steve Manger, Branch Chief
Utah Task Force

Subject: Biological Assessment for the Emery Deep Permit Application (UT0005), Emery County, Utah.

OSM has prepared and reviewed the attached Biological Assessment for the Emery Deep permit application. As you review this assessment please remember that the proposed permit is for an existing coal operation where there are no additional disturbances proposed during the term of this permit. Therefore, there are no known effects anticipated for any threatened or endangered (T&E) species. The assessment, however, does address the potential for the existence of T&E species within the permit area and adjacent lands.

cc. Susan Linner, UDOGM.

Biological Assessment For The Emery Deep Mine,
Consolidation Coal Company
Prepared By The Office of Surface Mining,
Western Technical Center,
Denver, Colorado.
December 20,1983.

Background Information

The Emery Deep Mine, operated by Consolidation Coal Company (Consol) is an underground mine located in Emery County approximately four miles south of Emery, Utah. The mine began operations more than 80 years ago. Current production is about 700,000 tons per year and is planned to increase production to about 1.7 million TPY during the next five years. The Emery Deep permit area encompasses 5,180 acres of which 42 acres are previously disturbed by surface facilities. The disturbed area represents about 1 percent of the permit area. The post mining land use includes wildlife and the reclamation plan will incorporate food and cover vegetation to support wildlife species in the area. Operations at Emery Deep Mine have been temporarily suspended as of June 29, 1983.

On September 23, 1983, OSM requested a list of threatened and endangered species potentially inhabiting the Emery Deep Mine site from the U.S. Fish and wildlife Service (FWS), Salt Lake City, Utah. The FWS responded on October 21,1983 with a list including Wright fishhook cactus (Sclerocactus wrightae). No other species were identified by the FWS as potentially inhabiting the Emery Deep Mine site. The assessment of potential impacts on the species is presented below.

IMPACT ASSESSMENT

Wright fishhook cactus

Wright fishhook cactus (Sclerocactus wrightae) has been collected in Emery County by Dorde Wright Woodruff (1961) and Lyman Benson (1966)[1]. Wright fishhook cactus occurs in close proximity with another fishhook cactus of the same genus (S. pariflorus), which is not a threatened or endangered (T&E) species. The only visual difference between the two cacti are the flower color and shape. Both cacti flower in the early spring. During the summer the cacti sometimes shrink to ground level to retain moisture making identification very difficult. There are no identified individuals or communities of Wright fishhook cactus inhabiting the Emery Deep permit area or within a mile of the permit area. However, two sites of possible S. pariflorus have been located within one mile east of the permit area and another within two miles east of the permit area.

1 U.S. Fish and Wildlife Service. 1983.

Consol contracted a consultant that conducted a vegetation survey of the permit area. S. wright and S. pariflorus were not encountered in the survey, however, Echinocactus whipplei var. spinosior, another fishhook cactus that is not a T&E species, was found on the site. Mining operations within the Emery Deep permit area are not expected to have any additional effect on the vegetation. No expansion of disturbance is projected through the term of the permit. However, there is a potential for encountering Wright fishhook cactus under the proposed Emery surface mine, a different permit application adjacent to the Emery Deep Mine. The proposed surface mine will be evaluated for the potential of threatened and endangered species at a later date. Therefore, OSM does not anticipate disturbance of any threatened or endangered plant or animal species as a result of the proposed Emery Deep Mine permit.

REFERENCES

Bureau of Land Management. 1983. Uinta-Southwestern Utah Coal Regional Round Two Final Environmental Impact Statement.

England, L. 1983. Personal Communication. U.S. Fish And Wildlife Service, Endangered Species, November, 1983.

U.S. Fish And Wildlife Service. 1983. Technical Review Draft Recovery Plan for the Wright fishhook cactus, Sclerocactus wrightiae. Department of the Interior.

U.S. Fish And Wildlife Service, U.S. Forest Service, and Bureau of Land Management. Date unknown. Illustrated Manual of Proposed Endangered and Threatened Plants of Utah. Department of the Interior and Department of Agriculture.

Folder No. 2
Copy to
Lynn

SCOTT M. MATHESON
GOVERNOR

STATE OF UTAH
DEPARTMENT OF COMMUNITY AND
ECONOMIC DEVELOPMENT

Division of
State History
(UTAH STATE HISTORICAL SOCIETY)

MELVIN T. SMITH, DIRECTOR
300 RIO GRANDE
SALT LAKE CITY, UTAH 84101-1182
TELEPHONE 801/533-5755

October 24, 1983

James W. Smith, Jr.
Coordinator of Mined
Land Development
Division of Oil, Gas & Mining
4241 State Office Building
Salt Lake City, Utah 84114

JIM
OCT 26 1983

Attn: Lynn Kunzler

RE: ACR Response, Consolidated Coal Company, Emery Deep Mine, ACT/015/015, Folder No. 2, Emery County, Utah

Dear Mr. Smith:

The Utah Preservation Office has received a copy of the ACR response from Consolidated Coal Company on its Emery Deep Mine. After review of the material provided, our office notes that there are no materials on which our office can comment or provide further assistance to the Division of Oil, Gas & Mining at this time.

Since no formal consultation request concerning eligibility, effect or mitigation as outlined by 36 CFR 800 was indicated by you, this letter represents a response for information concerning location of cultural resources. If you have any questions or concerns, please contact me at 533-7039.

Sincerely,

James L. Dykman
Cultural Resource Advisor

JLD:jrc:G573/7313c

RECEIVED
OCT 2 . 1983
DIVISION OF
OIL, GAS & MINING

State History Board: Milton C. Abrams, Chairman • Thomas G. Alexander • Philip A. Bullen • J. Eldon Dorman • Elizabeth Griffith
Wayne K. Hinton • Dean L. May • David S. Monson • William D. Owens • Helen Z. Papanikolas • Anand A. Yang

JIM

OCT 0 1 1981

STATE OF UTAH

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RIGHTS

DEE C. HANSEN
STATE ENGINEER

EARL M. STAKER
DEPUTY

200 EMPIRE BUILDING
231 EAST 400 SOUTH
SALT LAKE CITY, UTAH 84111
(801) 533-6071

DIRECTING ENGINEERS
HAROLD D. DONALDSON
DONALD C. NORSETH
STANLEY GREEN
ROBERT L. MORGAN

September 25, 1981

Mr. James W. Smith, Jr.
Coordinator of Mined Land Development
Utah Division of Oil, Gas, and Mining
1588 West North Temple
Salt Lake City, Utah 84116

RE: Consolidation Coal Co.
Emery Deep Mine
ACT/015/015
Emery County, Utah

Dear Mr. Smith:

This office has completed its review of the Mining and Reclamation Plan for the above mentioned project. Both the water rights and pond design are in order; therefore this letter will serve as approval for the project.

Sincerely,

Dee C. Hansen

Dee C. Hansen, P.E.
State Engineer

DCH/RLM/cpm

cc: Price Area Office

001

IN REPLY REFER TO
3400
U-5287
(U-067)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Moab District
P. O. Box 970
Moab, Utah 84532

MAR 3 1 1984

Memorandum

To: Center Administrator, OSM, Denver, CO

Attention: Louis Hamm

From: Associate District Manager, Moab

Subject: Response to Revisions of Mining and Reclamation Plan for Consolidation Coal Company's Emery Deep Mine

We have reviewed revisions to the mine plan concerning ground water and alluvial valley floor investigations, OSM Serial No. UT-0005, and have found them to be complete. We have no further comments at this time.

We do not recommend that any of the lands within the mine plan area be designated unsuitable for coal mining.

Kenneth V Rhea

OSM-UTC
OSM APR -1 AM 10: 13

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
UTAH STATE OFFICE
136 E. SOUTH TEMPLE
SALT LAKE CITY, UTAH 84111

IN REPLY REFER TO
3482 (921)
U-5287

JUN 25 1984

Memorandum

To: Utah Senior Project Manager, OSM, Denver

Attn: Lou Hamm

From: Chief, Mining Law and Solid Minerals, BLM, SO
Salt Lake City, Utah

Subject: Consolidated Coal Company, Emery Deep Mine, Emery County, Utah, Permit Application Package (PAP)

Twelve submittals of subject information identified and listed below have been reviewed for completeness and technical adequacy and are now a part of the PAP on file in this office:

1. Maps and pages forwarded with your letter dated December 5, 1983, and identified as "11/11/83 submittal of revisions for mining and reclamation plan in response to UT DOGM letter of 10/27/83."

2. Resource Recovery and Protection Plan (R2P2) for Emery Mine involving Federal lease U-5287 with Consol letter dated December 12, 1983, (Higgins to Moffitt.) Delivered to BLM State Office by Mr. Higgins on December 13, 1983. Included a briefing of the R2P2 plan by Consol personnel.

3. Pages forwarded with your letter dated January 4, 1984, and identified as "11/14/83 submittal of revision for vol. 13 of the ACR response regarding protection of the hydrologic balance."

4. One map forwarded with your letter dated January 4, 1984, and identified as "Submittal of Revision for vol. 13 of the ACR response, revised plate showing improvements to the water management system for the intermediate catch basin."

5. Maps and pages forwarded with your letter dated February 16, 1984, and identified as "02/02/84 submittal of revisions for ACR response in response to OSM request."

6. Pages forwarded with your letter dated February 16, 1984, and identified as "01/20/84 submittal of response to UT DOGM technical review deficiencies dated 12/30/83."

7. One map and pages forwarded with your letter dated March 5, 1984, and identified as "02/27/84 submittal of revisions for mining and reclamation plan in response to UT DOGM."

8. One map and pages forwarded with your letter dated March 9, 1984, and identified as "alluvial valley floor investigations, response to UT DOGM letter dated January 27, 1984,--March 1, 1984."

9. Letter dated March 15, 1984, Dunn to McKean containing supplemental information explaining why the coal seams below the I-Zone are not considered minable in Federal lease U-5287.

10. One map forwarded with your letter dated May 8, 1984, and identified as "04/25/84 submittal of revised map for mining and reclamation plan."

11. A copy of the Utah Division of Oil, Gas, and Mining's technical analysis for the subject mine that was forwarded with letter dated May 9, 1984, Manager to Moffitt.

12. One map and pages forwarded with your letter dated June 11, 1984, and identified as "05/18/84 submittal of revisions for MRP in response to final technical analysis and State decision package dated 05/18/84."

The total PAP presently on file in this office consists of seventeen volumes identified as follows:

Volumes 1 through 10 - Initial Mining and Reclamation Plan (MRP) submittal (as amended.) Supplement volumes - (as amended)

Volumes 11 and 12 - Coal Preparation Plant

Volumes 13 through 15 - Apparent completeness Review (ACR) and Associated documents(ACR)

Volumes 16 and 17 - Resource Recovery and Protection Plan (R2P2)

We have determined that the underground mining part of the subject PAP listed above generally conforms with 43 CFR 3482.1(c) rules and regulations. Within the constraints of the present economy and current markets, the proposed coal recovery procedures should safely obtain maximum economic recovery of the coal resource within the plan area by following the planned technology and by using the types of equipment listed in the plan. The R2P2 part of the PAP is adequate for BLM administration of the associated Federal lease U-5287. Within the limits of our authority we recommend that the Consolidation R2P2 be included as an integral part of the first permit package.

