0027

Utah Power & Light Company
1407 West North Temple
P.O. Box 899
Salt Lake City, Utah 84110

April 1, 1985

Mr. Allen D. Klein
Office of Surface Mining
Reclamation and Enforcement
Brooks Towers
1020 15th Street
Denver, Colorado 80202

Dear Mr. Klein:

Please find enclosed a copy of the Final Reclamation Bond for the Deer Creek Coal Mine.

Per your instructions in your letter dated March 8, 1985, the original bond was submitted to the Division of Oil, Gas and Mining, together with the affidavit and map.

If you require additional information you can contact me at 800-535-4225.

Sincerely,

C. E. Shingleton
Director of Permitting,
Compliance & Services
Mining and Exploration

CES:bb:4790
Enclosure

(Revised December 1984)

Bond Number 027 21 58
Permit Number ACT/015/018
Mine Name DEER CREEK

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
(801) 538-5340

THE MINED LANDS RECLAMATION ACT

BOND

The undersigned UTAH POWER & LIGHT COMPANY as principal, and AMERICAN CASUALTY COMPANY OF READING, PA surety, hereby jointly and severally bind ourselves, our heirs, administrators, executors, successors and assigns unto the State of Utah, Division of Oil, Gas and Mining, and the U. S. Department of the Interior, Office of Surface Mining in the penal sum of one million two hundred twenty four thousand and no/100-- dollars ($1,224,000.00----------). Such sum shall be payable to one, but not both, of the above-named agencies.

The principal estimated in the Mining and Reclamation Plan filed with the Division of Oil, Gas and Mining on the 20th day of March, 19 81, that 26.5 acres of land will be disturbed by this mining operation in the State of Utah. A description of the disturbed land is attached hereto as Exhibit "A."

When the Division has determined that the principal has satisfactorily reclaimed the above-mentioned lands affected by mining in accordance with the approved Mining and Reclamation Plan and has faithfully performed all requirements of the Mined Land Reclamation Act, and complied with the Rules and Regulations adopted in accordance therewith, then this obligation shall be void; otherwise it shall remain in full force and effect until the reclamation is completed as outlined in the approved Mining and Reclamation Plan.

If the approved plan provides for reclamation of the land affected on a piecemeal or cyclic basis, and the land is reclaimed in accordance with such plan, then this bond may be reduced periodically.

In the converse, if the plan provides for a gradual increase in the area of the land affected or increased reclamation work, then this bond may accordingly be increased with the written approval of the surety company.

The Division shall only accept the bond of a surety company if the bond is noncancellable by the surety at any time for any reason including, but not limited to nonpayment of premium or bankruptcy of the permittee during the period of liability.

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING

CONFIRMATION/REPORT OF TELEPHONE CONVERSATION

TO	Name: STEVE MILLER	FROM	Name: LOUIS HAMM
	Office: Mine Safety and Health Administ.		Office: OSM/WTC
	Location: Denver		Location: Denver
	Telephone Number: (303) 236-2743		Telephone Number: (303) 844-5656

Purpose of Call: DEER CREEK MINE

Deer Creek permit application sais (p. 3-59) they are disposing of development waste underground. Conflicts with UMC 817.71 (m).

Spoke with Mr. Chris Shingleton of Utah Power and Light (mine owners). He describes the practice as one of backstowing non-carbonaceous development rock underground. All waste containing coal goes outside to the fill.

Mr. Miller of MSHA acknowledged that none of his inspectors have reported any violations of stowing carbonaceous material underground. Therefore, as long as UP&L and Emery Mining Co. (operator) continue to stow only non-carbonaceous material underground, no MSHA permit is required.

Explanatory Remarks:

3/12/85
(Date)

Louis Hamm
(Signature)

CONFIRMATION COPY

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UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING

This permit, UT-0016, is issued for the United States of America by the Office of Surface Mining (OSM) to

Utah Power and Light Company
P.O. Box 899
Salt Lake City, Utah 84110

for the Deer Creek Mine. Utah Power and Light Company is the lessee of Federal coal leases SL-064607-064621, SL-064900, U-1358, SL-070645, U-02292, U-084923, U-084924, U-083066, U-040151, U-044025, U-014275, U-024319, and U-47979.

Sec. 1 STATUTES AND REGULATIONS - This permit is issued pursuant to the Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. 1201 et seq., hereafter referred to as SMCRA, and the Federal coal leases issued pursuant to the Mineral Leasing Act of 1920, as amended, 30 U.S.C. 181 et seq., the Federal Coal Leasing Amendments Act of 1976, as amended 30 U.S.C. 201 et seq. and in the case of acquired lands, the Mineral Leasing Act for Acquired Lands of 1947, as amended, 30 U.S.C. 351 et seq. This permit is also subject to all regulations of the Secretary of the Interior including, but not limited to, 30 CFR Chapter VII and 43 CFR Part 3400, and to all regulations of the Secretary of Energy promulgated pursuant to Section 302 of the Department of Energy Organization Act of 1977, 42 U.S.C. 7152, which are now in force or, except as expressly limited herein, hereafter in force, and all such regulations are made a part hereof.

Sec. 2 The permittee is authorized to conduct surface coal mining and reclamation operations on Federal lands, as well as on such other lands affecting or affected by those operations on Federal lands situated in the State of Utah, Emery County, and located within:

Township 16 South, Range 7 East, Salt Lake Baseline and Meridian:
Sec. 27, SW1/4.
Sec. 28, SE1/4, E1/2 SW1/4.
Sec. 33, E1/2, E1/2 W1/2, SW1/4 SW1/4.
Sec. 34, W1/2, SE 1/4, S1/2 NE 1/4.

Township 17 South, Range 7 East, Salt Lake Baseline and Meridian:
Sec. 2, S1/2, Lots 1-7 and 10-12
Sec. 3, W1/2, W1/2 NE1/4, NE1/4 NE1/4, S1/2 SE1/4.
Sec. 4 through 10, all.
Sec. 11, N1/2 NW1/4, W1/2 SW1/4, approximately.

Township 17 South, Range 7 East, Salt Lake Baseline and Meridian Continued:
Sec. 14, W1/2 W1/2, approximately.
Sec. 15 through 22, all.
Sec. 27, N1/2 N1/2, SE1/4 NE1/4, approximately.
Sec. 28, N1/2 N1/2.
Sec. 29, N1/2 N1/2.
Sec. 30, N1/2 N1/2, SW1/4 NE1/4, S1/2 NW1/4, NW1/4 SW1/4, N1/2 SW1/4 approximately.

Township 17 South, Range 6 East, Salt Lake Baseline and Meridian:
Sec. 1, E1/2, E1/2 W1/2.
Sec. 12, E1/2, E1/2 W1/2.
Sec. 13, E1/2, E1/2 W1/2.
Sec. 24, E1/2, E1/2 W1/2.
Sec. 25, N1/2 NE1/4.

and shown on Map P-1, page 8 of the permit; and to conduct surface coal mining and reclamation operations on the foregoing described property subject to the conditions of the leases and the approved mining plan, and all other applicable conditions, laws, and regulations.

Sec. 3 The term of this permit is 5 years from the date of issuance, except that this permit will terminate if the permittee has not begun the surface coal mining and reclamation operations covered herein within 3 years of the date of permit issuance.

Sec. 4 The permit rights may not be transferred, assigned, or sold without the approval of the Director, OSM. Request for transfer, assignment, or sale of permit rights must be done in accordance with 30 CFR 740.13(e) and UMC 788.17.

Sec. 5 The permittee shall allow the authorized representatives of the Secretary, and the Utah Division of Oil, Gas and Mining, including but not limited to inspectors and fee compliance officers, without advance notice or a search warrant, upon presentation of appropriate credentials, and without delay to:

a. Have the rights-of-entry provided for in 30 CFR 842.13 and UMC 842.13; and,

b. Be accompanied by a private person for the purpose of conducting an inspection in accordance with 30 CFR 842.12 and UMC 840.15, when the inspection is in response to an alleged violation reported by the private person.

Sec. 6 The permittee shall conduct surface coal mining and reclamation operations only on those lands specifically designated as being within the permit area on the maps submitted in the permit application and approved for the term of the permit and which are subject to the performance bond.

Sec. 7 The permittee shall minimize any adverse impact to the environment or public health and safety resulting from noncompliance with any term or condition of this permit by including, but not being limited to:

a. Accelerated monitoring to determine the nature and extent of noncompliance and the results of the noncompliance;

b. Immediate implementation of measures necessary to comply; and

c. Warning, as soon as possible after learning of such noncompliance, any person whose health and safety is in imminent danger due to the noncompliance.

Sec. 8 The permittee shall dispose of solids, sludge, filter backwash, or pollutants removed in the course of treatment or control of waters or emissions to the air in the manner required by the approved Utah State Program and the Federal Lands Program which prevents violation of any applicable State or Federal law.

Sec. 9 The permittee shall conduct its operations:

a. In accordance with the terms of the permit to prevent significant, imminent environmental harm to the health and safety of the public; and

b. Utilizing methods specified as conditions of the permit by the Utah Division of Oil, Gas and Mining and OSM, the approved Utah State Program, and the Federal Lands Program.

Sec. 10 The permittee shall provide the names, addresses, and telephone numbers of persons responsible for operations under the permit to whom notices and orders are to be delivered.

Sec. 11 Upon expiration, this permit may be renewed for areas within the boundaries of the existing permit in accordance with SMCRA, the approved Utah State Program and the Federal Lands Program.

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Sec. 12 If during the course of mining operations previously unidentified historic properties are discovered, the permittee shall ensure that the site(s) is not disturbed and shall notify the Regulatory Authority (RA). The RA, shall inform the permittee of necessary actions required.

Sec. 13 The operator shall pay all reclamation fees required by 30 CFR Chapter VII, Subchapter R for coal produced under this permit.

Sec. 14 APPEALS - The permittee shall have the right to appeal: (a) under 30 CFR 775 from an action or decision of any official of OSM; (b) under 43 CFR 3000.4 from an action or decision of any official of the Bureau of Land Management; (c) under 30 CFR 290 from an action, order, or decision of any official of the Minerals Management Service; or (d) under applicable regulations from any action or decision of any other official of the Department of the Interior arising in connection with this permit. The appeal period commences with the date of publication of the notice of decision in the newspaper.

Sec. 15 SPECIAL CONDITIONS - The permittee shall comply with the terms and conditions set out in the leases and this permit. In addition, the permittee shall comply with the conditions appended hereto as Attachment A. These conditions are also imposed upon the permittee's agents and employees. The failure or refusal of any of these persons to comply with these conditions shall be deemed a failure of the permittee to comply with the terms of this permit and the lease. The permittee shall require his agents, contractors, and subcontractors involved in activities concerning this permit to include these conditions in the contracts between and among them. In accordance with 30 CFR Part 774 (1983), these conditions may be revised or amended, in writing, by the mutual consent of the grantor and the permittee at any time to adjust to changed conditions or to correct an oversight. The grantor may, by order, require reasonable revisions of this permit to ensure compliance with SMCRA and the regulatory program.

OFFICE OF SURFACE MINING

By:_____
Administrator, Western Technical Center

_____
Date

DRAFT

Attachment A
Special Conditions

Condition No. 1

Within 30 days of the permit effective date, the permittee shall calculate the sediment pond storage volume minus sediment storage volume, and water volume between full sediment level and the dewatering pipe intake (water which cannot be evacuated after a storm event) and submit the calculations to the regulatory authority for review. The permittee must show that the net available volume in the sediment pond is sufficient to contain the 10-year, 24-hour storm event (calculated to be 8.0 acre-feet). If the net available volume of the pond is not sufficient to contain the 10-year, 24-hour storm event, the permittee shall modify the sediment pond system to ensure that the volume of the 10-year, 24-hour storm event can be stored as required by UMC 817.42 and UMC 817.46. Any necessary modifications to the sediment pond system must be completed within 120 days of permit issuance.

Condition No.2

Prior to September 1, 1985, the permittee must install surface-water monitoring devices on both Deer Creek and Grimes Wash that are capable of measuring all flow including peak runoff.

Condition No. 3

Prior to the end of the 1985 calendar year, the permittee must increase the capacity of the Deer Drainage and Elk Canyon Creek diversion culverts to convey the 10-year, 24-hour storm event as required by UMC 817.44. This can be accomplished by implementing the permittee's February 4, 1985 design submittals or by implementing an alternative approach to meet the required performance standards.

If the permittee chooses an alternative approach, the design must be submitted to the regulatory authority within 60 days of the permit effective date for approval.

Condition No. 4

No element of riprap to be placed in reclaimed channels and energy dissipator structures will exceed one-third the channel or structure bottom width.