Although we recommend approval of the R2P2 plan, the overall recovery of coal in Federal lease U-5287 is low and we believe there is a future potential to increase the recovery as market conditions and technology improves. Performance standards at 43 CFR 3484 require that underground mining operations

be conducted to assure that maximum economic recovery of the coal resource will be obtained in a safe manner. BLM must approve plans that are consistent with known technology, that will maximize mine stability, and, as required, maintain the value and use of surface lands. Principle reasons for the low predicted recovery rate are listed below with possible future changes we expect would improve recovery.

1. Present economic conditions.

Should improve with time.

2. Geologic interpretations by the company of the multi seam complex.

As the mine develops new geologic knowledge will be gained and will possibly result in mine plan modifications which will permit more coal to be recovered. Modifications must involve BLM beginning with onsite discussions to final approval of modifications.

3. Requirements established by the company to determine minability.

As we have discussed with the company before, parameters used by them to determine what coal is minable are different than the parameters used by BLM. BLM parameters were established from experiences in the Blackhawk Formation in Carbon and Emery Counties. The I Zone selected for mining by the company is in the Ferron Sandstone Member of the Mancos Shale., We believe these differences will be tested with time.

4. Practical mining methods that have been developed by the current operator for the Emery Deep Mine.

Adverse geologic and mine conditions and the necessity to market mine run coal is basically responsible for the mining methods developed. Changes in conditions and the construction and operation of the planned coal preparation plant will, no doubt, require changes or modifications in mine planning and will ultimately enhance recovery.

BLM is responsible for all underground operations on Federal leases and is also concerned with underground operations on other lands, within the same mine complex, that may have adverse impacts on the associated Federal leases. The company must be aware that following PAP approval and issuance of mining permit, they will be required to perform as required by 43 CFR 3400 rules and regulations, which are administered by the BLM.

J. H. Moffitt

cc: Moab
DOGM
Consolidation

United States Department of the Interior
FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES OFFICE
1406 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138-1197

IN REPLY REFER TO

January 20, 1984

MEMORANDUM

TO: Branch Chief, Utah Task Force
Office of Surface Mining, Denver, Colorado

FROM: Field Supervisor, Endangered Species Office
U. S. Fish and Wildlife Service, Salt Lake City, Utah

SUBJECT: Biological Assessment for the Emery Deep Permit Application (UT 0005), Emery County, Utah.

We have received and reviewed your agency's biological assessment prepared for the Emery Deep Permit application (UT 0005) in Emery County, Utah. We concur with your determination of no affect by this project to any species currently listed as either threatened or endangered by the U. S. Fish and Wildlife Service, including Sclerocactus wrightiae (Wright fishhook cactus).

The biological assessment mentions Echnocactus whipplei var. spinosior as occuring on the site. This taxon is now recognized as Sclerocactus spinosior (Engelm.) Woodruff & Benson (see Cactus & Succulent Journal Vol. XLVIII, 1976 page 131). We suspect however that the cactus plants you found at the mine site are Sclerocactus whipplei var. roseus since Sclerocactus spinosior is not known to occur east of the Wasatch Plateau.

U. Robert Benton
for Fred L. Bolwahnn

APPENDIX B

Consolidation Coal Company
Emery Deep Mine
ACT/015/015, Emery County, Utah
February 26, 1985

Technical Analysis for the Emery Mine Preparation Plant and Loadout Facility

I. Letter from DOGM - Approval of Stipulation Responses, dated September 21, 1982.

II. Technical Analysis

III. Letters of Concurrence

STATE OF UTAH
NATURAL RESOURCES & ENERGY
Oil, Gas & Mining

Scott M. Matheson, Governor
Temple A. Reynolds, Executive Director
Cleon B. Feight, Division Director

1241 State Office Building • Salt Lake City, UT 84114 • 801-533-5771

September 21, 1982

Mr. Dave Schouweiler
Consolidation Coal Company
2 Inverness Drive East
Englewood, Colorado 80112

RE: Final Approval for the
Preparation Plant/Loadout Facilities
Emery Deep Mine
ACT/015/015
Emery County, Utah

Dear Mr. Schouweiler:

The Division has reviewed your response to the stipulations of the conditional approval for the preparation plant/loadout facilities as amended on June 2, 1982. The Division has found Consolidation Coal Co.'s response to the stipulations adequate in addressing the deficiencies of the technical analysis.

The Division has also received the additional bond for the modification involving 2½ acres for coal stockpiling which was approved on August 3, 1982. The Soils Map (plate 8-1) will be attached to the Bond as "Exhibit A" to depict the area covered by the Bond.

This letter conveys final approval of the modification to the mining and reclamation plan for these facilities.

The Division appreciates the timely manner in which Consolidation Coal Co. has responded to the concerns and deficiencies identified during the review and processing of this modification.

Should you have additional concerns, please don't hesitate to call myself or Lynn Kunzler of my staff.

Sincerely,

JAMES W. SMITH, JR.
COORDINATOR OF MINED
LAND DEVELOPMENT

JWS/LMK/mn

cc: Allen Klein- OSM, Denver
Dean Bray, Emery Deep Mine

Board/Charles R. Henderson, Chairman • John L. Bell • E. Steele McIntyre • Edward T. Beck
Robert R. Norman • Margaret R. Bird • Herm Olsen

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TECHNICAL ANALYSIS

CONSOLIDATION COAL COMPANY
PREPARATION PLANT AND LOADOUT FACILITY
ACT/015/015, Emery County, Utah

Introduction

Consolidation Coal Company's Emery Deep Mine is located two miles east of Highway 10 and six miles north of U. S. Interstate 70 in Emery County, Utah. The company has proposed to construct a coal preparation plant and loadout facility north and adjacent to the existing mine facilities. The preparation plant is essential to the continued operations of the Emery Deep Mine due to the increasing level of sulphur detected in the coal. Without the capacity for coal processing the company may not meet contractual agreements.

Two roads will be used for plant access. The coal haulage road and a smaller employee access road.

A waste disposal area is designated for the preparation plant. There will be a coarse refuse disposal pile and a slurry settling lagoon consisting of two cells. The proposed disturbance is 206.6 acres.

Clean water will be recycled back through the preparation plant from the slurry cell and the existing mine discharge sediment pond.

The facilities will be operational throughout the life of the Deep Mine, about 2010. All facilities will be removed and the area reclaimed at the permanent cessation of operations.

UMC 817.11 Signs and Markers

Applicant's Proposal

The applicant has not specifically discussed the use of signs and markers. Upon initiation of construction of the preparation plant and facilities, perimeter markers should be distributed in an appropriate manner.

Compliance

Consol will be in compliance with this section by meeting the requirements of this performance standard during operations.

Stipulation

None.

UMC 817.13-.15 Casing and Sealing of Underground Openings

Not applicable.

UMC 817.21-.25 Topsoil

Applicant's Proposal

The proposed area of disturbance for the Emery Preparation Plant lies in portions of Section 32 and 33, Township 22 South, Range 6 East, Emery County.

A soil survey of an approximately Order I intensity was conducted for the 210 acres of surface to be affected by the preparation plant and support facilities. Fifteen soil series or combination of series were found and sampled within the area to be disturbed.

Map unit descriptions are either directly from the SCS, refined to be site specific, or are units developed specifically for this inventory. Forty-nine map unit descriptions are provided. Where possible, SCS map units were used for the inventory. In the detailed inventory area, SCS map unit descriptions were refined to be site specific. New map units were developed in the case of several soil units for which no SCS map unit descriptions were appropriate.

Physical and chemical analyses of the major series were conducted by Utah State University Cooperative Soils Laboratory, Logan, Utah. All horizons were analyzed for the following: particle size distribution; textural class; saturated paste pH; percent organic carbon; percent gypsum; electrical conductivity (EC); moisture tension at saturation and 15 atmospheres; water soluble cations (Ca, Mg and Na); SAR; and boron. Engineering analysis of soils, including liquid and plastic limits, plasticity index, and Unified and AASHO classification systems, were also performed. The analytical techniques used are listed in Appendix 8.1.

Present and potential soil uses of the project area were determined. Present uses of the soils are shown on Plate 8-3, Soil Use Map. Present uses include grazing, irrigated pasture, irrigated cropland, wildlife habitat, mine land and timber land. Prime farmland and important farmland were identified by the SCS (T. B. Hutchings, SCS State Soil Scientist 1980). Delineations were made from SCS data, aerial photo-interpretations and field inspection.

Soil series in the areas to be affected were evaluated as sources of reconstruction material. Soil analysis, on-site information and soil interpretation records (SCS) were used in this evaluation. The criterion used in this determination are those outlined in the National Soils Handbook (USDA, SCS 1976). Available topsoil depth and restrictive features are given for each soil occurring in areas to be disturbed (Table 15-1 Revised, January 1982).

Engineering interpretations were made using SCS guidelines (USDA, SCS 1971). Included are interpretations for soil use of septic tanks, shallow excavations, haul roads, mine buildings and suitability as a source of sand, gravel and road fill. Soil features affecting settling ponds, reservoirs, diversion dikes, levees or fill embankments are also discussed. These interpretations show suitability for various uses and are not meant to replace on-site soil engineering.

Water and wind erodibility in areas to be affected were evaluated. The wind erodibility group (WEG) was determined for each map unit within the area to be disturbed. The soil erodibility factors (K) of surface soils, and cropping factor (C) were calculated for major soils in the detailed mapping area. This information is needed for reclamation planning to control loss of salvaged and redressed material.

Prior to construction, the topsoil will be removed and stockpiled. The topsoil will be removed with scrapers to a depth recommended by the soil classifiers report (Table 15-1). The storage piles will be constructed with broad side slopes (2 Hor:1 Vert) and will be revegetated with a permanent vegetative cover.

The life of the preparation plant facility is anticipated to be until the year 2010, at which time the facilities will be removed and the disturbed land returned to the approximate original contour.

Topsoil will be spread over previously prepared surfaces to a depth of approximately 13.5 inches. Section 784.11 lists the exact timetables for removal and reclamation of preparation plant facilities.

Compliance

Applicant complies with these sections.

Stipulations

None.

UMC 817.41-.42 Hydrologic Balance: Water Quality and Effluent Limitations

Applicant's Proposal

Consol has proposed to use a sedimentation pond for the treatment of 115 acres of disturbed area associated with the preparation plant facilities (see 817.46 for design details). A diversion ditch will intercept drainage above the prep plant yard and route it to a natural drainage channel which discharges into Quitchupah Creek (see 817.43 for design detail).

A slurry cell impoundment will be constructed in the waste disposal area to settle slurry fines from the processing plant and treat runoff which occurs from the coarse refuse pile (see 817.45 for design detail). A diversion ditch will be constructed above the refuse disposal area to route natural runoff and flood irrigation flow directly to Quitchupah Creek (see 817.43 for design detail).

A NPDES permit has been issued for both the sedimentation pond and slurry cell impoundment.

Compliance

The applicant will comply with these sections during operations.

Stipulations

None.

UMC 817.43 Diversions and Conveyance

Applicant's Proposal

During the growing season, an artificial ground water mound exists beneath the proposed slurry cell area. This is due to flood irrigation practices which are carried out in a field northwest and adjacent to the prep plant permit area. Consol has proposed a diversion ditch to run the length of the irrigated field which will divert flows and thus eliminate the ground water mound effect. A modification to the ditch design was submitted on February 19, 1982, and approved by DOGM on March 17, 1982. The ditch is sized to safely carry the discharge of the probable maximum thunderstorm event for the permit area. The design discharge is 75 cfs. The maximum design flow velocity is 3.72 fps. The drainage area is 72.3 acres. The discharge will be directly into the main channel of Quitchupah Creek.

If an artificial mound should develop from the seepage which is predicted to occur from the slurry cells, then a horizontal gradient of flow is predicted from a pore pressure analysis which was conducted in the area.

A second diversion ditch will channel undisturbed area runoff away from the plant area. This diversion controls a 75.1 acre drainage area and discharges into the proposed north main entrance road ditchline which ultimately flows into a natural channel.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.44 Stream Channel Diversions

Not applicable.

UMC 817.45 Sediment Control Measures

Applicant's Proposal

Two slurry cells will be constructed adjacent to the coarse refuse disposal site. The cells will be utilized to settle suspended solid materials from processing waters from the preparation plant. Slurry will be pumped from the plant at a rate of 130 gpm through a three inch line to cell #2 for initial settling. The minimum clarified water return from cell #1 is expected to be 50 gpm. The total cell design will ultimately facilitate 33 acre-feet of submerged fines.

Cells #1 and #2 will be excavated to a 3:1 slope to an elevation of 5931.0 for cell #1 and 5934.0 for Cell #2. This silty sand material will be used to construct the embankment of the slurry impoundment to a crest of 5953 feet. The upstream slope will be 3:1 and downstream will be 4:1 with a crest width of 20 feet. Two 40 foot wide dikes will be constructed in the impoundment to form cell #1. The zoned dikes will be composed of an earth core placed at 3:1 to design elevation 5943 with a crest width of 12 feet. A two foot clay liner will be compacted over the earth zone to form a liner. Coarse refuse will be placed on the inner dike and allowed to settle to the angle of repose, approximately 1.7:1. At design elevation 5951 the dike will have a 40 foot wide crest. Three polyethelene pipes will be placed through the refuse dike between cell #1 and #2 at 1.13 percent slope. The three inch perforated well pipe riser has a top elevation of 5941.6. Throughout both cells, a clay liner will be constructed of local Mancos shale materials. The clay will be watered, rolled and compacted to a two foot depth. A six inch protective cover will then be compacted over the clay. In accordance with MSHA regulations, a stability analysis was conducted for the impoundment. The embankments exceed the critical factor of safety. The maximum storage capacity of the slurry impoundment is 198.2 acre-feet at elevation 5949.5.

An emergency spillway has been designed in accordance with MSHA standards. Both the probable maximum precipitation and probable maximum thunderstorm were utilized in the design. The 12 foot wide trapezoidal channel is capable of passing the design storm, with 100 percent of the design storm inflow evacuated in one day. The impoundment is designed to store runoff above the maximum pool level prior to discharge while maintaining the three foot freeboard. An emergency discharge permit (NPDES) has been obtained for the structure.

The slurry cell impoundment will also treat all runoff occurring from the coarse refuse disposal area.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.46 Sedimentation Ponds

Applicant's Proposal

One sedimentation pond (#5) has been constructed for the treatment of all disturbed area runoff from the preparation plant. The approval for pond construction was granted on November 25, 1981. The pond will collect disturbed runoff from a 115 acre watershed. The structure is partially excavated to provide the 3.6 acre foot required capacity. The 10-year, 24-hour event plus three years of sediment accumulation are included in the design capacity.

The pond is equipped with a three inch polyethylene pipe gate valve decant system with provisions to trap oil and gas. The emergency spillway, designed to pass a 25-year, 24-hour precipitation event, consists of a 20 foot wide trapezoidal channel. The channel is riprapped. The minimum freeboard is 1.0 foot. Discharge from this pond will flow westward into the natural drainage channel. A NPDES permit for the discharge point has been obtained.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.47 Discharge Structures

Applicant's Proposal

Discharge structures are proposed for sedimentation pond #5, the slurry cell impoundment and from the preparation plant and refuse area diversion ditches. The sizing of these structures is discussed in previous sections. Consol has committed to the use of riprap material at all discharge points to adequately dissipate the velocity of discharge prior to entering natural drainages.

Compliance

Applicant is in compliance with this section.

Stipulations

None.

UMC 817.48 Acid-forming and Toxic-forming Materials

Applicant's Proposal

The amount of runoff occurring from the disposed coarse refuse material will be minimized through the use of a drainage diversion structure above the refuse area. The runoff which does occur from the coarse refuse will be routed through the slurry cell impoundment for reuse in the preparation plant.

The potential for oxidation of pyritic materials which were identified in a coarse refuse sample will be minimized by reducing the pore space within the refuse by compaction during construction of the pile.

Consol has proposed a minimum five foot cover of subsoil and topsoil over the coarse refuse pile and slurry impoundment upon final reclamation. The final grading plan provides for "naturally" flowing drainage patterns over these impoundment areas.

Compliance

Applicant is in compliance with this section.

Stipulations

None.

UMC 817.49 Permanent and Temporary Impoundments

Applicant's Proposal

Consol has proposed to remove and reclaim sedimentation pond #5 upon final abandonment of the area. The slurry cell impoundment will be rendered nonimpounding and covered with suitable reclamation materials prior to revegetation.

Compliance

Applicant comples with this section.

Stipulations

None.

UMC 817.50 Underground Mine Entry and Access Discharges

Not applicable.

UMC 817.52 Surface and Ground Water Monitoring

Applicant's Proposal

Ground Water. A minor, shallow aquifer is contained with the Quaternary alluvium along stream channels and is Quaternary pediment deposits scattered throughout the Emery area. This unconfined aquifer is generally less than 50 feet thick, and its boundaries are clearly defined by the limits of the Quaternary deposits and contact with the underlying Bluegate shale.

Recharge to the Quaternary pediment terrace aquifers is sustained by almost constant irrigation and leaching applications by local farmers using water diverted predominantly from Muddy Creek. Water moves through the Quaternary pediment terrace deposits and exists from numerous springs at the contact with the relatively impervious Bluegate Shale. Because of the rolling topography of the Bluegate shale, water flowing from some of these springs becomes trapped in swales, creating "alkali swamps."

There are no wells completed exclusively in the Quaternary deposits; however, water quality can be determined from data collected during a spring and seep inventory conducted during October 1979 and June 1980. Conductivity

of the spring waters ranged from 658 to 2015 Mhos/cm with an average of 1162 Mhos/cm at 20°C; pH ranged from 6.3 to 8.3 with an arithmetic average of 7.6. Although discharge at most of the spring sites was not measurable because of the unlocalized nature of the spring and/or vegetative overgrowth, most springs had flows of less than 10 gpm. Except for one small irrigation diversion, water from the springs is used only for stock watering.

The Bluegate shale is considered an aquiclude, and it separates the Quaternary alluvium and Ferron sandstone aquifers. In the vicinity of the prep plant, the Bluegate consists of massive gray shales with minor intercalated, fine-grained sandstones and thin carbonaceous layers. Several monitoring wells, installed by Consol and the USGS, are completed totally or partially in this zone.

Wells completed in the Bluegate shale experience minor seasonal variations in water level, which may be a result of irrigation and precipitation.

Water quality data indicates that the Bluegate shale is very saline with high amounts of sodium, sulfate and chloride. The visibility of gypsum crystals in hand samples and the numerous alkali deposits throughout the Emery area also indicate salinity.

Ground water in the area of the preparation plant is contained in the permeable Ferron sandstone member of the Mancos shale. The Ferron sandstone is confined above by the Bluegate shale and is believed to be confined below by the Tununk shale.

Recharge to the ground water body in the area of the prep plant is believed to take place on the Wasatch Plateau and along the Joe's Valley-Paradise fault zone (Kaufman 1976; Owili-Eger 1979). Relatively higher amount of precipitation in the recharge zone (30 inches/year on the Wasatch Plateau) and the shape and southeastward slope of the potentiometric surface suggest this to be the case.

Although the amount of ground water recharge to the Ferron sandstone is not well understood, both the upper and lower sandstone units within the Ferron sandstone are known to contribute subsurface outflow to Muddy and Quitchupah creeks, Christiansen Wash and to Miller Canyon. Subsurface flow contributions to Miller Canyon and Muddy Creek are generally believed to be beyond the radius of influence of the prep plant and, therefore, are not critical to the permit area.

Surface Water. The proposed prep plant and loadout facility is located approximately four miles due south of the town of Emery. It is situated at the confluence of Quitchupah Creek and its only major tributary, Christiansen Wash. Quitchupah Creek is a tributary to Ivie Creek which in turn is a tributary to Muddy Creek. Muddy Creek empties into the dirty Devil River above Hanksville, Utah; the Dirty Devil River is a major tributary to the Upper Colorado River.

The most recent water quality information on Quitchupah Creek and Christiansen Wash has been collected by Consol beginning in October 1979. As part of Consol's surface water monitoring program for the Emery Mine (see Section 7.2.7 of the mine plan for details), monitoring sites as indicated on Plate 7-2 have been established for monthly water quality sampling.

Quitchupah Creek water is characterized by the following dominant ions in order of decreasing concentration (mg/l): SO_4, Na, Ca, Mg, HCO_3 and Cl. In general, the water becomes more saline downstream with increasing SO_4 and Na concentrations. Quitchupah Creek's water quality noticeably deteriorates between sample sites 1 and 4, as a result of its confluence with the unnamed tributary into which Emery Mine discharges water. The overall effect is an increase in TDS concentration of 377 mg/l. The two sources of this increase are discharge from the mine water sedimentation pond (site 6) which averages 3894 mg/l TDS, and the unnamed tributary above the discharge point (site 8), which averages 14054 mg/l TDS. Water quality in this tributary is a result of irrigation flows having been exposed to the saline Bluegate shale. It is difficult to separate the influence of the sediment pond from that of the unnamed tributary; however, a comparison of the average flows from both sources--0.56 cfs from the sediment pond versus 0.04 cfs from the unnamed tributary--indicates that discharge from the sediment pond has the major influence.

The combination of all of the previously mentioned influences is reflected in the water quality at site 3 situated below the confluence of Quitchupah Creek and Christiansen Wash and the influence of the Emery Mine. The TDS of the water leaving the area averages 1430 mg/l.

In addition to the chemical water quality parameters, Consol's monitoring program also tests for total suspended solids (TSS) at each of the sites.

First, the mine water sedimentation pond (site 6) has been very effective in reducing the discharge of TSS with an average of 8.39 mg/l and a maximum of only 19.3 mg/l. From the other sampling sites, it appears that TSS is highly variable with a maximum range at site 4 of 21.8 mg/l to 5358 mg/l.

With the incorporation of the prep plant, the TDS contribution to Quitchupah Creek will be reduced through the use of 70 percent of the mine water discharge in the facilities. The average daily salt load would be reduced by 4.5 tons.