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Attachment A
Special Conditions
(continued)

Condition No. 5

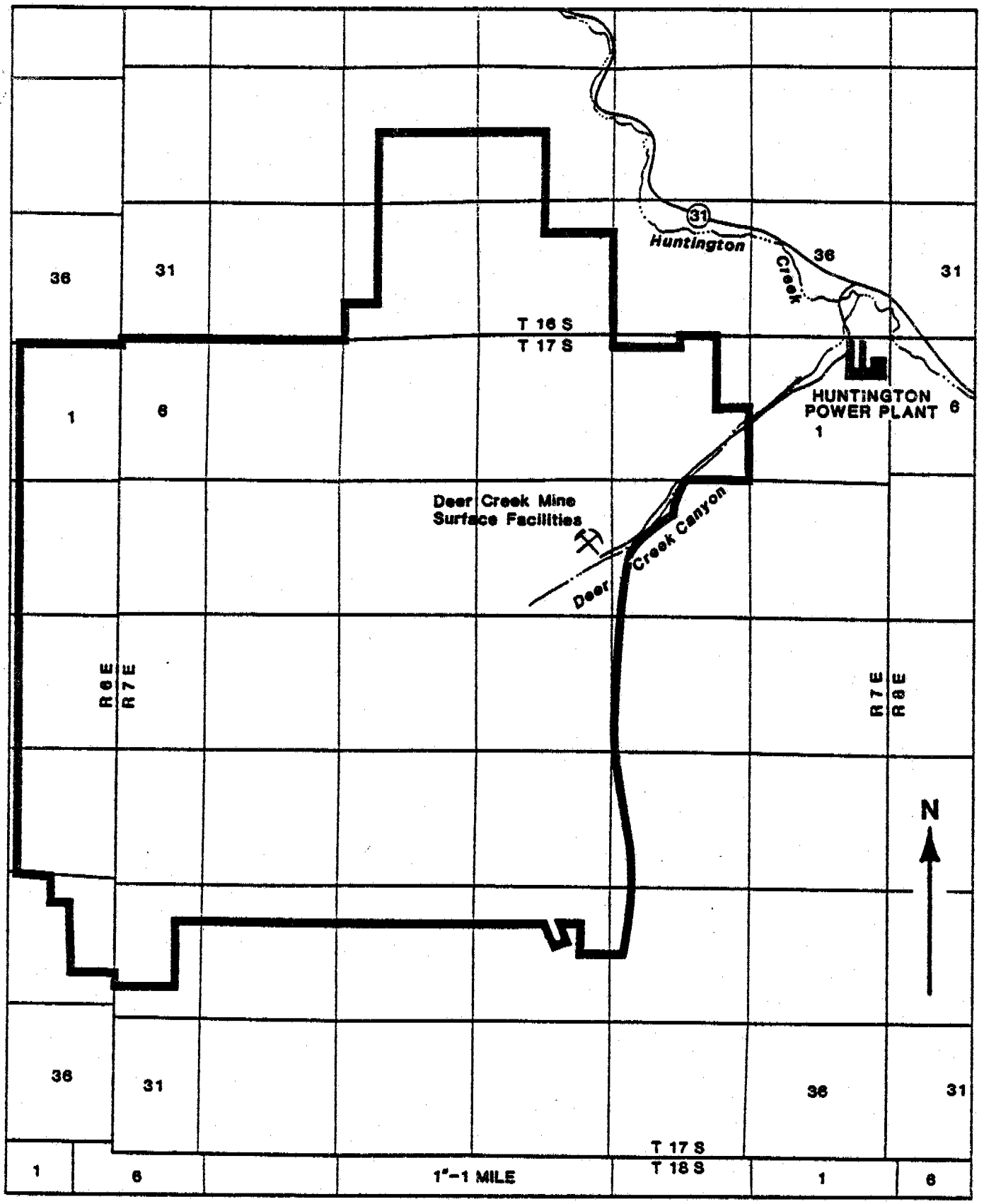
The permittee shall replace any water demonstrated to have been lost or adversely affected by mining operations with water from an alternate source in sufficient quantity and quality to maintain the rights of present users and current and postmining land uses. The permittee will advise the regulatory authority of the loss or adverse occurrence within two working days of becoming aware that it has occurred, and within 14 calendar days of notification shall submit to the regulatory authority for approval a plan to replace the affected water. Upon acceptance of the plan by the regulatory authority, the plan shall be implemented in the time-frames dictated by the regulatory authority's approval notification.

Condition No. 6

Existing raptor nests adversely affected by mine related subsidence shall be replaced or otherwise mitigated by the permittee in consultation with the U.S. Fish and Wildlife Service and the Utah Division of Wildlife Resources according to the requirements of UMC 784.21 and UMC 817.97. Notification of the loss to the above named agencies and the regulatory authority shall take place within two working days of the permittee becoming aware that the loss has occurred.

Condition No. 7

Prior to beginning second seam mining inside a perennial stream buffer zone as defined by a 35 degree angle of draw from vertical, measured from the limit of mining in the lowest seam, to the center of the stream channel, the permittee shall present a detailed evaluation of the anticipated effects of multiple seam mining on perennial streams as required by UMC 817.126(a). This evaluation must be based upon subsidence monitoring information collected on multiple seam mining in areas with similar overburden depths and surface topography.



Deer Creek Mine Permit Area

MAP P-1

FINDING OF NO SIGNIFICANT IMPACT

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Utah Power and Light Company
Deer Creek Mine

The technical analysis (TA) and environmental analysis (EA), preceded by this "Finding of No Significant Impact" statement, identify certain environmental impacts that would result from the Federal approval of the mining plan for Utah Power and Light Company's Deer Creek Mine. The 5-year permit application, submitted to the State under its approved permanent program, proposes a total permit area of 16,900 acres. This permit is for 14,620 acres of those proposed by the applicant. Leases U-06039, U-024317, and SL-051221 will not be permitted at this time. The permit area encompasses portions of several Federal leases.

The regional impacts of coal mining in the region are addressed in the Bureau of Land Management, 1981, Final Environmental Impact Statement titled Uinta-Southwestern Utah Regional Coal Environmental Impact Statement.

Impacts to the Deer Creek Mine area would result from mining the Deer Creek Mine. However, OSM finds that impacts would not be significant.

Based upon the evaluation of impacts given in the TA and EA, I find that no significant impacts to the human environment would result from continuation of the existing mine operation. Therefore, preparation of an environmental impact statement is not required.

_____
Administrator
Western Technical Center

_____
Date

DRAFT

ENVIRONMENTAL ASSESSMENT
FOR THE
DEER CREEK MINE

PREPARED BY:

U.S. OFFICE OF SURFACE MINING
WESTERN TECHNICAL CENTER

MARCH 18, 1985

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ENVIRONMENTAL ASSESSMENT FOR THE DEER CREEK MINE, EMERY COUNTY, UTAH

March 18, 1985

INTRODUCTION

The Deer Creek Mine is an underground coal mine owned by the Utah Power and Light Company (UP&L) and operated by the Emery Mining Company. The mine is located in central Utah approximately eight miles west of Huntington, Utah. The proposed permit area covers 14,620 acres, approximately 7,200 acres of which will be undermined. Approximately 91 percent of the permit area is underlain by thirteen Federal coal leases. The remaining coal is either owned by UP&L or leased to UP&L. Coal reserves total approximately 186,000,000 tons with 95,000,000 tons recoverable. Federal surface on the proposed permit area totals 8,225 acres with 7,985 acres managed by the Manti-LaSal National Forest, and the remaining 240 acres managed by the Bureau of Land Management. The proposed mining rate will average 2.5 million tons per year. The estimated life of the mine is 47 years.

The Bureau of Land Management, Branch of Solid Minerals, granted approval of the Deer Creek Resource Recovery and Protection Plan (RRPP) on October 31, 1984. The Office of Surface Mining (OSM) has determined that the northern leases proposed for permitting by the applicant (U-06039, SL-051221, and U-024317) cannot be permitted at this time because the applicant has not obtained the right-of-entry to access privately owned lands adjacent to these coal lease areas. Therefore, the permit area and mining plan area are 2,280 acres smaller than the RRPP approval area. The proposed area of mining plan approval and permit approval are identical.

Adjacent to the Deer Creek operation is the Wilberg Mine, the Des-Bee-Dove Mine, and the Trail Mountain Mine. Deer Creek, Wilberg, and Des-Bee-Dove are owned by UP&L. While the Deer Creek Mine is primarily devoted to mining the Blind Canyon coal seam (with the exception of the northern part of the permit area where both the Blind Canyon and Hiawatha seams are mined), the Wilberg Mine is primarily devoted to mining the Hiawatha coal seam which is situated below the Blind Canyon seam. Therefore, most of the Deer Creek and Wilberg Mines overlap (Figure 1). The Des-Bee-Dove Mine is situated adjacent to Deer Creek and Wilberg on the east. The Trail Mountain Mine (Trail Mountain Coal Company) is adjacent to Deer Creek and Wilberg on the southwest.

Other active mines in the vicinity of the Deer Creek Mine are the Hiawatha Mine (King Mines), the Star Point Mine, Crandall Canyon Mine, Huntington Canyon Mine, and the non-Federal Bear Canyon Mine.

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PURPOSE AND NEED FOR ACTION

The Deer Creek Mine has been operating under a permit issued by the State of Utah, Division of Oil, Gas and Mining (UDOGM) (ACT/015/018) since May 11, 1978, with approval under 30 CFR 211 issued by the U.S. Geological Survey on January 23, 1978. To continue mining, the applicant has submitted an underground mining and reclamation permit application in compliance with the Coal Mining and Reclamation Permanent Program (Chapter 1) of the State of Utah. The necessary federal action is to approve, disapprove, or conditionally approve the permit and mining plan in accordance with the requirement of SMCRA and the Mineral Leasing Act. This environmental assessment will address the environmental consequences of the proposed mining operations and reclamation plans in the permit application package. The consequences of no permit approval will also be addressed. The purpose of this document is to assist the decision makers in making a decision with respect to NEPA compliance.

DESCRIPTION OF ALTERNATIVES

Proposed Action: Approval of the Permit Application Package, With Conditions

OSM may approve the operator's permit application package for the 14,620 acres of coal subject to certain conditions.

Alternative I: No Action

SMCRA and the Mineral Leasing Act requires that the Secretary of the Interior approve, disapprove, or conditionally approve mining operations on Federal leases. Therefore, the alternative to take no action is not viable and will not be discussed further.

Alternative II: Disapproval of the Permit Application Package

Disapproval of the permit application package would result in permanent closure of the existing mining operation. All facilities are in place at the Deer Creek Mine, so this alternative would not result in long-term impacts greatly different from the proposed action. Under this alternative, the mine operator would begin reclamation at the disturbed area.

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DESCRIPTION OF THE AFFECTED ENVIRONMENT

Soils

Soils in the proposed permit area are composed of three map units. These units are Typic Cryochrepts-Lithic Cryorthents-Rock Outcrop, loamy skeletal, shallow association (40-60 percent slopes); Pachic Cryoborolls, loamy and loamy-skeletal (10-25 percent slopes), and Typic Cryoborolls, loamy and loamy-skeletal (25-40 percent slopes). The Typic Cryochrepts association is composed of soils which are primarily loamy skeletal and lithic with areas of sandstone outcrops. Cryochrepts have a gravelly loam or sandy loam surface layer 35 cm thick with 25 percent sandstone fragments underlain by a gravelly or stoney loam 100 cm thick with 35-50 percent sandstone fragments. Cryorthents are primarily shallow and are underlain by rock within 50 cm of the surface. The Pachic Cryoboroll soil has a loamy surface layer about 60 cm thick overlying a loamy subsoil 30 cm thick. The substratum is a gravelly sandy loam containing 50 percent sandstone fragments. The Typic Cryoboroll soil is characterized by a loamy surface layer about 40 cm thick over a calcareous substratum with up to 50 percent sandstone fragments.

Hydrologic Resources

The Deer Creek permit area comprises approximately 14,620 acres of land located within Cottonwood and Huntington drainages. The disturbed area (surface disturbance, 25 acres) is drained by Deer Creek, a tributary of Huntington Creek. Most tributaries located on the permit area are ephemeral or intermittent except for Deer Creek, the left fork of Grimes Wash, and sections of Meetinghouse and Rilda Canyon Creeks. Meetinghouse is considered to be perennial below Elk Spring, and Rilda Canyon Creek is considered a perennial stream below the confluence of its right and left forks. Elevations in the general area range from around 7,000 feet in the canyon bottoms to 10,000 feet along the ridges and plateaus. Sediment-treated water from the Deer Creek Mine facilities area drains into Huntington Creek, approximately three miles north of the main tipple. The Huntington Creek drainage basin encompasses 181 square miles above its confluence with Deer Creek. Huntington Creek, a perennial tributary to the San Rafael River, annually yields approximately 67,000 acre-feet of water. The discharge averages approximately 96 cfs.

The major drainages within the permit area are relatively small perennial to intermittent streams. This base flow is sustained by spring discharges and groundwater seeps. Most of the annual flow (approximately 65 percent) comes in April through June in response to snowmelt. The water quality of the surface drainage is generally good and can be characterized as a calcium-magnesium bicarbonate water with total dissolved solids ranging from 300 to 600 milligrams per liter.

The majority of springs on East Mountain occur in the North Horn Formation, which consists of varigated shales, sandstones, conglomerates and freshwater limestone. The overlying Flagstaff Limestone is highly fractured, which allows for good vertical transport of water with little lateral movement, and hence few springs. The Flagstaff serves as a local source of recharge to the North Horn Formation. The existing water quality of the springs on East Mountain is good and is of similar chemical character to the surface water. The applicant has identified numerous springs and seeps within three miles of the permit area.

Vegetative Resources

The permit area includes five vegetation types: mixed conifer, pinyon-juniper, sagebrush, grass, and riparian. Mixed conifer primarily occurs at higher elevations and on north-facing slopes, and is the most extensive floral community. The next most extensive community is pinyon-juniper which occurs on steep rocky slopes with a southern exposure and on more gentle terrain at lower elevations. The sagebrush and grass communities occur at higher elevations on more moisture deficient sites. The riparian community occurs along Cottonwood Creek on the western side of the permit area, with some along Deer Creek.

Fish and Wildlife Resources

Wildlife species inhabiting the mine permit area and vicinity are typical for this region of the Wasatch Plateau. Several game and high-interest species inhabit the general vicinity of the mine permit area. None are potentially exposed to any significant impact. Riparian habitat along Deer Creek is considered of high value to the area's wildlife resources; however, none of the habitats present are unique or restricted to the mine permit area. No fish species occur in Deer Creek or Grimes Wash in the vicinity of the mine facilities, although the drainages are tributary to Huntington Creek, which does support trout and is classified as a Class 3 fishery.

Cliffs in the vicinity of the mine portal and facilities area represent potentially valuable cliff-nesting habitat for several species of raptors (e.g. golden eagle, red-tailed hawk, and prairie falcon). Wooded habitats within the permit area also provide nest sites for tree-nesting species such as northern goshawk, Coopers's hawk, sharp-shinned hawk, red-tailed hawk, American kestrel, and screech owl. The bald eagle is a winter visitor to the area. A 1981 U.S. Fish and Wildlife Service raptor survey for cliff-nesting species identified two golden eagle nests (No. 57 & 59) and one raven nest (No. 58) within one kilometer of the Wilberg Mine portal area. All were inactive in 1982. Four buteo nests were located near the Deer Creek Mine facilities area. One of these nests was an active red-tailed hawk nest in 1981. All were inactive in 1982. In addition, an inactive raven nest (No. 46) occurs within one kilometer of the Meetinghouse Canyon breakout (Map 2-18, PAP Vol. 6).

Mule deer occur within the permit area year round. During the summer they are found predominantly in habitats at the mid to upper elevations in the permit area (e.g., mixed conifer, sagebrush, and grassland). In the winter, habitats at the lower elevations (especially pinyon-juniper) along the benches and slopes of the southern and eastern portions of East Mountain are designated by the Utah Division of Wildlife Resources (UDWR) as high-priority and critical mule deer winter range. The pre-law waste rock storage site and portions of the access/haulroad and sewer absorption field occur within high-priority mule deer winter range.

Land Use

Surface ownership of the Deer Creek portal and facilities area is private (UP&L Co.). The majority of the remaining land within the mine permit area is either privately owned or is part of the Manti-LaSal National Forest. The Bureau of Land Management manages 240 acres.

Premining land uses in the disturbed areas associated with the Deer Creek Mine were livestock grazing and wildlife habitat. Land use on and adjacent to the permit area consists of recreation, mining, wildlife habitat, and limited livestock grazing.

Topography

The Deer Creek Mine is located at the junction of Deer Creek Canyon and Elk Canyon. The facilities area is for the most part located on a flat area created by pre-law fill material along the stream, but is adjacent to a steep hillside. The hillside has been excavated to form additional work area for the operations. The cliff above the mine is formed by interbedded shales and sandstones and massive sandstone layers. The sandstone layers form vertical cliffs over much of the hillside.

Cultural Resources

See Addendum A

Socioeconomics

See Addendum B

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ENVIRONMENTAL IMPACTS OF THE PROPOSED ALTERNATIVE

Soils

The soils existing at the Deer Creek Mine were buried during previous mining operations. No new disturbances are planned at this site.

Because soil for reclamation is lacking, the applicant proposes to attempt to develop a substitute soil by temporarily reclaiming various existing fill slopes which will not be disturbed during mining (see Chapter X, Technical Analysis, Revegetation). It is assumed that the surface material of the slopes, through temporary reclamation, will increase in organic matter content and microbial populations, thereby providing a planting medium superior to existing fill materials. At the onset of final reclamation grading, this "topsoil" would be stripped from the temporarily reclaimed slopes and temporarily stockpiled during backfilling and grading operations. As grading is completed, these cut-and-fill seedbed materials ("topsoil") will be distributed on newly graded surfaces to a depth of 6 to 12 inches at random locations throughout the site to enhance reclamation potential.

The seedbed at the Deer Creek Mine will consist primarily of fill composed of sandstone and shale parent material. During previous mining coal wastes became mixed with this material at and adjacent to coal handling facilities. Mixing will continue through the life of the mine (potentially 47 years). The applicant has committed to burying all toxic materials, which will result in the use of uncontaminated fill as seedbed material after final grading. Therefore, the impact of coal mixing is considered slight.

Erosion of fill, and therefore future seedbed materials, will occur during operations as a result of wind and water forces. The potential for erosion is greatest on the slopes of the major construction fills. To decrease erosion potential, the applicant will fertilize, plant, and mulch these slopes during the first year of operations. Irrigation will be used on subsequent plantings if the first seeding attempt fails. Though slope reclamation will reduce erosion to some degree, the success of revegetation cannot be quantified at this time. Erosion will be significantly reduced for at least one year after planting due to mulch application. As mulch decomposes, erosion will increase until vegetation becomes established.

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Soil in stockpiles will be subject to compaction, a reduction in nutrient levels, and a reduction in the microbial populations. Soil structure will also be lost during salvage. Compaction will be relieved during soil reapplication. Nutrient levels will be re-established through fertilization. Microbial populations should readily re-establish in the soil matrix through innoculation from surrounding areas. Soil in stockpiles will be lost through erosion. This loss, however, should be minimal with respect to the total amount salvaged. The applicant's commitment to temporarily revegetate berm stockpiles will reduce soil loss resulting from erosion.

Reapplied soil will be subjected to erosion from the time of final grading until revegetation is established. As in the case of temporary revegetation of Wilberg Mine fill slopes, erosion should be significantly reduced from the time of mulch application until applied mulch decomposes and no longer provides surface protection. Erosion will likely increase at this time until vegetative cover is established because of the quality of seedbed material involved, the steep postmining slope gradients, and the average annual precipitation. Because of the commitment to irrigate if the initial planting fails, the significance of this impact is reduced both in terms of magnitude and duration. With respect to these factors, the erosion impact is considered less serious for both the Cottonwood fan portal and the waste rock disposal site. It is believed that establishment of vegetative cover to presumed premining levels can be accomplished more rapidly at these sites. Therefore, the duration of the erosion impact, compared to that of the main mine site, is reduced.

Surface Water Hydrology

All surface drainage facilities are designed to safely control water and sediment runoff from all disturbed areas. In addition, all surface water originating from undisturbed lands upstream of the facilities area will be controlled and diverted around the operation. Storm runoff from within the mine facilities area is collected in a system of open ditches, bermed roadways and culverts, and is discharged to the sediment pond at the base of facilities area. All undisturbed runoff is discharged to Deer Creek below the facilities area.

The sediment pond is designed to detain the 10-year, 24-hour storm. It should be noted that when the design event is exceeded (i.e. storms larger than the 10-year, 24-hour storm), sediment detention times will be reduced, leading to a slightly higher sediment load in Deer Creek.

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Runoff from 25 acres of disturbed land will be temporarily detained in the Deer Creek Mine sediment pond. This water will be released to Deer Creek following the required 24-hour detention. The surface-water impact associated with the Deer Creek Mine operations will be minimal.

At the end of mining and reclamation, impact to the surface-water system will be minimal. It is not anticipated that significant dewatering of the springs by mining and associated subsidence will take place. Fourteen springs located on the permit area are closely monitored by the applicant. Should mining at the Deer Creek Mine affect the recessional behavior of these springs, the applicant has committed to replace the lost water supply.

Reclamation of the drainage at the Deer Creek Mine will consist of removing the temporary drainage system, diversion and sedimentation pond. Permanent channels will be constructed on the original bedrock. A riprap-lined channel will be constructed across the tipple yard fill. All channels are designed to pass the 100-year, 24-hour runoff peak flow. The proposed surface-water reclamation plan will have negligible impact on water quantity or quality of Deer Creek and its tributaries.

Ground-Water Hydrology

The Deer Creek Mine discharges an average of 0.7 cfs. The majority of this intercepted groundwater is utilized by the Huntington Power Plant as cooling water. Numerous springs and seeps exist on and near the permit area. The majority of these springs (39 of 59) discharge from the North Horn Formation.

The ground-water system is generally described as consisting of numerous perched aquifers in the North Horn and Blackhawk Formations. These aquifers receive recharge from snowmelt and influent stream through a system of fractures and faults in the overlying and occasionally underlying formations. Confining layers of lenticular siltstones and shales direct the lateral movement of ground water. The data collected by the mine generally support this hypothesis. Ground water is intercepted but rapidly diminishes in flow.

With the approval of the mine plan, a detailed ground-water monitoring program will be approved. The applicant will collect data from 59 springs and extensively monitor the discharge recession of 14 springs.

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Discharge quantity and quality data will continue to be collected from seeps within the mine, and two wells located off site will continue to provide baseline data.

Based on the available data, it appears that the Deer Creek Mine will not significantly impact the ground-water resources of the area. Because of the uncertainties associated with the hydrologic consequences of the proposed and continued operations, the applicant has committed to a detailed ground-water monitoring program. In the event that monitoring data should indicate a significant impact occurring, the applicant has committed to mitigation of the impact.

Vegetation Resources

Only pinyon-juniper vegetation has or will be disturbed in the Deer Creek Mine permit area. Twenty-five acres of pinion-juniper vegetation has been disturbed by the Deer Creek Mine at the main facility area. No further disturbance will occur. Since revegetation will restore the native species to these areas, the long-term impacts should be minimal.

Fish and Wildlife

Surface disturbances associated with the Deer Creek Mine total approximately 25 acres, all within pinyon-juniper habitat. The disturbed area will remain devoid of wildlife habitat for the life of the mine and until reclamation is successful. None of the areas affected represent any unique habitats for the region or critical habitats for threatened or endangered species. Because of this and the limited extent of surface disturbance, the overall potential for impact on wildlife species resulting from loss of habitat will remain relatively minor.

Other mine-associated wildlife impacts that may be more important than direct loss of habitat include (1) human harassment of wildlife, (2) mule deer road kills, and (3) the potential effects of subsidence on springs and raptor cliff-nesting habitat. The effects of human harassment on wildlife, either inadvertent or purposeful, should be considered from a cumulative standpoint since at least three other mines are currently operating along the southern end of East Mountain. However, since premining baseline data for wildlife

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populations in the area are lacking, these effects are extremely difficult to quantify. Company-sponsored wildlife educational programs should help to reduce harassment of wildlife as much as possible.

Mine-related subsidence is not expected to impact springs within the Deer Creek permit area. The total spring flow within the permit area is small in comparison to the total spring flow on East Mountain. Spring monitoring will allow early detection of subsidence effects on the springs system so that any necessary mitigation measures can be initiated to protect the hydrologic balance from the cumulative effects of the Wilberg and Deer Creek Mines Complex.

At a minimum, mine activities will likely preclude raptor nesting use of cliff nest sites within one kilometer of the Deer Creek Mine facilities area. The effect of subsidence on raptor cliff nesting habitat is considered to be minor. Subsidence at a cliff face will simply create new cliff face that will provide equivalent nesting habitat. The only nest potentially affected by subsidence is one inactive raven nest (No. 46) located in Meetinghouse Canyon (Map 2-18, PAP Vol. 6). If subsidence affects this nest or any nests constructed in the future, the permit requires the mine operator to work closely with State and Federal agencies to mitigate damage to the nest sites.

Land Use

Surface disturbance associated with the Deer Creek Mine will remain until reclamation is completed following mine closure. Land-use impacts resulting from surface disturbance will be relatively minor, since these areas have already been disturbed and will not be expanded. In addition, premining grazing use of these areas was limited because of steep slopes and generally low levels of available wildlife forage.

Backfilling and Grading

The applicant is planning to return the surface disturbances associated with the Deer Creek Mine to a suitable postmining topography capable of supporting the intended postmining land use. The fill, a pre-law structure supporting the surface facilities, will remain. The location of this fill in the canyon will not be inconsistent with the surrounding topography. The stability of the fills as they exist and after reclamation has been evaluated and meets the requirements of the regulations. This conclusion is based upon analyses presented by the

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applicant, and the duration of the fills over which there have been no major slope failures. The environmental and economic factors associated with the alternative of removing the fill are considered detrimental when compared to the applicant's proposal and designs for leaving the fill. The post-mining drainage system has been evaluated in Chapter II of the technical analysis (TA) document and has been found to be adequate. The applicant is granted a variance from the requirements of UMC 817.72(d).

Coal waste and pyritic materials will be diluted with low sulfur rock and fill material, and will be buried under four feet of non-toxic fill as will road-base material and sediment from the sediment pond. The applicant has proposed plans for backfilling that will ensure the mass stability of the slopes.

Subsidence

Approval of mining in the Deer Creek Mine will result in lowering of the ground surface possibly over 10 feet in many areas of the mine where multiple seam mining will occur. In areas of deep cover (greater than 1,400 feet), monitoring has shown that up to 6 feet of subsidence has not resulted in any significant impacts to the ground surface, seeps, or springs. Some uncertainty exists as to what extent of surface cracking might occur. Possible impacts include (1) fracturing of the surface, which would be a hazard to cattle and wildlife, (2) fracturing along cliffs, which could cause slope failures and possibly disrupt raptor nests, and (3) fracturing of overburden through the North Horn Formation which could result in disruption of some seeps and springs. Information to be submitted by the applicant in annual monitoring reports will identify the probable extent of these impacts. At this time, there is no positive evidence of detrimental subsidence effects to streams or springs. The applicant has proposed adequate measures to mitigate subsidence cracking, and has committed to mitigation of other subsidence drainage that may occur.

Cultural Resources

See Addendum A

Socioeconomics

See Addendum B

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IMPACTS OF THE DISAPPROVAL ALTERNATIVE

Disapproval of the permit application would shut down the existing Deer Creek mining operation and reclamation of the present disturbance would commence. Given the 47-year life of the mine and the prospects of no additional surface disturbance, this alternative would provide few additional environmental benefits and would result in the loss of the recoverable coal reserves. The final extent of subsidence related impacts would be reduced as no further mining would take place. The most noticeable impact would be socioeconomic in nature, resulting in the permanent loss of jobs in the area. It is possible that some of the existing staff at Deer Creek would be used for reclamation operations. Coal would have to be obtained elsewhere, impacts would be transferred to other sites.

The impact unique to this alternative would be the loss of 95,000,000 tons of recoverable coal reserves.

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Wilberg, Deer Creek and Des-Bee-Dove

Cultural Resources

A. Description of Existing Environment

A single all-inclusive inventory of the three Utah Light and Power (UP&L) mines was conducted in 1980 by Archaeological-Environmental Research Corporation which included intensive inventories of proposed surface disturbance areas and a sample inventory of areas potentially impacted by subsidence. The resulting report summarized previous work in the lease area, including survey of areas around drill hole locations and 160-acre sample units in conjunction with the Central Utah Coal project. Areas surveyed include the Wilberg, Des-Bee-Dove and Deer Creek Mines in Emery County, Utah. Eight sites and 12 isolated finds have been recorded, including one historic site and seven prehistoric sites. Four of the sites (42 EM 1308, 1309, 1310, 1633) are considered eligible for nomination to the National Register of Historic Places. None of the eligible sites were in an area of proposed surface disturbance, although potential impacts from subsidence may occur in the future. The Utah State Historic Preservation Officer has made a finding of "no effect" if the permit is approved.

B. Description of Applicant's Proposal

OSM's administrative review of the cultural resources documentation submitted with the UP&L permit applications identified several inadequacies that required the submission of additional information. The applicant has submitted the required information.

C. Evaluation of Compliance

Applicant's Compliance: Acceptance and implementation of the proposed Special Stipulations (Section F) will indicate that the applicant is in compliance with all applicable regulations and legislation.

OSM Compliance: OSM has received concurrence from the Utah State Historic Preservation Officer concerning eligibilities of sites (recommended as eligible: 42EM 1308, 1309, 1310, 1663 - recommended as not eligible: 42EM 853, 854, 855, 1307), and in a finding of "No Effect" if the permit is approved.

D. Revision to Applicant's Proposal

If the plan is approved, the applicant will satisfy the permit conditions identified in Section F.

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F. Proposed Permit Conditions

Standard Permit Condition: If, during the course of mining operations, previously unidentified cultural resources are discovered, the applicant shall ensure that the site(s) is not disturbed and shall notify OSM. The operator shall ensure that the resource(s) is properly evaluated in terms of the National Register Eligibility Criteria (36 CFR 60.6). Should a resource be found eligible for listing (in consultation with OSM), the land managing agency (if the site is located on Federal lands) and the State Historic Preservation Officer require the operator to confer with and obtain the approval of these agencies concerning the development and implementation of mitigation measures.