Consol intends to place two slurry cells, for settling of solids from the prep plant just west of the preparation plant. All water used in the preparation process which accumulates in the slurry cells will be pumped back to the plant for reuse. Consol intends to monitor the seepage from the cells by placing six shallow ground water wells into the alluvium. Calculated seepage volumes from the slurry cells approximate 500 ft^3/day. The equilibrium TDS content of the slurry cells is expected to range between 5,000-10,000 mg/l. This would add 0.15 tons per day to the alluvial ground water system and in turn to Quitchupah Creek. Therefore, the total salt load to the creek would be reduced to approximately two tons/day.

Compliance

Surface water baseline data collection is adequate. The proposed alluvial ground water monitoring plan is adequate.

At this point, no information is available to DOGM on the initiation of monitoring of six alluvial ground water wells adjacent to the slurry disposal area. In a verbal discussion with Mr. Louis Meschede, hydrologist for Consol, DOGM agreed that monitoring of the ground water wells to reflect seasonal variation prior to operations was acceptable even though concurrent construction of surface facilities is carried out.

Stipulation

None.

UMC 817.53 Transfer of Wells

Not applicable.

UMC 817.55 Discharge of Water Into an Underground Mine

Not applicable.

UMC 817.56 Postmining Rehabilitation of Sedimentation Ponds, Diversions, Impoundments and Treatment Facilities

Applicant's Proposal

There are no permanent hydrologic structures proposed for this project.

All roads and respective drainage structures except for the existing county access road will be removed and reclaimed prior to abandonment.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.57 Stream Buffer Zones

Applicant's Proposal

The applicant has not specifically addressed stream buffer zones in the permit application.

Compliance

Data from the aquatic wildlife study presented in Chapter 10 of the Emery Deep Mine MRP indicates that Quitchupah Creek contains a "biological community" (determined according to UMC 817.57[c]) and thus requires a buffer zone. Surface disturbance within a stream buffer zone is not permitted except in accordance with the provisions of paragraph (a) of this section.

The applicant will comply with this section if the following stipulation is met.

Stipulation

The area within 100 feet of Quitchupah Creek will be established as a stream buffer zone and be appropriately marked as specified in UMC 817.11.

UMC 817.59 Coal Recovery

Applicant's Proposal

The proposed slurry pond will be located above the intersection of the 6 south and 2 west mine workings which are in the I and J seams. The approximate depth of the mine workings in the area is 251 feet. The room and pillar method was used in extracting the coal, and pillars have been left in place for stability. No retreat mining is to be done in this area. Mining height has been 8-10 feet, leaving two feet of floor coal and approximately eight feet of roof coal.

The amount of coal left in the floor and roof are for stability. Also, the coal occurring in the roof is high in sulfur and difficult to market.

Justification for nonrecovery, according to Chapter 3 of the overall mine plan, is economic. Certain seams are higher in sulfur and/or ash than acceptable under contractual or government coal quality specifications.

Compliance

The area of coal recovery is being examined as a part of the overall mine plan. Comments will be made at that time.

Stipulations

None.

UMC 817.61-.68 Use of Explosives

Applicant's Proposal

The small amount of explosives on hand are kept in a MSHA approved powder magazine and any use of explosives will be as directed by MSHA regulations.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.71-.74 Disposal of Underground Development Waste and Excess Spoil and Nonacid and Nontoxic-forming Coal Processing Waste

Not applicable to this plan.

UMC 817.81-.85 Coal Processing Waste Banks

Applicant's Proposal

Coal processing waste will be deposited south of Quitchupah Creek at a refuse disposal site west of the slurry impoundment. Coarse refuse will be hauled to the site in pan-type scrappers and compacted. The refuse comprised largely of 4 inches X 3/8 material will be placed on a 2.5:1 slope with 25-foot wide benches for every 25 feet rise in elevation.

Construction of the refuse bank will be accomplished by placing material in maximum lifts of two feet and compacting to attain 90 percent of maximum dry density. The proposed width of the bench terraces is 25 feet. A letter was submitted by the applicant on April 26, 1982, stating that this designed width would better accommodate equipment movement on the pile and ease the constraints of construction. The Division finds there is no eminent danger in this proposal as long as Consol can meet the static factor of safety discussed in UMC 817.85.

Benches will be constructed with a slight reverse slope. Both transverse to the face to prevent the flow of surface water runoff down the face of the slopes and longitudinally to the sides of the pile to route runoff into the slurry impoundment. The refuse bank will facilitate approximately 447 acre feet of coarse refuse at a maximum design elevation of 6,015 feet.

Reclamation will be accomplished by replacing approximately four feet of subsoil and topsoil material and establishing a permanent vegetative cover.

Compliance

The applicant will comply with these sections when the following stipulations have been met.

Stipulations

1. The applicant must outline a plan for site inspections by a qualified engineer as required by UMC 817.82.

2. Design calculations included in the plan (15.6.3) do not show the static factor of safety for the coarse refuse waste banks. This must be presented as discussed in UMC 817.85.

UMC 817.86-.87 Burning and Burned Waste Utilization

Applicant's Proposal

The operator is compacting refuse material to 90 percent of its maximum dry density which should prevent spontaneous combustion.

Compliance

The operator will be in compliance when the following stipulations of this section have been met.

Stipulations

1. A specific plan for extinguishing coal processing waste fires should be submitted to the Division for approval as required by UMC 817.86.

2. A discussion on the removal of burned coal processing waste, should be submitted with this plan as discussed in UMC 817.87.

UMC 817.88 Return to Underground Workings

Not applicable.

UMC 817.89 Disposal of Noncoal Wastes

Covered in the general mine plan and is adequate for mining and processing operations.

UMC 817.91-.93 Coal Processing Waste: Dams and Embankments

Not applicable.

UMC 817.95 Air Resources Protection

Applicant's Proposal

The State of Utah, Bureau of Air Quality has reviewed the applicant's air quality protection plan. The State found that the preparation plant was not subject to requirements pertaining to Prevention of Significant Deterioration (PSD) regulations.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.97 Protection of Fish, Wildlife and Related Environmental Values

Applicant's Proposal

The permit area includes portions of the Wasatch Plateau, San Rafael Sell and desert geographical regions. Generally, the topography is flat to gently rolling uplands which includes several steep-walled canyons that are assocated with drainages.

The limited riparian areas are the only habitat that is classified as crucial-critical to wildlife, otherwise, it is generally of limited value. Disturbances in riparian areas will be kept to a minimum and all altered riparian habitat will be restored during reclamation.

A total of 170 vertebrate species of wildlife have been documented on the permit area. Of these, mule deer, golden eagles, ringneck pheasants, cottontail rabbits, jackrabbits and prairie dogs are the most common.

The only threatened or endangered species known to inhabit the permit area or adjacent areas is the bald eagle, which makes limited use of the general area during the winter.

During surveys, 13 species of raptors were documented, all of which are afforded protection. The U. S. Fish & Wildlife Service has surveyed existing power lines (see letter dated April 8, 1982) and found that raptors were not using these poles.

Mitigation and protection measures to be used by the applicant include: selecting plant species for reclamation based on their compatability with habitat restoration and value for wildlife and grazing; employee's will be instructed not to harrass or illegally take wildlife; all hazards to wildlife associated with the mining acitivites will be appropriately fenced; and, all new power lines will be designed so as to be "safe" to raptors.

Compliance

The applicant is in compliance with the requirements of this section.

Stipulations

None.

UMC 817.99 Slides and Other Damage

Applicant's Proposal

The applicant has not specifically addressed this section of the regulations.

Compliance

Applicant will be in compliance upon acceptance of the following stipulation.

Stipulation

Applicant shall commit to notifying the Division of any slides or surface failures which may occur during operations and shall work in conjunction with the Division to devise remedial measures.

UMC 817.100 Contemporaneous Reclamation

Applicant's Proposal

The applicant plans to reclaim all surface disturbance areas as contemporaneously with the operations as possible. Consol will use the following seed mix for temporary revegetation and stabilization:

Species	Pounds PLS/Acre
*Crested wheatgrass	3
Streambank wheatgrass	3
*Russian wildrye	3
Western wheatgrass	3.5
*Yellow sweetclover	1.5

Although this list contains introduced species (marked with an *), they are adapted to the climate and should provide quick cover to stabilize soils and prevent erosion.

Compliance

The applicant is in compliance with the requirements of this section.

Stipulations

None.

UMC 817.101-.106 Backfilling and Grading

Applicant's Proposal

Preparation Plant Site. Prior to regrading the plant site, surface debris will be removed. It is anticipated that this material will be suitable to use as fill for other reclamation sites at the mine. Regrading will consist of shaping the surface so that the final topography is similar to adjacent

landscapes. Overall, the predisturbance topography of the site will not be significantly changed by the plant construction operations so the task of regrading will be minimal. During regrading, the predisturbance drainage system will be restored.

Roads. The roads will be left in place until the plant site and refuse disposal sites have been regraded. This will facilitate the reclamation process by allowing access to the sites. When the roads are no longer needed for access, they will be removed and regraded. Prior to regrading, the surface paving material will be removed. The road areas will be regraded to a topography consistent with adjacent unaffected lands.

Refuse/Slurry Disposal Site. Contemporaneous regrading will occur at the coarse refuse disposal site as the refuse is deposited. As the refuse disposal bank is constructed, backfilling, regrading and reclamation will be conducted on the lower face. Twenty-five foot terraces will be constructed above the regraded face to control drainage.

Final grading of the disposal site will not be conducted until final abandonment of the site. At this time, the coarse refuse disposal area will be final graded, backfilled and retopsoiled. The slurry refuse disposal ponds will be allowed to dry before they are backfilled and graded. After the pond cells are thoroughly dry, the refuse dikes will be dozed over the site. This material will be compacted and then covered with excess material taken from the earthen dam. The area will be further backfilled with the excavated material originally stockpiled during construction of the disposal site.

Sedimentation Pond. The sedimentation pond will be removed and the site regraded when an effective, erosion-controlling plant cover has been established on the preparation plant site. This will be approximately three years after the site has been seeded. The approximate original topography of the pond area will be restored.

Upon final reclamation, the refuse disposal site will be backfilled and graded. The regraded surface will then be covered with four feet of nontoxic material excavated and stored during the slurry pond construction.

Approximately 13 inches of topsoil material will be redistributed over the pre-prepared disposal area.

Compliance

The following stipulation must be met in order for the applicant to show compliance with this section.

Stipulation

None.

UMC 817.111-.117 Revegetation

Applicant's Proposal

The proposed preparation plant/loadout facilties will effect approximately 206 acres in the "greasewood shrub," "annual forb" and "mixed desert shrub" community types. A description of these types is as follows:

Greasewood Shrubland. This community occurs in and along the bottoms of drainages in saline clay soils. The dominant species is greasewood (Sarcobatus vermiculatus). The species diversity is generally low in this community. However, other species frequently encountered include greenmolly summercypress (Kochia americana), fireweed summercypress (Kochia scoparia), African mustard (Malcolmia africana) and common halogeton (Halogeton glomeratus). The total herbaceous layer cover is approximately 24 percent. The total estimated annual production is 156.8 grams per square meter (14000 lbs/ac), the majority of which is greasewood. Density of woody plants is 6141 individuals per acre. The greasewood shrubland occupies 49 percent (99 acres) of the area to be affected.