Special Permit Condition: At such time that OSM, in consultation with the Division of Oil, Gas and Mining and the SHPO, determines that subsidence within the permit area may adversely affect known or unrecorded cultural sites, additional cultural resources studies may be required. This determination will be based on new subsidence or cultural resource information and clear justification will be presented to the applicant.

G. Summary of Compliance

The applicant will be in compliance if all conditions in Section F are adhered to and by ensuring that the proposed permit conditions are followed. OSM is in compliance, and SHPO concurrence has been received.

H. Proposed Departmental Action

The Secretary can approve the application with the proposed Special Stipulations following receipt of SHPO concurrence with recommendations concerning site eligibility and project effect.

I. Residual Impacts of Proposed Departmental Action

Sites which are currently considered ineligible for nomination to the NRHP will be directly impacted and an unknown number of sites will be indirectly affected.

Cultural resources that are considered insignificant today may contain information that would be recognized as significant in the future. These sites could be adversely affected, making future data recovery impossible. Unknown cultural resources may also be adversely affected through operator activities, vandalism and unauthorized collection.

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J. Alternatives to the Proposed Action

One alternative would be disapproval of the permit. Another would be to require complete inventory of the permit area and avoidance of all cultural resources during construction of surface facilities. Neither of these alternatives is appropriate.

The preferred alternative is to approve and implement the requirements stipulated in Section F. This allows the applicant to proceed and allows OSM to comply with all applicable Federal legislation and regulations.

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Environmental Assessment
Addendum B

DEER CREEK MINE COMPLEX
SOCIOECONOMIC ASSESSMENT

Existing Environment

Utah Power and Light Company currently employs 372 people at the Deer Creek Mine Complex. This includes 75 supervisory and 40 office personnel. This employment level is projected to remain stable in order to produce 2.5 million tons a year of coal throughout the life of the mine.

The primary jurisdictions affected by the mining operation and their current and projected population are as follows:

	1980	1985	2000
Emery County	11,450	15,750	20,900
Castle Dale	2,052	2,835	3,362
Orangeville	1,140	1,890	2,508
Huntington	2,622	3,150	3,762
Carbon County	23,500	29,100	32,250

Source: Southeastern Utah Association of Governments, May 14, 1984

Projected Impacts

The employment level at the Deer Creek Mine Complex will remain constant throughout the life of the mine; therefore, there will be no primary or secondary socioeconomic impacts associated with the continued operation of the facility. The mine currently supports approximately 600 secondary jobs in the region. The company contributes approximately $650,000 a year in property taxes and $400,000 a year in state unemployment benefits. The unemployment rate in the region has remained high throughout the early 1980's (nearly 15 percent); therefore, the mine provides a stable employment base for area miners.

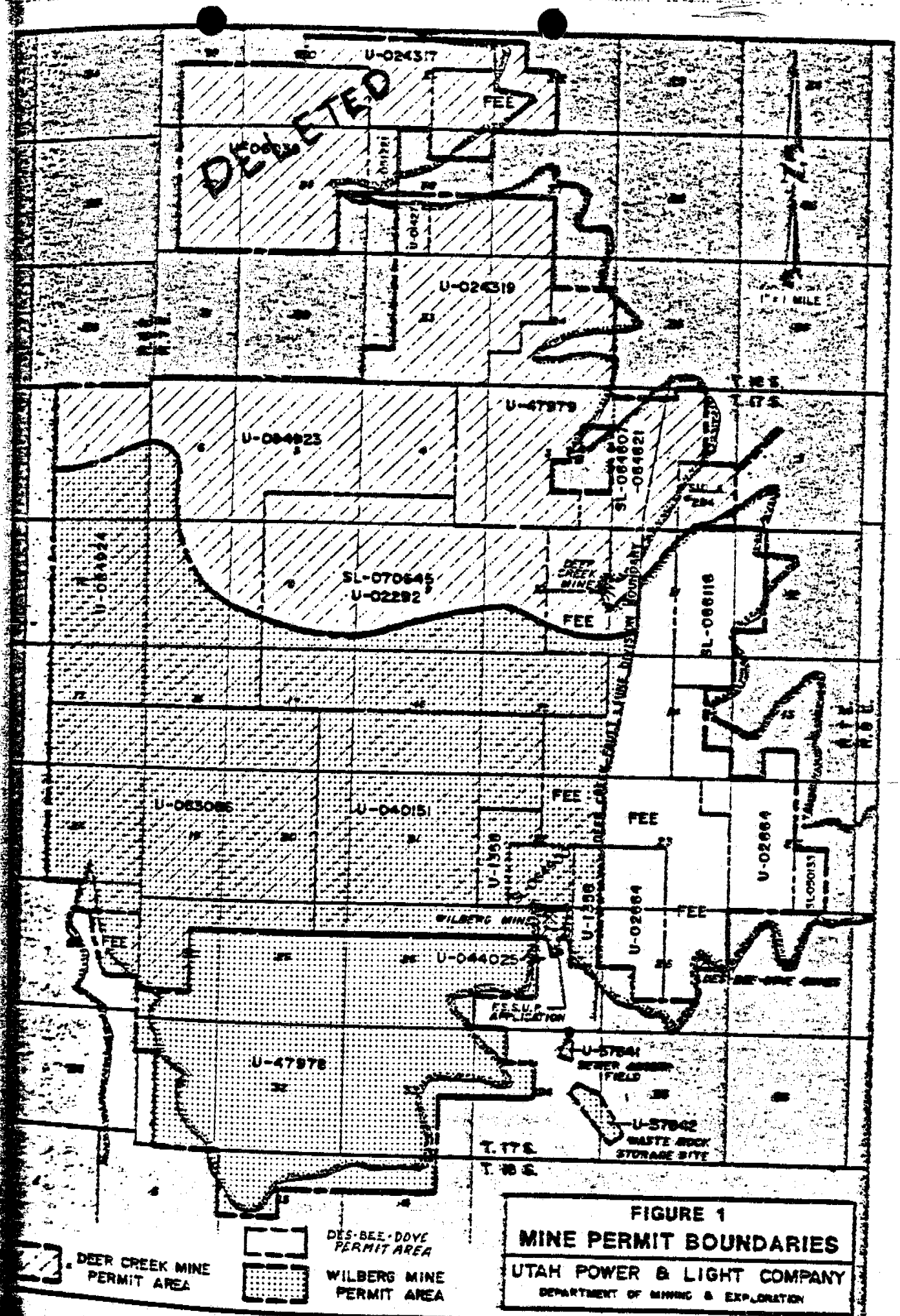

FIGURE 1

MINE PERMIT BOUNDARIES

UTAH POWER & LIGHT COMPANY

DEPARTMENT OF MINING & EXPLORATION

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TECHNICAL ANALYSIS
FOR THE DEER CREEK MINE
UTAH POWER AND LIGHT COMPANY
EMERY COUNTY, UTAH

AUGUST 9, 1985

PREPARED BY:

U.S. OFFICE OF SURFACE MINING
WESTERN TECHNICAL CENTER

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ATTACHMENT A

Cumulative Hydrologic Impact Assessment Summary

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TECHNICAL ANALYSIS
FOR THE DEER CREEK MINE,
EMERY COUNTY, UTAH
April 1, 1985

INTRODUCTION

Utah Power & Light Company of Salt Lake City, Utah, has submitted an underground mining and reclamation permit application for the Deer Creek Mine complex in Emery County, Utah, in compliance with the Coal Mining and Reclamation Permanent Program (Chapter I) of the State of Utah. The permit area and mining plan area consist of 14,620 acres and will be mined to the year 2032 (life of mine). The term of permit is five years, with right of successive renewal. The applicant anticipates adding approximately 2,280 acres (northern leases U-06039, SL-051221, and U-024317) at a later date. The Deer Creek Mine is presently operating under an approved mining permit issued by the State of Utah, Division of Oil, Gas and Mining (UDOGM) (Act/015/018) issued on May 11, 1978, and with approval under 30 CFR 211 issued by the U.S. Geological Survey on January 23, 1978.

The Deer Creek Mine is one of three separate mining operations owned by Utah Power & Light Company (UP&L). These mines are located in the area of East Mountain (T17S, R7E), and are largely within the Manti-LaSal National Forest. The three mines are the Wilberg, Deer Creek, and Des-Bee-Dove, containing three mineable coal seams: Hiawatha, Cottonwood and Blind Canyon. Operations of the Deer Creek Mine overlap those of the Wilberg Mine. The coal reserves within the (lower) Hiawatha Seam are being mined predominantly by the Wilberg Mine and the (upper) Blind Canyon coal reserves are mined predominantly by the Deer Creek Mine. A third seam, the Cottonwood, occurs between the Hiawatha and Blind Canyon seams and is mined only in the south part of the Wilberg Mine. The anticipated life-of-mine production is 110 million tons. Total in-place reserves within the Deer Creek Mine boundaries are approximately 186,000,000 tons which includes 51,000,000 tons to be mined from the Hiawatha Seam. Approximately 65 percent of the Deer Creek recoverable coal reserve will be extracted by long-wall mining systems; the remaining 35 percent will be extracted by room-and-pillar methods. Estimated annual production will average 2,500,000 tons through the first decade of the next century.

Utah Power & Light Company purchased the Deer Creek Mine in 1977 from Peabody Coal Company, which had acquired leases on the Deer Creek property and begun operations in 1969. Coal mining operations had taken place on fee land in Deer Creek Canyon prior to 1946 when the first Federal coal lease was issued in this area.

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The Deer Creek Mine surface facilities are located on a 25-acre site (including the conveyor) at the junction of Deer Creek Canyon and Elk Canyon. Surface facilities for the Deer Creek Mine operation include coal handling facilities with a coal surge bin, transfer tower, breaker and crusher stations, coal weigh bin, truck loadout, and conveyors; embankment fills that support material storage; mine office and bathhouse facilities, parking, and a warehouse-shop building; sediment control impoundment; and miscellaneous features such as drainage structures. There are 11 portals associated with the mine, most of which are for ventilation purposes. Ventilation portals create little surface disturbances since they are constructed from within the mine.

Coal and Special-Use Leases

The approximately 14,620 acres contained in the Deer Creek Mine permit area cover all or part of the following leases:

SL-064607-064621	613.92 acres
SL-064900	160.00 acres
U-1358	320.00 acres
SL-070645, U-02292	2,560.00 acres
U-084923	2,252.42 acres
U-084924	1,211.48 acres
U-083066	2,485.00 acres
U-040151	1,720.00 acres
U-044025	40.00 acres
U-014275	80.00 acres
U-024319	1,040.00 acres
U-47979	1,063.38 acres

A separate group of leases to the north of the permit area (U-06039, SL-051221 and U-024317) are not included in the permit area because the applicant has not obtained the necessary right of entry for these leases (UMC 784.11; correspondence to the applicant from OSM on December 28, 1984; correspondence to OSM from applicant on January 22, 1985).

Owners of fee coal to be mined in the Deer Creek permit area include:

The Estate of Malcolm McKinnon	440.00 acres
Cooperative Security Corp.	425.00 acres
Utah Power and Light Company	40.00 acres

The following special-use lease agreement is in effect within the permit area:

State of Utah Special Use Lease Agreement No. 284	160.00 acres
U.S. Forest Service Special Use Permit	5.9 acres

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Description of Operations

The Deer Creek Mine is a multi-seam operation utilizing longwall and room-and-pillar techniques for coal extraction. Two longwall systems and three continuous mining units are currently being utilized. The continuous miners will be used for development of mains and panels and for retreat mining in pillar sections and in mains and submains once mining in an area is complete. The applicant intends to mine all areas within the mine limits, constrained only by safety conditions.

The seams which will be recovered are the Blind Canyon seam and the Hiawatha seam. Mining, as presently planned, will recover the uppermost seam first, then the lower seam. Approximately 3,060 acres of mineable coal in the Hiawatha seam and 11,590 acres in the Blind Canyon seam are accessible from the Deer Creek Mine (Attached Figure 2-3). The minimum seam thickness which can be economically recovered is 5 feet. This limit defines the horizontal extent of mining in many areas. The maximum thickness of coal to be recovered has not been identified by the applicant, although the USBM Information Circular identifies 10 feet of coal being mined in the longwall sections. The thickness of coal in the mine area reaches 16 feet, although 10 feet is average.

Geologic Setting

The UP&L mines, including the Deer Creek Mine, are located in the Wasatch Plateau Coal Field. The coal seams are located in the lower 150 feet of the Blackhawk Formation in the Mesa Verde Group. The Hiawatha seam is located on or near the Starpoint Sandstone, which occurs between the Blackhawk Formation and the Mancos Shale. The Blind Canyon seam is located 14 to 190 feet above the Hiawatha seam. Approximately 800 feet above the Starpoint Sandstone is the Castlegate Sandstone. This massive sandstone is almost 200 feet thick in the area and is a prominent cliff former. Above the Castlegate is the Price River Formation, which is sandstone-interbedded shale and conglomerate and is approximately 350 feet thick. Above the Price River Formation is the North Horn Formation, which is interbedded shales and sandstones and is approximately 750 feet thick. Finally, capping East Mountain in the Deer Creek Mine area is the Flagstaff Limestone, approximately 100 feet thick. Figure 2-2 (permit application package (PAP) Vol. 1, Attached), shows the general stratigraphy of the mine area. Total thickness of all formations is approximately 2,200 feet. East Mountain is very dissected and overburden above the coal seam is usually much less than the total thickness of all formations.

Renewable Resources and Structures

Several types of structures occur above the mine, including buildings, roads, and a landing strip. The buildings are occupied seasonally since access to the top of East Mountain is restricted to the summer months. Photographs of the structures are given in Appendix XI (PAP, Vol. 3). Most of the structures are wood-framed; some have block or

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concrete slab foundations. A small landing strip is located in the northwest corner of Section 17 overlying the mine. A 345 KV transmission line parallels Meetinghouse Canyon and traverses the permit area from east to west. No oil or gas wells, pipelines, or other utility structures which would be affected by surface subsidence exist within the Deer Creek Mine area, with the exception of a small waterline from Burnt Tree Spring to a nearby cabin. Several unimproved roads cross the top of the mine and provide access to the cabins and most grazing areas.

Renewable resources overlying the underground mine include springs, seeps, grazing land, timber and wildlife. Springs and seeps are shown on Map 2-12 (PAP, Vol. 6). The ground-water section (Chapter III) of this technical analysis (TA) provides a detailed description of the hydrologic characteristics of the springs and seeps (also see the following section, Hydrologic Resources).

Wildlife land uses above the mine include deer winter and summer range, elk winter range, and raptor habitat (PAP, Vol. 6, Map 2-18). Range lands are widespread over the surface of the mine. Raptor habitat is associated with the sandstone outcrops.

Hydrologic Resources

The Deer Creek permit area includes tributary drainages to Huntington and Cottonwood Creeks (see Cumulative Hydrologic Impact Analysis (CHIA) documents including the CHIA summary, Attachment A of this document, concerning these basins for additional information). Huntington Creek tributaries within the permit area include:

Deer Creek	3,710 acres	75% within permit area
Meetinghouse Canyon Creek	5,560 acres	83% within permit area
Rilda Canyon Creek	5,240 acres	21% within permit area

Cottonwood Creek tributaries within the permit area include:

North Cottonwood Creek	12,550 acres	21% within permit area
Left Fork Grimes Wash	2,270 acres	100% within permit area
Right Fork Grimes Wash	1,220 acres	100% within permit area

The Deer Creek Mine facilities area is located in the Deer Creek basin and occupies the valley floor. Deer Creek and adjacent small tributaries are passed underneath the facilities area in a seven-foot-diameter culvert. The culvert and the associated diversions collect runoff from 3,100 acres of the Deer Creek basin. Runoff from 123 acres around and including the facilities area is controlled by a storm drainage system that discharges to a sediment pond with a volume of 12.0 acre-feet. The facilities area constitutes a 20.0-acre disturbance without the overland conveyor system which extends 1.8 miles to the Huntington Power Plant coal pile.

No mining-related disturbances, except for ventilation portals, exist on the surface of the other basins within the permit area. Subsidence from mining operations in the Deer Creek and Wilberg Mines has caused a general lowering of the land surface within the permit area. Changes in surface elevation have been recorded at various locations in the permit area (see Subsidence Monitoring, Chapter IX of this document), and as yet no significant changes have been noted in either drainage basin topography or channel morphology.

Both the Left Fork of Grimes Wash and Deer Creek are perennial streams within the permit area as indicated by current monitoring data. Each is sustained by ground water from numerous springs in the upper portions of each basin. Both Meetinghouse Canyon Creek and Rilda Canyon Creek sustain segments of perennial and intermittent streams. Meetinghouse Canyon Creek is considered to be perennial below Elk Spring. Rilda Canyon Creek is considered to be perennial below the confluence of the left and right forks (PAP, Vol. 6, Map 2-11). All streams within the permit area convey annual snowmelt runoff. Maximum peak flows result from thunderstorms.

Surface-water quality data have been collected by UP&L since 1978 in conjunction with the hydrologic monitoring program. Water quality parameters measured include pH, conductivity, total dissolved solids (TDS), total suspended solids (TSS), iron and manganese. Water quality is good, with measured values falling within a range acceptable for drinking water.

The geohydrologic system within the permit area includes an isolated recharge zone on the top of East Mountain associated with the Flagstaff Limestone. This formation is nearly level and is highly fractured, which allows for vertical transport of water with little lateral movement or runoff.

Significant recharge occurs in the Flagstaff Limestone during the March through June snowmelt period. Few springs occur in this formation.

Below the Flagstaff Limestone is the North Horn Formation, composed of a sedimentary sequence of variegated shales, and sandstone. A large number of springs are formed in the North Horn Formation where shales form relatively impermeable layers that impede downward migration of the ground water and transport it laterally to the outcrop. An erosionally resistant shale bench just below the Flagstaff Limestone is a notable topographic feature in the Deer Creek and Grimes Wash basins. Faults and fractures in the North Horn Formation provide a ground-water connection to lower formations on East Mountain.

Springs also occur in the Price River Formation for the same reasons that they are found in the North Horn Formation, but to a more limited extent. The Price River Formation has a similar composition to the North Horn Formation, but with an increasing amount of sandstone in its lower portions. Springs are found where a confining layer of shale forces lateral movement of ground water within the formation.

A conceptual model of the ground-water system on East Mountain is a cascade of water from the recharge zone to a number of aquifers perched atop shale layers in the North Horn and Price River Formations. Where these shale layers outcrop, springs are likely to occur. Fluctuations in the shale layers together with faulting and fracturing complicate this conceptual picture. Hydrologic data is continually collected to more fully understand the hydrologic system at East Mountain and the effects that mining may have on it.

Water quality for East Mountain springs is measured quarterly as a part of the hydrologic monitoring program. Measurements indicate that the water quality of springs meets drinking-water standards.

The Deer Creek Mine is in contact with aquifers in the Blackhawk Formation. Ground-water inflows in the mine have been associated with sandstone on the roof of the coal seam, faults and fractures. The coal seams are in contact with ancient stream channels (now sandstone layers and stringers) in the Blackhawk Formation. Faults within the mine are also a source of water, as are joints and fractures. The fault system on East Mountain probably enhances local permeabilities in the area of the fault plane, providing lateral and vertical flow channels within and across geologic units. Mine dewatering consists of water drained from aquifers in the Blackhawk Formation and from natural recharge to these aquifers from the upper formations on East Mountain.

In-mine water quality for the Deer Creek Mine is measured as water is discharged from the mine to a pipeline which conveys it to UP&L's Huntington Power Plant. TDS concentrations are slightly above standards for drinking water (590 ppm versus 500 ppm), while other water quality parameters fall within the standards. All water leaving the Deer Creek Mine is used in the cooling towers at the power plant. UP&L does not have a water right to the outflow of the mine, but uses the water by exchange with water rights that it does have on Huntington Creek.

Vegetative Resources

The permit area includes five major vegetation types: mixed conifer, pinyon-juniper, sagebrush, grass, and riparian. Mixed conifer primarily occurs at higher elevations and on north-facing slopes, and is the most extensive floral community. The next most extensive community is pinyon-juniper, which occurs on steep rocky slopes with a southern exposure and on more gentle terrain at lower elevations. The sagebrush and grass communities occur at higher elevations on drier sites. The riparian community occurs only along Deer Creek as it exits the northeastern side of the permit area.

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Because this is an active mine and most disturbances have already occurred, baseline vegetation data for disturbed areas were impossible to obtain. Therefore, reference areas were selected (and sampled) from representative locations around the disturbance area.

The main facility area including the conveyor system has disturbed a total of 25 acres of vegetation, including 19.5 acres of pinyon-juniper, 4.0 acres of mixed conifer, and 1.5 acres of riparian vegetation. It is expected that this acreage will be lost for the duration of mining to the point that reclamation is complete. Comparisons of similarity between each of the three reference areas and estimates of the predisturbance characteristics of respective disturbed communities are presented on pages 2-118 and 2-119 (PAP, Vol. 1).

Field investigations revealed no threatened or endangered species present near any area of disturbance. The Office of Endangered Species, U.S. Fish and Wildlife Service, provided a letter on January 10, 1984, stating that it has found no potential conflict with the proposed action.

Soils

Soils occurring within the proposed permit area are composed of three soil mapping units. These units are Typic Chryochrepts-Lithic Cryorthents--Rock Outcrop, loamy skeletal shallow association (40 to 60 percent slopes); Pachic Cryoborolls, loamy and loamy skeletal (10 to 25 percent slopes); and Typic Cryoborolls, loamy and loamy skeletal (25 to 40 percent slopes).

Due to previous mining operations, little topsoil remains on disturbed areas. The final graded surface to be used as a seedbed will be composed primarily of cut, fill, and mine-generated spoil materials which include some coal waste in small proportions from spillage over time. The pH of selected spoil samples ranged from 7.6 to 8.4, with coal waste samples having values of 8.1 and 8.2. Electrical conductivity (EC) values for coal wastes and spoil samples taken in 1980 and 1983, respectively, varied widely. The 1983 values were all less than 0.6, while the 1980 values for spoil material ranged from 0.5 mmhos/cm to 9.0 mmhos/cm. Sodium adsorption ratios (SAR) were relatively low for most materials analyzed(less than 2.3). Nitrogen, phosphorous, and potassium levels were generally low for all samples analyzed. Percent saturation values for 1983 fill samples ranged from 20 to 30, indicating coarse spoils with relatively low water-holding capacities. Textures of 1980 fill samples are primarily sandy loam, with two samples being loamy. Textures of 1983 fill samples are sandy clay loam and loamy sand.

The soil units which are found adjacent to the disturbed area include the Comodore-Beenom Complex (Co-Be), 40 to 60 percent slopes, and the Rock Outcrop-Rubble Land-Sunup Gravelly Loam (Ro-R-S), 40 to 70 percent slopes. The Co soil (50 percent of unit) is shallow and well drained and primarily supports Douglas fir and mixed conifer vegetation. The Be soil (40 percent of

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unit) is also shallow and well drained and primarily supports grass vegetation. The Rock Outcrop developed from sandstone and shale. The Rubble Land portion consists primarily of sandstone boulders (75 percent of unit). The Sunup soils (25 percent of unit) are shallow and formed in material derived from sandstone. Permeability is moderately rapid in the soil above the rock.

Fish and Wildlife Resources

Wildlife species inhabiting the mine permit area and vicinity are typical for this region of the Wasatch Plateau; no critical habitats for threatened or endangered wildlife species occur in the areas disturbed, or to be disturbed, by mining operations. The bald eagle is a winter visitor to the region, but will not be affected by mine activities.

Riparian habitat along Deer Creek is considered by the Utah Division of Wildlife Resources (UDWR) to be of critical value to the area's wildlife resources. No fish species occur in Deer Creek; however, the drainage is tributary to Huntington Creek, which does support trout. Several game and high-interest wildlife species inhabit the general vicinity of the mine permit area. Most, except for mule deer and several species of raptors, will not likely be exposed to any impact resulting from mine operations (see Chapter VII of this document).

Cliffs in the vicinity of the mine portal and facilities area represent potentially valuable cliff-nesting habitat for several species of raptors (e.g. golden eagle, red-tailed hawk, and prairie falcon). Wooded habitats within the permit area also provide nest sites for tree-nesting species such as northern goshawk, Cooper's hawk, sharp-shinned hawk, red-tailed hawk, American kestrel, and screech owl. A 1981 U.S. Fish and Wildlife Service raptor survey for cliff-nesting species identified a group of four buteo nests (#48-three inactive; one active red-tailed hawk nest) approximately 1,500 feet from the Deer Creek Mine portal area. The red-tailed hawk nest was inactive in 1982. An inactive raven nest was also identified aproximately 700 feet from the South Fork Meetinghouse Canyon breakout. Map 2-18 (PAP, Vol. 6) of the application gives the locations of all nest sites. The USFWS has made recommendations concerning protection of raptor nest sites on or in the vicinity of the permit area in its letter dated July 10, 1984.

Mule deer occur within the mine plan area year-round. During the summer they are found predominantly in habitats at the mid to upper elevations in the permit area (e.g., mixed conifer, sagebrush, and grassland). In the winter, habitats (especially pinyon-juniper) at the lower elevations along the benches and slopes of the southern and eastern portions of the East Mountain in the vicinity of the Deer Creek mine are designated by the UDWR as high-priority and critical mule deer winter range. Map 2-19 (PAP, Vol. 6) shows the location of mule deer winter range in relation to the mine permit area. Approximately the last half-mile of the Deer Creek overland conveyor to the Huntington Power Plant traverses critical mule deer winter range. Also, approximately one mile of the access road (from the main highway) passes

through critical mule deer winter range. A "critical" designation is given to "sensitive use areas" which are considered necessary to sustain the existence and perpetuation of one or more species of wildlife during crucial periods in their life cycle. For mule deer, critical winter range represents those areas where mule deer congregate during the most severe winters.

Land Use

Surface ownership of the Deer Creek portal and facilities area is private and is leased to UP&L. The majority of the remaining land within the mine permit area is either privately owned or is part of the Manti-LaSal National Forest. Mineral ownership within the permit area consists of Federal and fee coal. No oil or gas wells have been drilled within the permit area.

Premining land uses in the disturbed areas associated with the Deer Creek Mine were livestock grazing and wildlife habitat. Land use on and adjacent to the permit area consists of recreation, mining, wildlife habitat, and limited livestock grazing. Land use and local land use classifications are shown on Map 2-18 (PAP, Vol. 6).

Recreational use of the permit area occurs primarily as hunting and sight-seeing on East Mountain.

Coal mining in Deer Creek Canyon has occurred since the early 1940's. UP&L has operated the Deer Creek Mine since 1977. Prior to the development of the Deer Creek Mine, mining in the Blind Canyon coal seam removed about 394,000 tons of coal.

No farming or commercial forest harvesting has occurred within the permit area. In the vicinity of the mine facilities, steep rocky terrain, poor soils, and low precipitation preclude any potential for farming. The rugged terrain and rocky cliffs also limit livestock grazing in the vicinity of the mine portal and facilities. BLM grazing allotments in the vicinity of the mine portal area are judged in poor and declining condition. Range condition for USFS land on East Mountain above the mine portal area is judged as good, with a static to upward trend. Total forage productivity of the pinyon-juniper vegetation type ranges from 25 to 100 lbs/acre (dry weight on the steep rocky slopes) to 100 to 325 lbs/acre on the benches, as estimated by the applicant. Mixed conifer and riparian range productivity is 167 to 290 lbs/acre (dry weight) and 1,500 to 2,500 lbs/acre (dry weight), respectively.

I. TOPSOIL

1.1 Description of Applicant's Proposal

The applicant provided a soil map and corresponding discussion which generally characterized the soils (to subgroup) occurring over the entire permit area (Vol. 1, pp. 2-112 to 2-113). The mapping corresponded basically to an Order III-IV Soil Conservation Service (SCS) survey. With the exception of possible subsidence effects, these soils will not be disturbed by mining.

The surface area affected by the existing operations had been disturbed by pre-law mining. There is no soil on this disturbed area, so a soil survey was not conducted. A sampling program was begun in 1980 to characterize the fill materials which would serve as the planting medium following final grading (Vol. 1, pp. 2-103 to 2-109). Additional sampling was conducted in 1983 to further evaluate the physical and chemical characteristics of fill material and waste rock.