Mixed Desert Shrubland. The mixed desert shrub community occupies 19 percent (40 acres) of the area to be affected. It is found on soils ranging from sandy, well-drained soils to saline clay soils. The species comprising this community have a relatively low moisture requirement and are somewhat salt tolerant. The conspicuous feature of this community is the shrub species dominated by shadscale saltbush (Atriplex confertifolia). Prickly pear cactus (Opuntia polyacantha), rubber rabbitbrush (Chrysothamnus nauseosus) and big sagebrush (Artemisia tridentata) are sub-dominant shrub elements. Important understory species include galleta grass (Hilaria jamesii), Indian ricegrass (Oryzopsis hymenoides), western stickseed (Lappula occidentalis) and nodding wildbuckwheat (Eriogonum cernuum). Total cover was 10 percent. Estimated total production was approximately 38.5 grams per square meter (340 lbs/ac). Woody plant density is 4,449 individuals per acre.

Annual Forb Community. This sparsely vegetated community is found on Bluegate shale outcrops and clay slopes. The annual forb community is dominated by desert trumpet wildbuckwheat (Eriogonum inflatum), common halogeton, orach (Atriplex powellii) and western stickseed. Shrub species, shadscale saltbrush and castle valley clover (Atriplex cuneata) are of secondary importance and most individuals are stunted and of low stature. Total vegetation cover for the annual forb community is only six percent. Estimated annual production of 20.5 grams per square meter (183 lbs/ac). Woody plant density is 1515 plants/acre. The annual forb community covers 32 percent (67 acres) of the area to be affected.

Reference areas (RA) for the "greasewood shrub" and "mixed desert shrub" community were established by Consol and approved by the Division (see October 28, 1981, inspection memo). A RA was not selected for the "annual forb" community inasmuch that the applicant proposes to use the same seed mix for this area as will be used for the "mixed desert shrub" community.

Justification for combining these two community types for reclamation was that the "annual forb" community has very little to offer as a habitat type for wildlife or livestock and that a perennial community would stabilize soils more effectively.

The seed mixes for permanent reclamation are:

SEED MIX A (to be used on the "mixed desert shrub" and "annual forb" types)

Species	Pounds PLS/Acre
Crested wheatgrass	1.5
Indian ricegrass	1.0
Alkali sacaton	0.25
Western wheatgrass	2.0
Galleta	1.5
Winterfat	4.0
Fourwing saltbrush	4.0
Rubber rabbitbrush	1.0

In addition to seeding, the following transplants will be used:

Species	Plants/Acre
Oldman wormwood	61
Fourwing saltbrush	302
Shadscale	182
Greasewood	61
Gardner saltbush	243
Winterfat	61
Rubber rabbitbrush	61
Cliffrose	121
Nevada Morman tea	61
Great Plains yucca	61

SEED MIX B (to be used on the "greasewood shrub" type)

Species	Pounds PLS/Acre
Pubescent wheatgrass	5.0
Streambank wheatgrass	2.5
Crested wheatgrass	1.5
Russian wildrye	2.5
Fourwing saltbrush	4.0
Rubber rabbitbrush	1.0
Winterfat	4.0
Big sagebrush	0.25
Alfalfa	1.0

In addition to seeding, the following transplants will be used:

Species	Plants/Acre
Oldman wormwood	54
Big sagebrush (var. wyomingensis)	134
Greasewood	27
Fourwing saltbush	134
Winterfat	54
Antelope bitterbrush	54
Oakbrush sumac	27
Woods rose	27
Great Plains yucca	27

Of the 23 species proposed to be utilized in revegetating the disturbance sites, five of them are introduced species. These five species are: crested wheatgrass; pubescent wheatgrass; Russian wildrye; alfalfa; and, oldman wormwood. Justification for their use was provided (as per UMC 817.112) as follows:

> "None of these species are poisonous or noxious and are compatible with the plant and animal species of the region. These species are necessary to aid in achieving a quick and permanent stabilizing cover that enhances the control of soil erosion. All of these species have been studied in appropriate field trials (most of them extensively) and have demonstrated their ability at establishing effective cover capable of achieving the postmining land-use."

A straw mulch will be used in conjunction with seeding on all areas and crimped into the soil.

Vegetative monitoring will consist primarily of data collection on cover and productivity. Comparisons with the appropriate reference areas will be made during the last two years of the liability period. Reference areas will be managed similar to the reclaimed areas.

Should weeds become a problem for reclamation success, the applicant will work out an acceptable weed control program at that time with the appropriate regulatory authorities.

Compliance

The applicant will comply with the general requirements of these sections.

Stipulations

None.

UMC 817.121-.126 Subsidence Control

Applicant's Proposal

A 220 acre foot slurry pond is to be installed on the surface, approximately 251 feet above the intersection of the 6 south and 2 west mine workings. Pillars will be left beneath the slurry pond to provide stability. Mining height will vary from 8-10 feet with approximately two feet of floor coal and eight feet of roof coal being left in place. Using W. A. Hustrulid's emperical formulas for measuring coal pillar strength, safety factors were calculated at 5.12 for 6 south, 2 west and 1 right-2 west pillars and 1.93 for pillars left in rooms of 1 right-2 west.

From the calculations made, it is felt that the slurry pond will remain stable in the long-term (+ 20 years). Subsidence monitoring stations have been established over the general mining area and are surveyed at regular intervals (every six months).

The applicant is prepared to mitigate any subsidence damage as mutually agreed upon by Consol, the regulatory authority and any landowners involved.

Compliance

Applicant complies with these sections.

Stipulations

None.

UMC 817.131-.132 Cessation of Operations

Applicant's Proposal

The application does not specifically address the cessation of operations.

Compliance

The applicant will be in compliance upon acceptance of the following stipulation.

Stipulation

Consol will commit to notifying the Division of the intention to cease preparation plant operations prior to such an occurrence.

UMC 817.133 Postmining Land-Use

Applicant's Proposal

The applicant will restore the premining land-uses of livestock grazing and limited wildlife habitat. The proposed reclamation practices and species used for revegetation should enhance these uses.

Compliance

The applicant is in compliance with the general requirements of this section.

Stipulations

None.

UMC 817.150-.156 Roads: Class I

Applicant's Proposal

The preparation plant and refuse disposal site will make continuous use of three roads; the main entrance, to be new construction; the coal refuse haulage road, to be an upgrading and extension of an existing road; and, the plant access road, to be an upgrading of an existing road.

The main entrance road will be used by coal and refuse haulage trucks to access the preparation plant. Design specifications and typical cross-sections are shown on Plates 15-3 and 15-4. A more complete description of the road is detailed on page 15-44, Volume 11.0 of the mine plan.

The coal refuse haulage road will be used to transport coarse material to the refuse disposal site and for facilities inspections. Design specifications and typical cross-sections are shown on Plates 15-5 and 15-6. A detailed description of the road is contained on page 15-45, Volume 11.0 of the mine plan.

The plant access road, a related bypass and a tank access extension road will serve as access to the preparation plant area by light passenger vehicles. Design specifications and typical cross-sections are shown on Plate 15-7. A more detailed description is contained on pages 15-45 and 15-46, Volume 11.0 of the mine plan.

Construction techniques and sequences are detailed on pages 15-61 through 15-67 of the mine plan.

Prior to construction, topsoil is to be removed and stockpiled. During final abandonment, as roads are no longer needed, they will be removed and regraded to a topography consistent with adjacent lands. Topsoil will be redistributed and the area will be revegetated.

Compliance

The applicant will comply with these sections when the following stipulation has been met.

Stipulations

The designed safety factor for road cuts, fills and embankments needs to be submitted for the new roads, along with the basis for safety factor calculations (refer to UMC 817.152[D][9]).

UMC 817.180 Other Transportation Facilities

Applicant's Proposal

Raw coal will be supplied to the preparation plant by a conveyor system designed to transport an average of 700 tons per hour from the Emery Deep Mine. The various facilities of the plant will receive coal through an above ground conveyor system which is detailed in 15.3.2.1 of the plan. Fine refuse will be pumped in a slurry through a three inch pipe from the plant to the slurry ponds. Clarified water for plant reuse will be pumped from the slurry pond through a six inch pipe back to the preparation plant. A more complete description of the operation is detailed in 15.3.3.2 of the plan.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.181 Support Facilities and Utility Installations

Applicant's Proposal

A detailed description of the coal preparation plant and its support facilities is shown in Chapter 15, Volume 11.0 of the mine plan.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

PERMIT ATTACHMENTS

I. Letter from Bureau of Air Quality

II. Letter from Division of Wildlife Resources

III. Letter from Department of Health

IV. Letter from Department of Health

V. Letter from Division of State History

Scott M. Matheson
Governor

STATE OF UTAH
DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
150 West North Temple, P.O. Box 2500, Salt Lake City, Utah 84110

Alvin E. Rickers, Director
Room 426 801-533-6121

James O. Mason, M.D., Dr.P.H.
Executive Director
801-533-6111

DIVISIONS
Community Health Services
Environmental Health
Family Health Services
Health Care Financing and Standards

OFFICES
Administrative Services
Health Planning and Policy Development
Medical Examiner
State Health Laboratory

533-6108
January 8, 1982

Richard M. Holbrook
Consolidation Coal Company
2 Inverness Drive East
Englewood, CO 80110

RE: Air Quality Approval Order
Air Controls for New Coal Preparation Plant, Stoker Loadout Operation, and a Coal Fired Furnace, Emery/Sevier Counties

Dear Mr. Holbrook:

On December 1, 1981, the Executive Secretary published a notice of intent to approve your new coal preparation plant and a stoker coal loadout operation to process coal from deep mining, and a coal fired furnace for the warehouse/office building. The 30-day public comment period expired December 31, 1981, and no comments were received.

This air quality approval order authorizes the proposed preparation plant, stoker loadout, and furnace as proposed in your notices of intent dated November 5, 1981 (from mining plan), and November 12, 1981, with the following operating conditions:

1. All emission control equipment shall be properly installed and maintained in good operating condition.

2. No visible emissions from the preparation plant, stoker loadout, and new heating furnace shall exceed 20% opacity except as permitted in Section 4.7 (unavoidable breakdowns), Utah Air Conservation Regulations (UACR).

3. All conveyors shall be fully enclosed with dust suppressants at all transfer points.

4. The transfer building shall be totally enclosed.

5. All storage piles shall be made by stacking tubes. Water shall be applied to the piles to minimize fugitive emissions as dry conditions warrant or as determined necessary by the Executive Secretary.

6. An underground reclaim system equipped with water sprays shall be used at the raw coal storage piles.

7. The preparation plant shall be totally enclosed.

8. The sample building shall be totally enclosed. The loading zone of the clean coal storage belt shall be equipped with water sprays and spraying required as dry conditions warrant or as determined necessary by the Executive Secretary.