Existing cut-and-fill material will constitute the majority of the seedbed material following grading, since the proposed mine is located on a previously disturbed area where no topsoil was salvaged. Most of this medium, given the absence of topsoil materials (see 817.103), is considered suitable for reclamation, based on chemical and physical analyses. Electrical conductivity, pH, and sodium adsorption ratios are within acceptable limits. Textures range from sandy clay loam to loamy sand. Water-holding capacities are low (Vol. 2, Table 1, pp. 4-14, 4-15).

Because soil for reclamation is lacking, the applicant proposes to attempt to develop a substitute "soil" by temporarily reclaiming various existing fill slopes which will not be disturbed during mining (see Section X, Revegetation, of this document). It is theorized that the surface material of the slopes, through temporary reclamation, will increase in organic matter content and microbial populations, thereby providing a planting medium superior to endemic seedbed materials. At the onset of grading, this topsoil would be stripped from reclaimed slopes and stockpiled. As grading is completed and cut-and-fill seedbed materials are distributed, the topsoil would be redistributed on newly graded surfaces to a depth of 6 to 12 inches at random locations throughout the site to enhance revegetation potential.

Following grading, all seedbed materials will be sampled to determine fertilizer requirements and detect the presence of localized high electrical conductivity and sodium adsorption ratios values (Vol. 2, p. 4-22). Fertilizer will be broadcast prior to planting according to recommendations based on soil test results.

1.2 Evaluation of Compliance

UMC 817.21 Topsoil: General Requirements

The applicant has complied with the requirements of this section.

UMC 817.22 Topsoil: Removal

The applicant has complied with the requirements of this section.

UMC 817.23 Topsoil: Storage

The applicant has complied with the requirements of this section.

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UMC 817.24 Topsoil: Redistribution

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

UMC 817.25 Topsoil: Nutrients and Soil Amendments

The applicant proposes to conduct soil sampling (Vol. 2, p 4-22) for fertility analysis following final regrading. Two samples from the 0 to 20 inch depth will be composited per acre for analysis. In addition, one core per fill with samples at two-foot intervals will be analyzed to detect aberrant SAR levels. Given this sampling program, the applicant has complied with the requirements of this section.

II. HYDROLOGIC BALANCE - SURFACE WATER

2.1 Description of Applicant's Proposal

The Deer Creek Mine facility is located on a 25-acre site at the junction of Deer Creek Canyon and Elk Canyon. This area contains the entrance to the mine and all surface facilities used for support of mine operations. The site is characterized by moderate vegetation and rugged, steep terrain. In addition to the main mine entrance in Deer Creek Canyon, there are five air intakes in Meetinghouse Canyon with two more proposed. These intakes are constructed from within the mine and no surface disturbance occurs beyond the entrance.

Diversion ditches and a single sedimentation pond are used at the Deer Creek Mine to protect the surface-water hydrologic balance. The applicant proposes to continue the use of the existing drainage facilities for the duration of mining operations. These drainage facilities consist of two separate systems which are classified by the applicant as "undisturbed" and "disturbed" collection systems. The "undisturbed" system collects uncontaminated water above the portal site and from side slopes adjacent to the site and conveys it underneath the disturbed area into the natural channel of Deer Creek. The "disturbed" collection system consists of a network of open ditches and culverts which collect runoff water from areas disturbed by human activity and drain into a sedimentation pond.

The principal undisturbed drainage, Deer Creek, is carried by a 7-foot-diameter culvert from a point about 800 feet southwest of the mine portal and discharged into the natural Deer Creek channel downstream of the sedimentation pond. The culvert is 2,800 feet long with a vertical drop of 420 feet. A secondary drainage, Deer Drainage, is diverted into a 36-inch-diameter culvert which feeds into the main Deer Creek culvert. The applicant has prepared designs to increase the carrying capacity of the Deer Drainage culvert. The applicant proposes the installation of an additional 54-inch culvert parallel to the existing culvert. A 30-inch culvert now lies in the drainage channel of Elk Canyon Creek and diverts runoff to the main 7-foot diameter Deer Creek culvert. Two side drainages from the south side of Elk Canyon Creek are diverted into this feeder culvert. A terrace on the south

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side of the facilities area diverts runoff to the main bypass culvert. All diversions are protected at the intake by concrete retaining walls and catch basins with trash racks. The Deer Creek culvert was designed to pass the 50-year, 24-hour storm event. The two side drainage culverts were designed to pass the 10-year, 24-hour storm event. Map 3-12 (PAP, Vol. 7) shows the layout of the system. To increase the carrying capacity of the Elk Canyon Creek diversion system, the applicant has committed to install a 42-inch culvert parallel to the existing culvert. The "disturbed" collection system collects runoff from roads, parking lots, storage areas, and the portal area and conveys it into a sedimentation pond located just downstream of the junction of Deer Creek and Elk Canyon Creek. This system consists of concrete catch basins, small-diameter culverts, and open ditches designed to collect and pass peak flow from a 10-year, 24-hour precipitation event. The system is shown on Map 3-13 (PAP, Vol. 7).

The sediment pond is situated in the approximate location of the old Deer Creek channel just downstream of its confluence with Elk Canyon Creek. The pond design capacity is 14.0 acre-feet: 2.0 acre-feet for sediment and 12.0 acre-feet for runoff. The pond will completely impound runoff from the 10-year, 24-hour runoff event of 2.25 inches. The runoff volume was determined by the applicant using a runoff curve number (CN) of 81 and a drainage area of 123.0 acres. All runoff from 20 acres of disturbed area is collected and routed through the pond. Considering this 20 acres, a sediment storage volume of 0.10 acre-foot per acre of disturbed land was provided. Map 3-15 (PAP, Vol. 7) shows the design layout of the pond.

The sediment pond was designed with an operational spillway consisting of a single 24-inch culvert and manually operated lift gate/riser for pond dewatering. A grouted riprap emergency spillway provides release of runoff from a 100-year, 24-hour precipitation event. The pond is located against the hard rock strata of the Deer Creek Canyon. Pond slopes vary depending on the material of which they are constructed. Slopes excavated in rock are nearly vertical, with a 1 horizontal to 4 vertical slope. Fill slopes were designed at 2.5 horizontal to 1 vertical. The riprapped upstream dam slope was designed at 2.5 horizontal to 1 vertical; the downstream dam slope design is 2 horizontal to 1 vertical. Design details of the dewatering device, spillway, and dam are shown on Drawing 3-16 (PAP, Vol. 7).

Reclamation at the Deer Creek Mine facilities site will consist of removing the temporary drainage system, sediment pond, and other structural facilities. Land slopes in the area will be recontoured, with the mine area fill and waste rock disposal fill left in place. Riprapped channels with 10-to 20-foot base widths and 2:1 side slopes are proposed for reconstructing the main Deer Creek, Deer Drainage, and Elk Canyon Creek drainages. These channels are designed for the 100-year, 24-hour storm event.

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The two stages of reclamation proposed for the Deer Creek Mine drainage system are shown on Map 4-1 (PAP, Vol. 7). During Stage I, reconstruction of the channels will be completed above the sediment pond area. The sediment pond will be left in place during this stage to serve as a sediment control for the disturbed areas. An existing arch culvert (part of the old bypass system) will be used to convey the Deer Creek and Elk Canyon Creek flows past the pond. During Stage II, the arch culvert will be removed and the Deer Creek and Elk Canyon Creek channels will be completed through the area where the sediment pond is now located.

A significant feature of the reclamation drainage plan is the passage of Deer Creek flows across the mine area fill. Leaving this fill in place presents a problem for channel stability due to the steep gradient at the down-valley face of the fill. To help address this problem, the applicant proposes to route the Deer Creek channel along the north side of the fill, then over a sandstone outcrop opposite the Elk Canyon drainage confluence. Construction will require cutting a channel 30 to 40 feet wide in the Starpoint Sandstone. Water will flow from a riprap-lined channel constructed on fill to the channel on the rock ledge and over the edge of a cliff. Loose material will be removed and the channel widened where it flows off the cliff edge. The Starpoint Sandstone is resistant bedrock that will form a stable drop for the new channel.

A riprap-lined splash basin will be used at the base of the cliff to dissipate energy and transition the Deer Creek flows into those of Elk Canyon Creek (Map 4-1 PAP, Vol. 7).

The applicant currently monitors flows in Deer Creek above and below the mine facilities, and at Grimes Wash above and below the Wilberg Mine facilities. During periods of runoff, monthly discharge measurements and grab samples for water quality analysis are collected. Samples are analyzed for pH, conductivity, total dissolved solids, total suspended solids, total iron and manganese. The monitoring locations are permanent, allowing collection of the data from a consistent location. The data are collected on a regular schedule to aid in identifying seasonal trends and variation from year to year. Measuring flumes used at both the Deer Creek and Grimes Wash locations are typically overtopped during peak runoff.

Huntington Creek is monitored by the USGS and UP&L above and below the Deer Creek confluence. Flow is recorded continuously and water-quality samples are taken monthly. The data are used in conjunction with the regulation of Electric Lake for the Huntington Power Plant and other water users.

Deer Creek Mine has been issued NPDES permit number UT-0023604 for the sedimentation pond at the mine. The applicant indicates that the pond has not discharged to date. The applicant is required to monitor and report discharge quality under the NPDES regulations.

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2.2 Evaluation of Compliance of Proposal

UMC 817.41 Hydrologic Balance: General Requirements

The applicant's compliance with this regulation is discussed in Section IV, Probable Hydrologic Consequences, of this document.

UMC 817.42 Hydrologic Balance: Water Quality Standards and Effluent Limitations

All surface drainage from the Deer Creek Mine is passed through the sedimentation pond. There is no uncontrolled discharge to the environment from the underground workings. Discharge is routed to the Huntington Power Plant as a coolant. Discharges from the sedimentation pond are expected to meet all applicable effluent limitation standards.

UMC 817.43 Hydrologic Balance: Diversions and Conveyance of Overland Flow, Shallow Ground-water Flow, and Ephemeral Streams

The applicant has designed the "disturbed" area runoff collection system at the Deer Creek Mine to pass the 10-year, 24-hour runoff event adequately. The two-year, 24-hour storm was used at the waste rock site. Inspection of the temporary drainage system on Map 3-13 (PAP, Vol. 7) indicates that it has been designed adequately. Adequate channel stability is provided in the system, with flow down steep slopes conveyed in culverts. Energy dissipators are not used at discharge points; however, operation of the drainage system has not caused any significant outlet scour problems to date.

During Stage I reclamation the existing disturbed area drainage system will be removed and the affected land regraded and revegetated. Drainage from the disturbed area will be routed to the sedimentation pond using two small ditches as shown on Map 4-1 (PAP, Vol. 7). "Ditch B" will be temporary and was designed using a two-year, 24-hour storm. "Ditch A" will be permanent and was designed using the larger 100-year, 24-hour event. Temporary culverts for "Ditch A" and "Ditch B" were designed considering the two-year, 24-hour event. Upon final reclamation (Stage II), all culverts and Ditch B will be removed. The system as designed meets the requirements of this section.

UMC 817.44 Hydrologic Balance: Stream Channel Diversions

The applicant has designed the "undisturbed" runoff system for Deer Creek to pass the 50-year, 24-hour runoff event. This event is larger than required by regulations, which only specify the use of a 10-year, 24-hour event for temporary diversions of stream channels. The peak flow at the main Deer Creek diversion was based on hydrologic analysis conducted by Stone and Webster, Inc. (report dated April 14, 1978) that gave a peak flow of 805 cfs. The main Deer Creek diversion is adequate to convey this flow.

The existing diversion culverts of Deer Drainage and Elk Canyon Creek are 36-inches and 30-inches in diameter, respectively. Neither culvert is capable of conveying the required 10-year, 24-hour design storm. The applicant has

presented revised designs for the two drainages on Map 3-12 and page 3-48A of the PAP. The applicant's calculations are presented in Appendix VII of the PAP. In order to convey the 10-year, 24-hour storm, the applicant proposes to install a 42-inch diameter culvert parallel to the existing culvert in Elk Canyon. Although the applicant has designed a 54-inch diameter culvert to be installed parallel to the existing Deer Drainage culvert (Map 3-12), the applicant requests a variance from its installation (page 3-48A). The basis for the request is (1) conservative runoff figures, (2) additional construction costs, and (3) six years experience with no overtopping of the existing 36-inch pipe. However, the regulatory authority denies the request for variance on the following basis: (1) conservative figures are an integral part of these designs. In the event of a major storm (i.e., rainfall over snowmelt), the applicant's chosen hydrologic coefficients may not be conservative, (2) the design life of the structures is in excess of 40 years, and six years of experience does not provide a valid basis for any determination, and (3) failure by overtopping would result in damage to the facilities area and the rapid filling of the sedimentation pond with sediment. The sediment pond would not contain the 10-year, 24-hour storm event, nor would the dewatering pipe function adequately. As a result, a significant possibility of sediment pond failure exists. The applicant shall install the 54-inch culvert in Deer Drainage or submit an equally effective alternative for review and approval (Condition 3).

The permanent reclaimed drainage system (Map 4-1) at the Deer Creek Mine has been designed for the 100-year, 24-hour runoff event as required by regulations. Peak flows were determined using the SCS Curve Number Method. The choice of curve numbers and calculations are acceptable. Flow capacities of the diversion channels were determined by computing normal depth using the Manning Equation. Additional freeboard depth was provided in the final design to allow for waves and surface fluctuations of the flow. The design capacities of the channels are adequate. Energy dissipation basins are designed at both Deer Creek inlets. Three-foot diameter riprap sufficient to sustain the 100-year, 24-hour event will be placed in these basins. The designs are adequate and should ensure long-term stability.

Drawings and calculations in the permit application indicate that the upper 810 feet of the reclaimed Deer Creek channel will not be protected with riprap. The applicant indicates that this section of the channel will be excavated to bedrock. This will help provide channel stability on the steep slopes (up to 40 percent). Riprap protection is provided, where needed, along channel banks constructed of fill material.

Flow through the remaining diversion ditches will take place at high velocities. These ditches will be built on erodable materials, so riprap protection is provided. The applicant makes proper use of the riprap design procedures and provides a riprap size adequate to stabilize these channels.

Although the mean diameters of riprap are adequate, the applicant does not provide riprap gradations. A typical riprap gradation will have rock sizes ranging from less than half the mean size to twice the mean size. This is generally applicable when the mean diameter is less than about two feet. For larger mean diameters this gradation becomes impractical, since very large-diameter rocks would be included in the gradation. This is especially critical considering the channel widths proposed, since the large rock could significantly restrict the flow area of the channel. From riprap thicknesses specified in the permit application it appears the applicant does not anticipate much variation for these larger sizes. Because of the small channel, the applicant must ensure that blockage of the channel by a large riprap element cannot occur. Maximum riprap size should not exceed one-third the dimension of the channel bottom width (Condition 4).

Specifications for a gravel filter under the riprap are provided in the permit application. A 2-foot clay liner is also specified for areas where the channel crosses fill. The clay liner will prevent water from saturating the fill and will ensure channel stability with respect to ground shifting and erosion. This clay liner is presented on Map 4-1 of the PAP. The proposed designs of the gravel and clay filters are adequate.

A final issue concerning the reclamation channel system is the proposal to route flows across the mine area fill, over a rock face, and into a riprap splash basin. This design represents a reasonable solution to the complicated problem of routing the Deer Creek channel down the steep valley without removal of the mine area fill. The applicant adequately addresses the transition of flow from the rock bench over the cliff face. Map 4-1 (PAP, Vol. 7) shows flow lines curving down the rock face to meet the splash basin. The channel is entrenched into the rock face sufficient to direct the flow. Other aspects of the design of the channel system over the fill, including the riprap splash basin, are adequate. The temporary splash basin used for the culvert outlet of Elk Canyon Creek during Stage I reclamation is also adequate. The applicant's design for constructing the reclaimed channel over the fill is adequate. The requirements of UMC 817.72(d) call for diversions to be routed away from fill. However, because of the detrimental environmental consequences associated with moving the fill, the applicant is granted a variance from the requirements of UMC 817.72(d). OSM has determined that with revised undisturbed area diversion culverts addressed in Condition 3, and proper riprap sizing ensured by Condition 4, the applicant's proposal is the most environmentally sound method of dealing with reclamation given the pre-law disturbance now existing at the site.

UMC 817.45 Hydrologic Balance: Sediment Control Measures

The existing drainage system at the Deer Creek Mine site provides an adequate means of controlling sediment runoff. Undisturbed flow from above the mine site is diverted below the disturbed area using underground culverts. Disturbed area runoff is directed to a sedimentation pond using a system of culverts and open ditches.

During Stage I of reclamation it is anticipated that some erosion will occur on vegetated areas. Annual maintenance is planned for these areas and runoff will be routed to the sedimentation pond. This will provide an adequate means of sediment control during this period. Upon final reclamation (Stage II), the slopes will be revegetated and the sediment pond removed.

All aspects of this section have been adequately addressed by the applicant.

UMC 817.46 Hydrologic Balance: Sedimentation Ponds

The sediment pond was designed to completely retain runoff from the 10-year, 24-hour storm. Calculations provided in the permit application showed the runoff from this event to equal 8.0 acre-feet. An additional volume of 2.0 acre-feet for sediment storage was also considered in the design. This represents 0.10 acre-foot of sediment for each acre of disturbed land. The total design volume of the sediment pond is adequate. Plans in the permit application show the sediment pond (Map 3-15, Map 3-16) for as-built conditions.

The sediment pond was designed with a manually operated dewatering device. This device can provide a 24-hour detention time or any other detention time that would be required. An "as-built" design drawing of the dewatering device is provided on Drawing 3-16 (PAP, Vol. 7). The inlet to the dewatering device is above the maximum elevation of sediment storage. However, Map 3-16 indicates that the dewatering pipe is not designed to fully evacuate the 10-year, 24-hour storm event. It appears that 3 or 4 acre-feet of storage above the sediment level cannot be drained. When water is occupying this 3 to 4 acre-feet of storage, the remaining available storage volume may not be adequate to store the 10-year, 24-hour event (Condition 1).

The emergency spillway crest is situated above the maximum 10-year, 24-hour pool elevation. This spillway is designed to pass the 25-year, 24-hour storm event with approximately one foot of freeboard. Calculations supporting this determination are presented in Appendix VII of the PAP. The design of the emergency spillway addresses the requirements of this section.

The combined upstream and downstream slopes of the sediment pond dam equal 1V:4.5H. Although this exceeds the 1V:5H required under this section for the settled embankment, the applicant has provided a geotechnical report to show that the dam is stable. Topographic constraints at the spillway location make standard practice design requirements impossible. Given the stability of the dam as built and the topographic constraints including increased environmental disturbance to accommodate the larger dam requirements, OSM has determined that the applicant's design is the most environmentally sound option to meet the requirements of SMCRA.

All other requirements of this section have been addressed adequately by the applicant.

UMC 817.47 Hydrologic Balance: Discharge Structures

The applicant adequately addresses the use of riprap energy dissipators at the outlets of the temporary and permanent diversions and the sediment pond and is

in compliance with this section. Energy dissipator designs and calculations are presented in Appendix IX of the PAP, Vol. 3.

UMC 817.49 Hydrologic Balance: Permanent and Temporary Impoundments

The only impoundment at the Deer Creek Mine site is the sediment pond addressed under Section UMC 817.46. All additional requirements under this section have been addressed adequately by the applicant.

UMC 817.52(b) Hydrologic Balance: Surface Water Monitoring

Grimes Wash and Deer Creek are routinely monitored for water quality and quantity measurements. Quality measurements are made quarterly. The applicant has committed to weekly water quantity measurements on Deer Creek and Grimes Wash (PAP, page 2-93). UP&L has completed annual hydrologic monitoring reports since 1979.

The applicant's water quantity measurement flumes on Deer Creek and Grimes Wash allow annual runoff peak flows to exceed flume capacity. (Hydrologic Monitoring Program Annual Reports, Appendices C and D).

Since the peak flow periods have overtopped the flumes, it is likely that 50 to 70 percent of the annual runoff has not been recorded. Issues related to the hydrologic balance of East Mountain can only be assessed if sufficiently accurate measurements of discharge from the Deer Creek and Grimes Wash basins are available. In particular, base-flow measurements will be extremely important in determining the influence of mining-induced subsidence on perched aquifers. Condition 2 requires improved methods of measuring peak discharge.

UMC 817.55 Hydrologic Balance: Discharge of Water into an Underground Mine

No discharge of surface water into underground mines is proposed at the Deer Creek Mine.

UMC 817.56 Hydrologic Balance: Postmining Rehabilitation of Sedimenation Ponds, Impoundments, and Treatment Facilities

Rehabilitation of all temporary diversions and sedimentation ponds at the Deer Creek Mine have been addressed adequately by the applicant.

UMC 817.57 Hydrologic Balance: Stream Buffer Zones

There are a number of perennial streams within the permit area [pp. 2-85 (A-D), Vol. I]. Mining operations (primarily longwall mining) will pass underneath significant portions of each of these streams. Operation of the Deer Creek and Wilberg Mines will remove both major coal seams from beneath the stream channels. The resulting subsidence (Chapter IX of this TA) may cause a uniform lowering of the land surface of approximately 10 to 12 feet. While it is possible that alteration of the channel shape, profile, or surface cracking may occur, because of the uniform nature of longwall mining, no major change in channel shape is anticipated. Single seam longwall mining in the southern portion of the Deer Creek permit area has taken place with no visible change in basin topography or channel shape.

Channel profile changes are possible where discontinuities in the mining operation are present, such as between barrier areas and the longwall mining area. The magnitude of these changes is, however, quite small in comparison to the gradients of the existing channels. Although surface cracking has not been observed away from the perimeters of East Mountain, the applicant has provided a commitment to repair any surface cracking that affects the flow of streams in the permit area (p. 4-50, PAP, Vol. 2). Temporary culverts over the crack are proposed by the applicant as a mitigation measure. The applicant has a thorough subsidence monitoring program in place at the Deer Creek Mine, as discussed in chapter 9 of this document. Together with the applicant's water monitoring programs, any surface effects of subsidence should be readily detectable. The major issue concerning perennial streams within the permit area is not the possible subsidence effects on the stream channel itself, but rather the possible influence of subsidence on the source of water that contributes to the base-flow of those streams. The base-flow is derived from the flow of numerous springs associated with the occurrence of perched aquifers on East Mountain. Loss of flow from these springs due to subsidence of the source area is discussed in the Probable Hydrologic Consequences chapter of this TA. The applicant's water monitoring programs will generate recession curve graphs which will allow tracking of any deviation in normal flow of springs and surface streams.

Because the effects of subsidence on channel geometry and profile are considered negligible, and because of steep local topography, the standard 100 feet stream buffer zone is not necessary for the protection of the hydrologic balance for perennial streams on East Mountain (see condition 7, page 44 of this TA).

2.3 Conditions

1. Within 30 days of the permit effective date, the permittee shall calculate the sediment pond storage volume minus sediment storage volume, and water volume between full sediment level and the dewatering pipe intake (water which cannot be evacuated after a storm event) and submit the calculations to the regulatory authority for review. The permittee must show that the net available volume in the sediment pond is sufficient to contain the 10-year, 24-hour storm event (calculated to be 8.0 acre-feet). If the net available volume of the pond is not sufficient to contain the 10-year, 24-hour storm event, the permittee shall modify the sediment pond system to ensure that the volume of the 10-year, 24-hour storm event can be stored as required by UMC 817.42 and UMC 817.46. Any necessary modifications to the sediment pond system must be completed within 120 days of permit issuance.

2. Prior to September 1, 1985, the permittee must install surface-water monitoring devices on both Deer Creek and Grimes Wash that are capable of measuring all flow including peak runoff.

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3. Prior to the end of the 1985 calendar year, the permittee must increase the capacity of the Deer Creek Drainage and Elk Canyon Creek diversion culverts to convey the 10-year, 24-hour storm event as required by UMC 817.44. This can be accomplished by implementing the permittee's February 4, 1985 design submittals or by implementing an alternative approach to meet the required performance standards.

   If the permittee chooses an alternative approach, the design must be submitted to the regulatory authority within 60 days of the permit effective date for approval.

4. No element of riprap to be placed in reclaimed channels and energy dissipator structures will exceed one-third the channel or structure bottom width.

III. HYDROLOGIC BALANCE - GROUND WATER

3.1 Description of Applicant's Proposal

The applicant proposes and commits to monitor the quantity and quality of ground water at flowing springs on East Mountain, within the mine, at two wells away from past and active mining areas, and at the discharge point from the mine (pp. 2-85, 2-85A, Vol. 1, PAP). For the past five years, UP&L has been collecting hydrologic data from the areas above and adjacent to the mine and within the mine. The applicant has collected stratigraphic data on the lateral extent of aquifers present on East Mountain. Data have been collected from 79 coal exploration drill holes (Map 2-1 PAP, Vol. 4) at 59 springs (Map 2-12 PAP, Vol. 6), and at nine in-mine locations. The hydrogeologic system of East Mountain is described by the applicant as consisting of perched aquifers concentrated in the North Horn and the Blackhawk Formations. The aquifers in the North Horn Formation intersect the surface along the rim of East Mountain. Most of the springs identified by the applicant (39 of 59) occur in the North Horn Formation, with eight occurring in the Flagstaff Limestone above the North Horn and the remaining twelve springs distributed in strata occurring below the North Horn. Only one spring surfaces in the Blackhawk Formation; however, mining in the Hiawatha and Blind Canyon coal seams in the Blackhawk has encountered significant ground water. Eleven of these springs are situated over areas of proposed double-seam mining between the Wilberg Mine (Hiawatha Seam) and the Deer Creek Mine (Blind Canyon Seam).

In order to describe the source of ground-water inflows to the Deer Creek Mine, the applicant has prepared maps of the perched aquifers. The maps were prepared from exploration drill holes completed both in-mine and from the surface. The applicant has hypothesized that the perched aquifers are located in ancient fluvial channels that formed as a part of the deltaic deposition active during and after the coal-forming peat accumulation. These fluvial channels are shown overlying the Blind Canyon coal seam and trending northeast to southwest. Experience by the applicant with water encountered during mining indicates that the largest influx of water occurs as fluvial channels are first contacted. The flows quickly diminish as the source is dewatered and the overall hydrologic balance is unaffected. Anomalies in the fluvial channels, such as a vertical sag (referred to as a channel roll) or faulting, leads to even larger inflows. A significant continuous source of water flows up into the floor of the Deer Creek Mine from the Pleasant Valley Fault.

Experience with mine dewatering indicates that as workings progress, wet areas show a marked decrease in flow. Data gathered by the applicant to date, exhibit a possible seasonal variation since dewatering volumes are often higher during the snowmelt period of the year. This indicates that the Blackhawk aquifers are not completely isolated and that some of the numerous faults and fractures supply direct recharge to these aquifers.

The Starpoint Sandstone, immediately underlying the Hiawatha coal seam, has moderate permeability, yet receives little recharge from above. Mine dewatering has not affected the recharge of this aquifer. Post-mining conditions may provide improved potential for increased recharge to the Starpoint Sandstone due to subsidence effects in the Blackhawk Formation. The magnitude of such a potential change in recharge cannot be determined.

3.2 Evaluation of Compliance

UMC 817.48 Hydrologic Balance: Acid-Forming and Toxic Materials

The applicant proposes to dispose of excess underground development waste from the mining operation at a waste rock disposal site 1,500 feet from the mine portal. The site is located near the base of the Starpoint Sandstone where it interfingers with the Masuk Shale. No springs or seeps are present in the Starpoint Sandstone at this location. The underlying Masuk Shale is the uppermost member of the Mancos Formation which is generally impermeable.

Chemical and physical analysis has been conducted by the applicant on more than 130 samples of rock above and below the mined seams in the Deer Creek Mine. These analyses indicated that the majority of the samples are non-toxic and non-acid forming. One sample from the Blind Canyon floor showed a high SAR value and one sample from the Blind Canyon roof showed a high pyrite/marcasite content. The applicant considers these samples to be atypical. The applicant states that the occurrence of such potentially toxic materials will be infrequent and that the operations of handling and removal will dilute the concentration of this material without the need for any special mixing. The application is in compliance with this regulation.