9. The sampling system and transfer points on the stoker bins shall be totally enclosed.

10. The work area of the front end loader(s) shall be water sprayed as dry conditions warrant to minimize fugitive dust.

11. The speed of the trucks or employee vehicles on any unpaved road shall not exceed 15 mph for trucks and 25 mph for other vehicles.

12. All unpaved roads shall be water sprayed to minimize fugitive emissions as dry conditions warrant or as determined necessary by the Executive Secretary.

13. The annual throughput of coal from deep mining for the preparation plant shall not exceed 2×10^6 tons without prior approval from the Executive Secretary according to Section 3.1, UACR.

14. A construction/installation/modification schedule shall be provided to the Executive Secretary when finalized.

15. The Executive Secretary shall be notified upon start-up/normal operations for the modification as an initial compliance inspection is required.

Sincerely,

Brent C. Bradford
Executive Secretary
Utah Air Conservation Committee

MRK:jw
cc: Southeastern District Health Dept.
EPA Region VIII (D. Kircher)
CONSOL (Carl Muha)
850

state of utah

DWR

File
ACT/015/015
Copy to Salty
& Lynn

DIVISION OF WILDLIFE RESOURCES

EQUAL OPPORTUNITY EMPLOYER

DOUGLAS F. DAY
Director

1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

JIM

MAY 0 4 1982

April 26, 1982

Mr. Cleon B. Feight, Director
Division of Oil, Gas and Mining
State Office Building
Salt Lake City, Utah 84114

Attention: James Smith

SUBJECT: Apparent completeness of Mining and Reclamation Plan for Consolidation Coal Company's Preparation Plant and loadout facility.

Dear Jack:

The Division has no further comment concerning the MRP for Consolidation Coal Company's Preparation Plant and loadout facility.

Thank you for an opportunity to provide comment.

Sincerely,

Douglas F. Day
Director

GOVERNOR
Scott M. Matheson

DEPT. OF NATURAL RESOURCES
Gordon E. Harmston
Exec. Director

WILDLIFE BOARD
Roy L. Young — Chairman
Lewis C. Smith
L. S. Skaggs
Warren T. Harward
Chris P. Jouras

Heath sed pond

Scott M. Matheson
Governor

STATE OF UTAH
DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
150 West North Temple, P.O. Box 2500, Salt Lake City, Utah 84110

James O. Mason, M.D., Dr.P.H.
Executive Director
801-533-6111

DIVISIONS
Community Health Services
Environmental Health
Family Health Services
Health Care Financing and Standards

OFFICES
Administrative Services
Health Planning and Policy Development
Medical Examiner
State Health Laboratory

Alvin E. Rickers, Director
Room 426 801-533-6121

(801) 533-6146
December 2, 1981

RECEIVED
DIVISION OF
OIL, GAS & MINING

Ms. Mary Jo Ormiston
Consolidation Coal Company
2 Inverness Drive East
Englewood, Colorado 80112

Re: Construction Permit for
Preparation Plant Area Drainage
Sedimentation Pond

Dear Ms. Ormiston:

We have reviewed the plans and specifications for construction of a sedimentation pond for disturbed areas around the proposed preparation plant. We hereby issue a construction permit for this sedimentation pond, subject to the following conditions:

1. The invert of the decant pipe must be raised to at least two feet above the maximum maintained sedimentation level. Also we recommend that the size of the decant pipe be increased to at least 6" diameter to avoid plugging problems.

2. Diversion channels to route storm water away from the disturbed area around the preparation plant must be constructed within a year.

3. An antiseepage colar should be provided on the outlet through the embankment.

4. An NPDES permit for any discharge from the sedimentation pond must be obtained through the Region VIII offices of EPA.

It is our understanding that the pond will capture all storm drainage from the plant site and surrounding area of a maximum of 115 acres and provide 3.6 acre feet storage for sediment control. The pond design is for containment of the 10 year 24 hour storm for the entire 115 acres maximum disturbed area for the present planned life of the plant. An inverted oil trap is provided on the decant outlet. The construction of the storm water runoff diversion from undisturbed areas will add a measure of safety for the pond capacity and will be constructed within a year.

If for any reason this pond does not meet the required capacity limits for the area or the Federal and State discharge standards then the company must proceed to modify or install new facilities to achieve compliance and submit plans for such modification for concurrance and approval from this office.

If there are questions regarding this permit please contact Brian Nelson of my office.

Sincerely,

Calvin K. Sudweeks, Director
Bureau of Water Pollution Control

BLN:drb

cc: EPA - Denver Permits
Gerald Story, Southeastern District Health Department
Sally Keffer - Division of Oil, Gas and Mining

Slurry Cell Const Permit

STATE OF UT.

DEPARTMENT OF HEALTH

DIVISION OF ENVIRONMENTAL HEALTH

150 West North Temple, P.O. Box 2500, Salt Lake City, Utah 84110-2500

MAR 10 1982

Alvin E. Rogers, Director
Room 474 801-533-6111

James O. Mason, M.D., Dr.P.H.
Executive Director
801-533-6111

DIVISIONS
Community Health Services
Environmental Health
Family Health Services
Health Care Financing

OFFICES
Administrative Services
Community Health Nursing
Management Planning
Medical Examiner
State Health Laboratory

March 4, 1982
(801) 533-6146

Mary Jo Ormiston
Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112

RE: Construction Permit
Slurry Recycle Pond Emery Mine

Dear Ms. Ormiston:

We have reviewed the plans for the above referenced project submitted to this office through the Division of Oil, Gas and Mining. The design of the proposed refuse slurry pond for solids separation and disposal, and water recycle appears to conform with the Utah Wastewater Disposal Regulations and therefore a construction permit as constituted by this letter is hereby issued.

It is our understanding that the pond will initially have a 24 acre surface area and 165 acre ft. of storage. There will be approximately 33 acre ft. of sediment volume capacity and there will be a minimum of 2.8 ft. of freeboard on the impoundment. The pond will have a 6" layer of compacted clay as a liner for seepage control from the pond. No discharge is anticipated to surface waters with water exiting the pond from evaporation and pumping to process recycle only. The capacity calculations include provision for containment of the 10-year 24 hour maximum storm to the pond and refuse storage pile areas in addition to capacity for the recycle slurry process water. An emergency spillway is provided for storm events in excess of the 10 year storm and an NPDES permit for such emergency discharge is in application with the Region VIII offices of EPA.

The expected life of this pond until filled with the coal refuse sediment will be 5-7 years at which time the pond will be replaced or dredged. The specific detail plan of this process is to be submitted to the Bureau of Water Pollution Control for review and approval and a new permit issued at the time for the replacement.

If there are questions regarding this permit please contact Brian Nelson of our office.

Sincerely,

Gary B. Griffin

Calvin K. Sudweeks, Director
Bureau of Water Pollution Control

BRN:ddr
cc: Southeast District Health Department
Oil, Gas and Mining
Dennis Dalley
U.S. EPA Permits Branch Region VIII

CNSOL Hist. recommendations by to Sally, Lynn
Deep Mine

JIM
FEB 03 1982

SCOTT M. MATHESON
GOVERNOR

STATE OF UTAH
DEPARTMENT OF COMMUNITY AND
ECONOMIC DEVELOPMENT

Division of
State History
(UTAH STATE HISTORICAL SOCIETY)

MELVIN T. SMITH, DIRECTOR
300 RIO GRANDE
SALT LAKE CITY, UTAH 84101
TELEPHONE 801 / 533-5755

January 20, 1982

Mr. Jim Smith
Division of Oil, Gas, and Mining
1588 West North Temple
Salt Lake City, Utah 84116

Re: Emery Deep Mine, ACT/015/015, Emery County, Utah

Dear Jim:

The staff of the Utah State Historic Preservation Officer has received, for consideration, the mine plan for the Emery Mine. The mine is located about 4 miles south of Emery in Township 22 and 23, Range 6 East.

This permit is concerned only with the existing Emery Mine. The project area eventually will include three underground mines and two strip mines. There has been an underground mine on the site for 80 years. No new surface facilities will be constructed in this phase. Two sites will be claimed and the road will be graded.

Concerning Cultural Resources:

There's a review in the mine plan of the known general information about historic and prehistoric sites. A field research of 460 acres was conducted during the summer of 1980 by the Archeological-Environmental Research Corporation. Eleven, previously unrecorded, sites were located for a total of 13 sites in the permit area. One of these, the Browning site is historic and the remainder are prehistoric.

No sites were evaluated as presently eligible for the National Register. Six sites were evaluated as potentially eligible. Four of the six were rated for moderate to adverse impact.

Four sites were not evaluated and would require further testing for final determination of eligibility. Two of these sites, including the Browning site, are rated for high potentiality of adverse effect in the total mine plan development.

State History Board: Milton C. Abrams, Chairman • Theron H. Luke • Ted J. Warner • Elizabeth Montague • Thomas G. Alexander
Dello G. Dayton • Wayne K. Hinton • Helen Z. Papanikolas • David S. Monson • Elizabeth Griffith • William D. Owens

Recommendations for avoiding and mitigating adverse effect include oral and written historical research and photographic documentation of the Browning Mine site with limited subsurface testing of the other potentially eligible sites and avoidance of sites within the permit area but outside the surface disturbance.

These recommendations should be considered by the Division of Oil, Gas, & Mining, in consultation with the Office of Surface Mining, in relationship to the development of the mine plan.

It appears that the first stage of work is very limited and there may be no impact. This information may be used by the Division of Oil, Gas, & Mining consultation with the OSM to determine completeness of the mine plan.

If you have any questions or concerns, please contact us at 533-7039.
Sincerely,

Melvin T. Smith
Director and
State Historic Preservation Officer

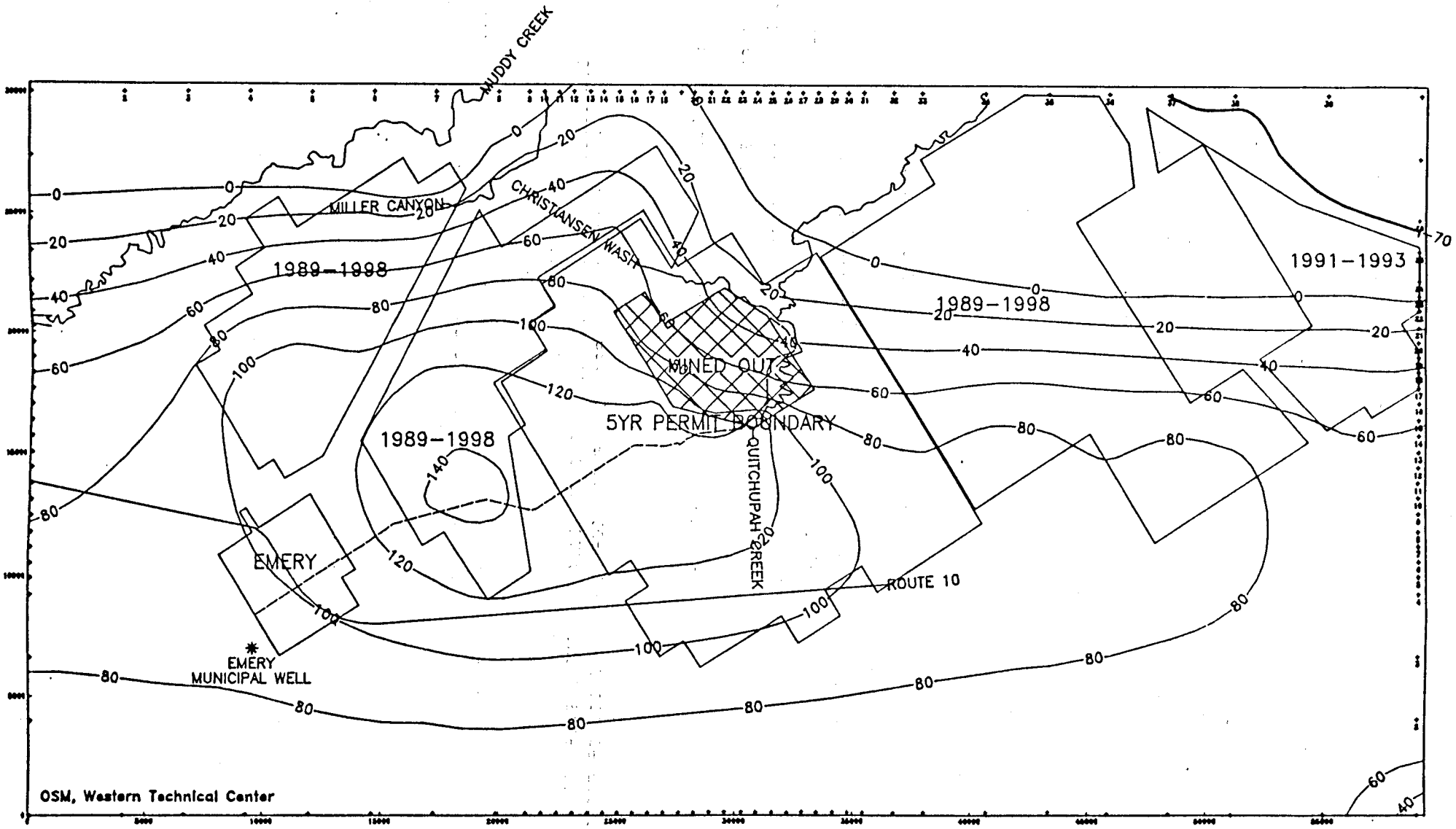
JLD:lo E419/1881c

APPENDIX C
OSM COMPUTER MODEL OUTPUT

Consolidation Coal Company
Emery Deep Mine
ACT/015/015, Emery County, Utah
February 26, 1985

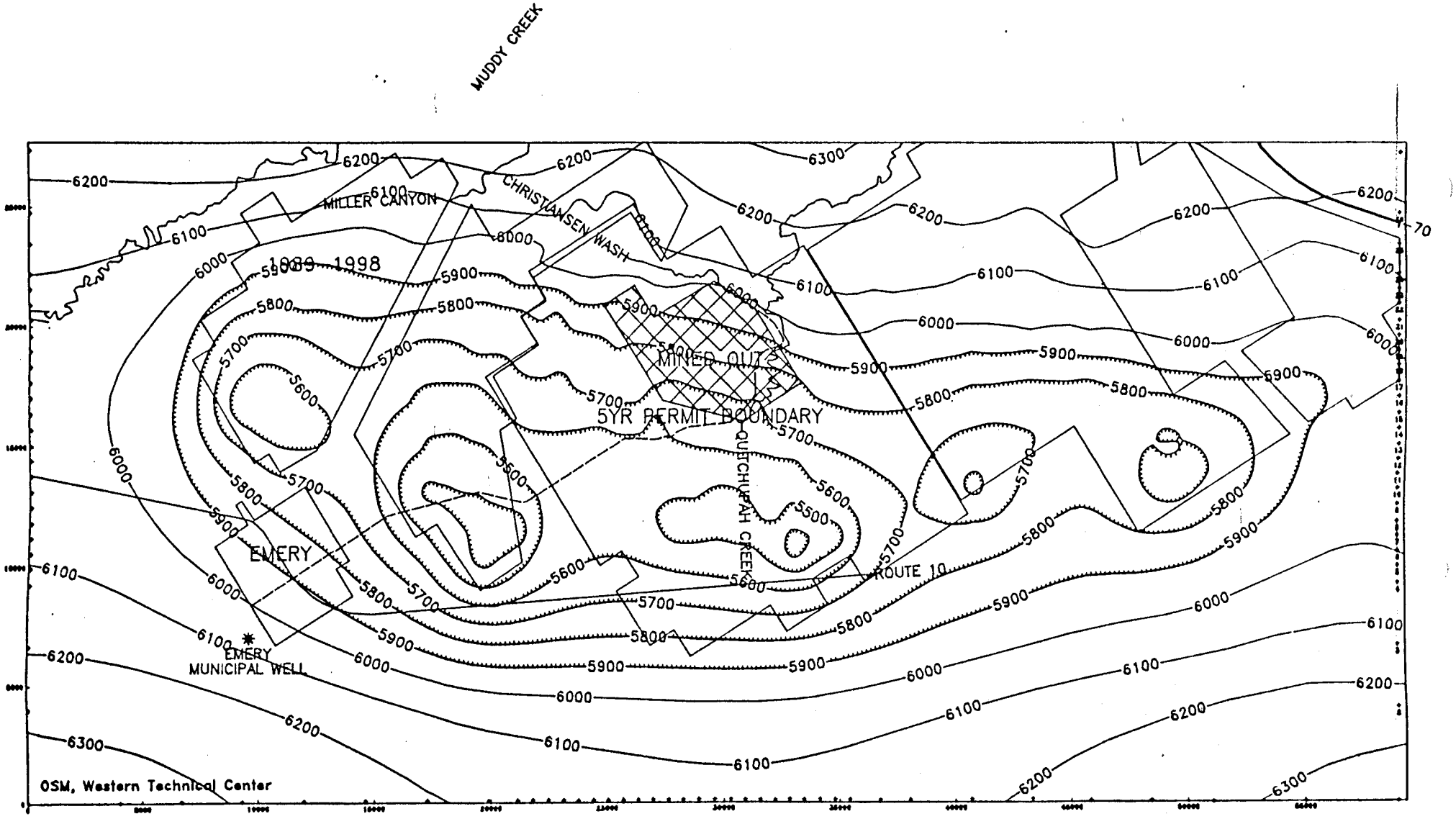
Emery Deep Mine

Drawdown Lower Ferron Aquifer 1998



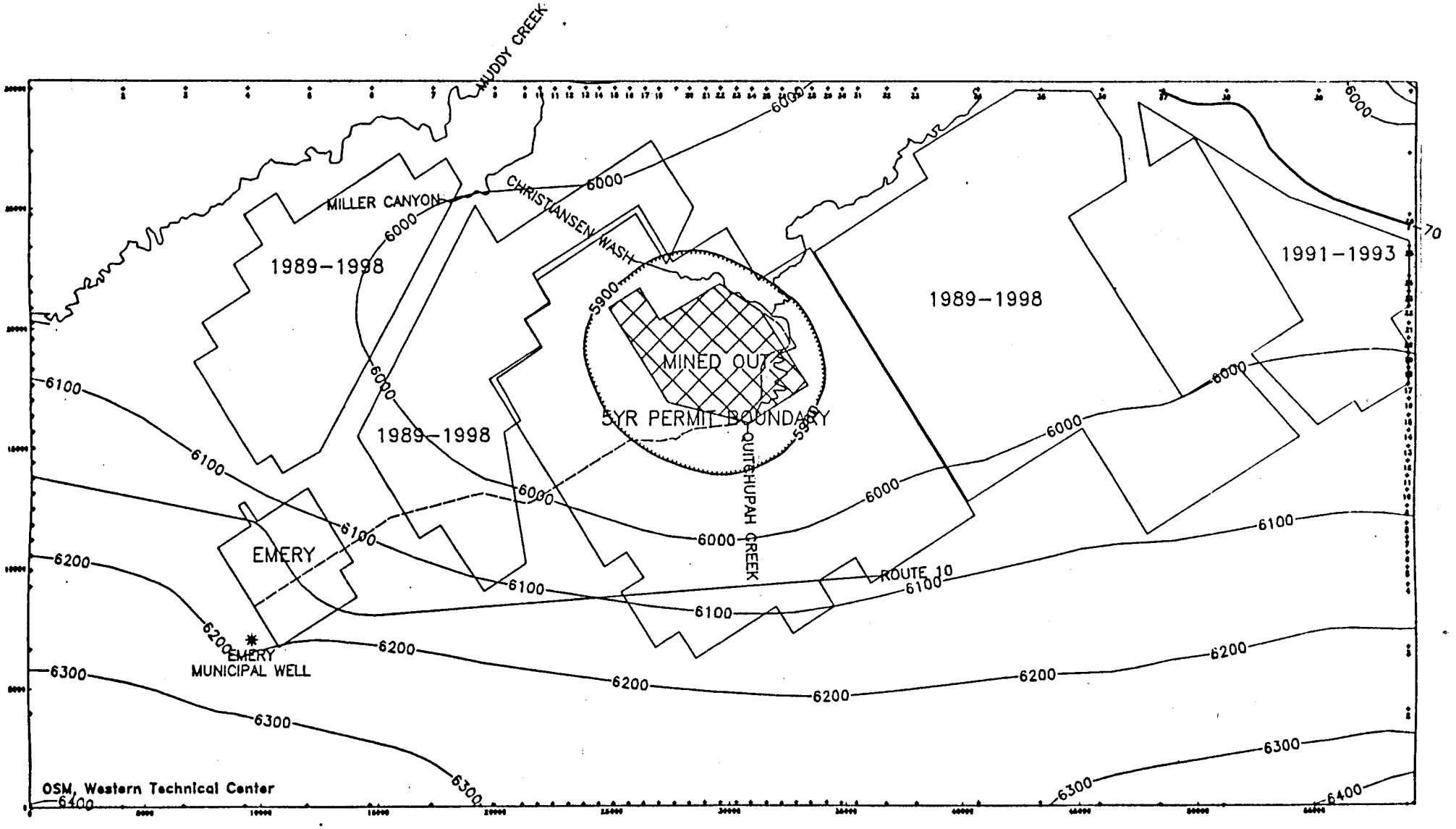
Emery Deep Mine

Potentiometric Surface Upper Ferron Aquifer 1998



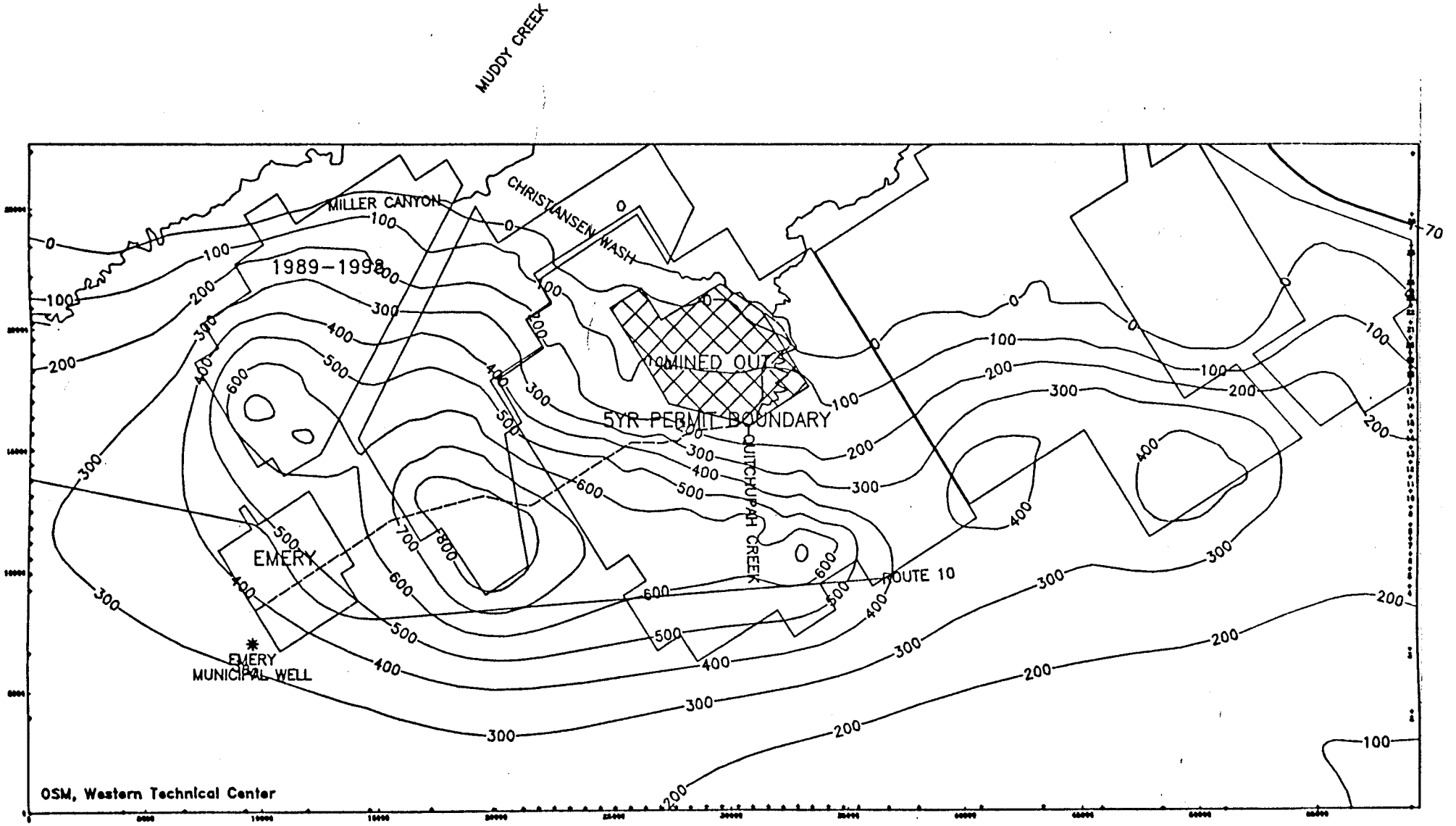
Emery Deep Mine

Potentiometric Surface Lower Ferron Aquifer 1998



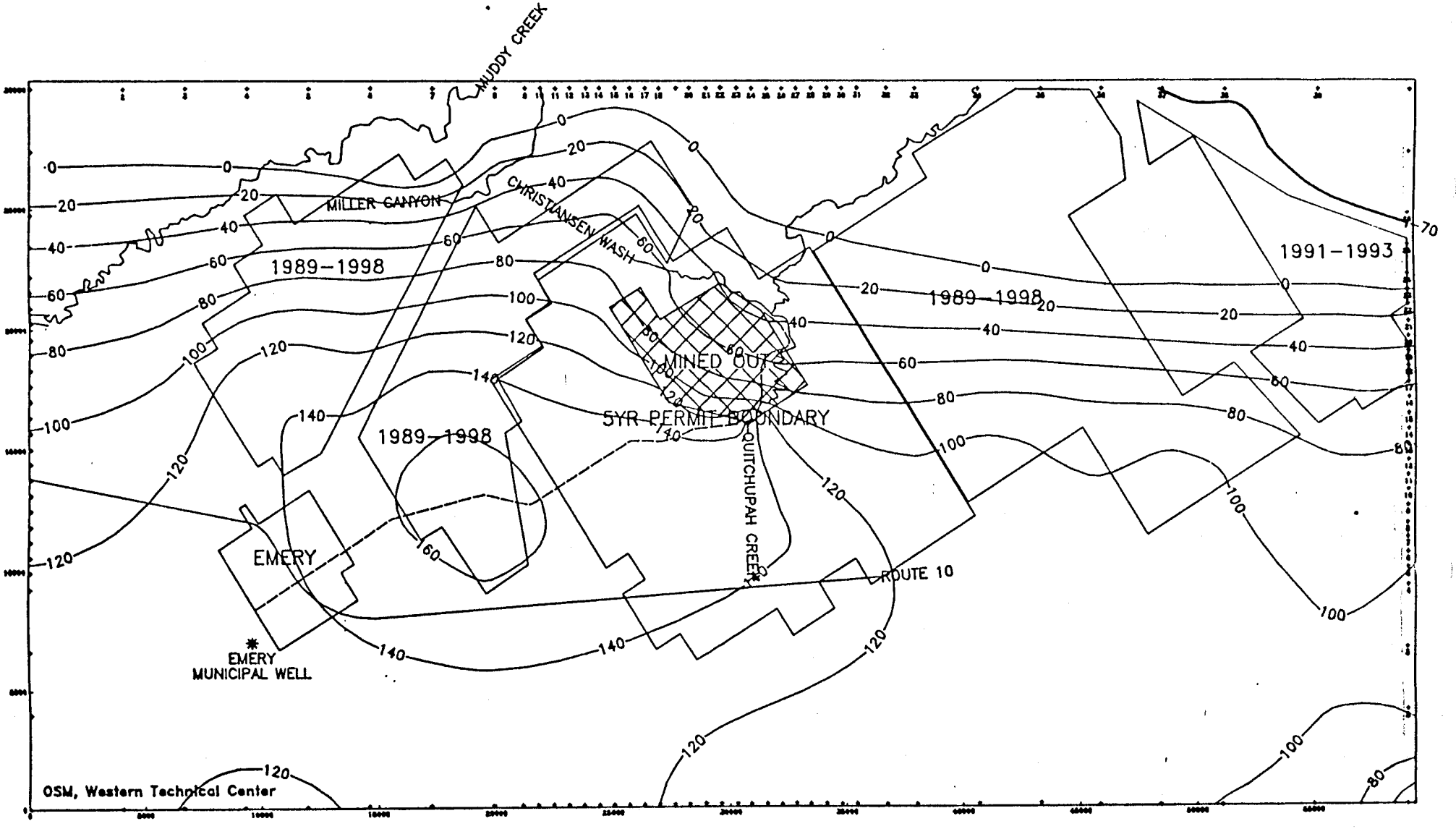
Emery Deep Mine

Drawdown Upper Ferron Aquifer 2009

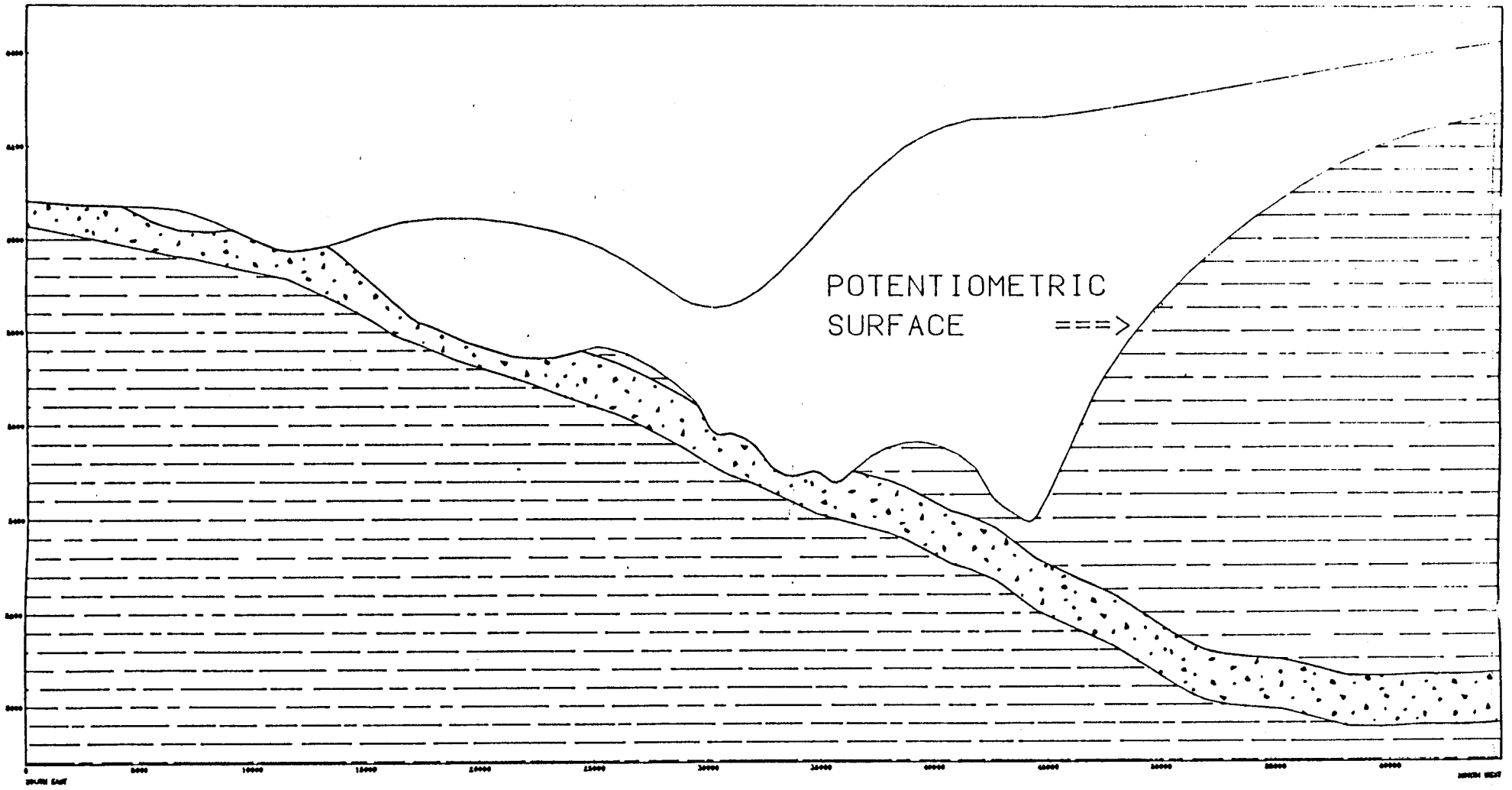


Emery Deep Mine

Drawdown Lower Ferron Aquifer 2009



UPPER FERRON AQUIFER
CROSS SECTION EMERY DEEP MINE PROJECT
1998 END OF MINING



MINED OUT