UMC 817.50 Hydrologic Balance: Underground Mine Entry and Access Discharges

The breakout in Meetinghouse Canyon is the lowest-elevation portal in the Deer Creek Mine. During the life of the mine, a large area will be mined below the elevation of the portal. For drainage to occur from the portal the abandoned mine workings will have to fill with water. This will take many years or possibly decades, depending on recharge rate to the Starpoint Sandstone. Since the potential for flooding of the abandoned workings is unknown, the applicant will provide a four-inch diameter drain pipe at the Meetinghouse portal capable of discharging 300 gpm to Meetinghouse Canyon. Because recharge will resume to the local aquifers, this discharge is sufficient to ensure that none of the other portals will discharge. The applicant, therefore, has not provided any drainage for the remaining portals. Any water that might be

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discharged is expected to meet EPA effluent limitations without treatment. The applicant will monitor any discharge water quality through bond release period. To date, the water produced at the Deer Creek Mine has been of good quality, and there is no evidence of any adverse mining-related impacts to ether Deer Creek or Huntington Creek. The impact of any future discharges on the existing hydrologic balance should be minimal. The application is in compliance with this regulation.

UMC 817.52 (a) Hydrologic Balance: Surface- and Ground-Water Monitoring

Water is produced at several locations in the mine and then flows to low areas which act as temporary sumps. These sumps are dewatered and pumped to a main sump in an abandoned area of the mine. Water volume is measured as it leaves the mine. Water produced in the mine is used for dust control and there is an internal loss of water due to evaporation. A complete mass balance of water use in the Deer Creek Mine can be computed based on measured outflows and estimated evaporation. The mass balance equation is:

$$V_t = V_H + V_D + E + dS$$

where V_t is the total volume of water produced in the mine, V_H is the volume of water discharged to the Huntington Power Plant, V_D is the volume of water consumed for dust control, E is the evaporation volume and dS is the change in sump capacity between reporting intervals. The sump volume is unknown and is assumed to vary little. All other outflow volumes are measured continuously and recorded monthly.

The total yearly domestic use of water by the Deer Creek Mine is approximately 25 acre-feet (eight million gallons), evaporation is approximately 58 acre-feet, and discharge to Huntington Power Plant has ranged from 107 acre feet to 359 acre-feet. Recent estimates of annual in-mine water production are approximately 442 acre-feet for the Deer Creek Mine or an average daily inflow of 275 gpm. There has been substantial variation from this mean over the period of record (1979 to 1982). The operational aspects of the Deer Creek Mine and the seasonal variation in precipitation both contribute to this variation. There is an upward trend in the mean in-mine water production due to the expansion of mining operations.

The applicant presently monitors some 59 springs on East Mountain for quantity and quality on an annual basis. Monitoring within the mine includes measurements of quantity and quality of discharge. Direct measurements of water quality are made; water quantity is estimated based on information from dewatering operations. This is sufficient to make a relative comparison between water-producing areas in the mine with total inflows based on a mass balance at the main sump. In addition, the monitoring program includes measurement of the discharge recession behavior of 13 springs. The purpose of these measurements is to monitor the condition of the aquifers that are the source of the spring flow. The 13 sites provide monitoring of aquifer conditions over a large area of East Mountain and within strata overlying mining operations. Such monitoring will be extremely useful in identifying the effects of subsidence to existing aquifers.

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Two wells located away from past and active mining areas will continue to be monitored. These wells provide baseline ground-water data within the Blackhawk and Starpoint aquifer. The application is in compliance with this regulation.

UMC 817.53 Hydrologic Balance: Transfer of Wells

No transfer of wells is currently proposed by the applicant.

UMC 817.55 Hydrologic Balance: Discharge of Water into an Underground Mine

No diversion of water into underground workings occurs or is contemplated at the Deer Creek Mine.

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

All surface drilled exploration holes have been reclaimed according to the U.S. Geological Survey's published Drill Hole Plugging Procedure. The application is in compliance with this regulation.

IV. PROBABLE HYDROLOGIC CONSEQUENCES

4.1 Description of Applicant's Proposal

Considerable data is currently being gathered to more fully assess the surface impacts of mining based upon pre-law and current mining progress. Adverse impacts to the hydrologic balance are unlikely; however, in a worse case situation possible impacts to the existing hydrologic balance by the Deer Creek Mine include alteration of ground-water movement in the Blackhawk Formation due to the presence of mine workings and loss of some springs on East Mountain as a result of subsidence. Loss of springs could result in alteration of flow in intermittent and perennial streams [pp. 2-85 (A-D), Vol. 1, PAP]. The applicant states that the majority of springs will be unaffected because of the use of controlled subsidence techniques. It is also stated that the presence of swelling clays in strata above the mine should assist in limiting the movement of ground water through fractures created by subsidence. The permit states that the applicant could replace any disrupted water supply from surrounding streams, wells, or the mine itself (page 2-99, Vol. 1, PAP).

The water-monitoring program indicates that the quality of water discharged from the Deer Creek Mine is good. The applicant does not anticipate that surface waters will be degraded by mining activities. The applicant plans to continue hydrologic monitoring of surface- and ground-water flows for the duration of mining operations. The applicant notes that the Emery Water Users Association has developed three springs in Rilda Canyon as a culinary water supply (pp. 2-97 throught 2-97B, Vol. 2, PAP). These springs are not situated above mine workings. The springs discharge from the Starpoint Sandstone and appear to be fracture related. Discharge records of the springs are given on page 2-97B of the PAP (Vol. 2). The applicant has committed to close monitoring of these springs to better understand their mode of occurrence and the potential impacts of mining.

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4.2 Evaluation of Compliance

Cumulative Hydrologic Impact Assessments have been prepared for Huntington and Cottonwood Creeks. The conclusions of this CHIA and the requirements of UMC 817.41, "Hydrologic Balance: General Requirements," are condensed and discussed below in relation to the applicant's proposal. See Attachment A of this TA document for the CHIA summary.

4.2.1 Surface-Water Impacts

The primary impact on surface waters by Deer Creek mining operations is the discharge of ground water intercepted during mining. The volume of ground water intercepted is expected to gradually increase over the next 20 years as underground operations at the Deer Creek Mine advance further underneath East Mountain. The majority of this intercepted ground water is utilized by the Huntington Power Plant for cooling. In general, the mine water quality is good, averaging 590 mg/l total dissolved solids. The mean annual dissolved solids concentration of the receiving waters (Deer Creek) range seasonally from 235 to 533 mg/l. Mining-related increases in dissolved solids concentrations in Deer Creek are not expected to degrade or preclude anticipated uses downstream of the Deer Creek Mine.

4.2.2 Ground-Water Impacts

The response to subsidence of various strata overlying Deer Creek mining operations is of concern for impacts on ground-water quantity. Studies to date (see Chapter IX) have indicated that expected subsidence is expressed on the surface very rapidly. The greatest potential subsidence-related impact can be to springs in the North Horn Formation. The overburden separating the springs from the coal seams is relatively thick, 1,200 to 2,000 feet, and should serve to dampen the effects of subsidence on the aquifers. The aquifers will be somewhat distorted and this may alter their character. Subsidence could disrupt aquifer water yield, and consequently result in the temporary or even permanent loss of flow at some existing springs and/or creation of new springs at new locations.

Cracking from subsidence may extend to perched aquifers that exist in the lower Price River Formation. This would enhance the vertical permeability of the underlying confining layer and reduce the outflow from a perched aquifer. Depending on the size and extent of cracking, the underlying confining shales may or may not seal in a reasonable period of time.

Spring flow varies greatly within the permit area, and while fewer springs exist in lower formations, their respective flows do not necessarily decrease. The applicant has proposed mitigation measures that address a relatively small loss of water when compared to the size of most springs on East Mountain. The applicant has not described the mitigation measures to be implemented should a substantial loss of water occur (Condition 5).

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In accordance with the requirements of BLM and Forest Service leases and the State's determination, and the post-mining land use requirements of UMC 817.124, the applicant must propose a plan to ensure the protection of the hydrologic balance should subsidence disrupt the discharge of these springs. A provision for developing a suitable water replacement plan must be part of the overall hydrologic protecion plan. (Condition 5).

In regard to the springs developed by the Emery Water Users Association, the proposed monitoring and evaluation of the springs will be a prudent way to study the spring system. This approach is acceptable because of (1) the complicated nature of the hydrologic system in the Rilda Canyon basin (Chapter III, this document, and Huntington Creek CHIA report to OSM, May 29, 1984) and (2) the "no material damage" findings and conclusions of the Huntington Creek CHIA. Mitigation measures can be devised if monitoring data indicate that impacts are occurring. This meets the requirements of UMC 786.19(c) and 817.41.

4.2.3 Conclusions

The probable hydrologic consequences of mining operations at the Deer Creek Mine meet the regulatory requirements. A trend in water production from the Deer Creek Mine is expected to increase the amount of water available to the Huntington Power Plant over the next 20 years. To date, no related trend showing change in water yield for the springs on East Mountain is apparent. Continued monitoring of water yield and aquifer properties is necessary to determine the effect of mining operations on East Mountain aquifers.

Analyses in the permit application package and the cumulative hydrologic impact analysis (CHIA summary, attachment A of this document) plus condition 5 indicate that the application is designed to prevent material damage. There have been no detrimental impacts positively identified to date. The monitoring program proposed by the applicant is necessary to track changes in the hydrology as they may occur in the future. Monitoring will provide a trigger mechanism by which any necessary mitigation can be developed and instituted as necessary. It will also provide a tracking system to revise analyses if the monitoring indicates incongruities in the development of data.

4.3 Conditions

5. The permittee shall replace any water demonstrated to have been lost or adversely affected by mining operations with water from an alternate source in sufficient quantity and quality to maintain the rights of present users and current and postmining land uses. The permittee will advise the regulatory authority of the loss or adverse occurrence within two working days of becoming aware that it has occurred, and within 14 calendar days of notification shall submit to the regulatory authority for approval a plan to replace the affected water. Upon acceptance of the plan by the regulatory authority, the plan shall be implemented in the time-frames dictated by the regulatory authority's approval notification.

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V. MISCELLANEOUS COMPLIANCE

5.1 Description of Applicant's Proposal

By letter correspondence of August 3, 1978, UPL proposed a sign and markers system to the UDOGM. The applicant submitted a Resource Recovery and Protection Plan to BLM for approval. The applicant's blasting plans are discussed in Appendix VI of the permit application package. Cessation of operations are discussed on page 4-1 of the permit application package. Transportation facilities are discussed on pages 3-34 through 3-38 of the permit application package. Support Facilities and utilities are discussed on page 3-15 of the permit application package.

5.2 Evaluation of Compliance

UMC 817.11 Signs and Markers

UDOGM approved the applicant's signs and markers system by letter of August 31, 1978.

UMC 817.59 Coal Recovery

By memo to OSM dated October 31, 1984, BLM recommended that the applicant's Resource Recovery and Protection Plan be approved.

UMC 817.61 through 817.68 Blasting

No surface blasting is being conducted at the Deer Creek Mine. Therefore, the performance requirements of these rules do not apply.

UMC 817.131 and .132 Cessation of Operations

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

UMC 817.180 Other Transportation Facilities

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

UMC 817.181 Support Facilities and Utility Installations

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

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VI. DISPOSAL OF UNDERGROUND DEVELOPMENT WASTE

6.1 Description of Applicant's Proposal

Development waste, coal reject material from the breaker station, and mine entry rehabilitation from the Deer Creek Mine will be disposed of at the development waste disposal site in the Deer Creek facilities area. The applicant has estimated that present mining plans could generate approximately 100,000 cubic yards of material which will require disposal at the site over the life of the mine. As much non-carbonaceous material as possible will be disposed of underground until available space is depleted.

The volume of spoil was determined by the applicant based on the proposed mine layout and operating history and is shown on page 3-59 of the PAP. This estimate shows waste rock volumes from rock slope construction in Main West. No information was provided on the rock slopes and air return shafts which will be constructed in 3rd North. The number of years used for determination of the amount of breaker station reject material was 35. However, if the mine is to operate until 2032 (see page 4-1 of the PAP), then 47 years of waste will be generated. Because of this additional reject material, the applicant will be required to construct additional waste disposal sites at some point in the future. On page 3-59, the applicant states that approval of additional sites will be obtained as needed. It is fairly certain that this will be the case unless substantial volumes of material can be disposed of underground.

The proposed disposal site is a fill structure located along the east slope of the existing portal fill. The location of the fill and cross sections is shown on Map 3-17. The fill will be constructed in four-foot lifts and compacted by machinery used to grade the material. The foundation of the fill is the Starpoint Sandstone and no seeps or springs have been identified in the fill area. Surface-water drainage is controlled to prevent erosion through the fill area. The final slope of the disposal pile along the outside edge will be 1V:2H, and the final elevation above the existing ground level will be approximately 140 feet.

6.2 Evaluation of Compliance

UMC 817.71 Disposal of Excess Spoil and Underground Development Waste: General Requirements

The waste material will be placed in a manner which ensures stability of the pile and prevents degradation of surface or ground waters. The disposal site is suitable for reclamation and revegetation, and will be compatible with the natural surroundings. The applicant is in compliance with UMC 817.71(a).

The fill has been designed by a registered professional engineer using recognized professional standards (see statement on page 3-60 of the PAP). The applicant is in compliance with UMC 817.71(b).

Diversion ditch designs for the disposal site are in compliance with UMC 817.43. The applicant is in compliance with UMC 817.71(d).

The applicant has located the waste disposal site on the most moderately sloping and naturally stable areas available. The bottom of the disposal site slopes gradually to the east and south; therefore, keyway cuts or rock toe buttresses are not required. The north and west sides of the fill are constructed against the portal fill area and the canyon wall, respectively. The applicant is in compliance with UMC 817.71(e).

The fill material is being placed in four-foot lifts and compacted by the machinery used in construction. The outside slopes of the fill will be graded to 1V:2H, and the top of the fill is to be graded to the west at a 0.5 percent slope to prevent drainage down the outslope. Therefore the long-term mass stability of the waste pile is ensured, and a long-term safety factor of 1.5 will be achieved. The applicant is in compliance with 817.71(f).

The configuration of the proposed fill is suitable for postmining land uses and is in compliance with UMC 817.71(g).

There are no terraces proposed in the construction of the fill, therefore UMC 817.71(h) does not apply.

The applicant has proposed plans to inspect the fill quarterly and during critical construction periods (PAP, p. 3-63). Inspection reports will be submitted to UDOGM within two weeks of inspection and a copy will be retained at the mine. The applicant is in compliance with UMC 817.71(i).

With the exception of the material disposed of underground, the applicant is proposing to dispose of coal waste with the development waste. This waste material accounts for approximately one-third of the total waste volume and is a very coarse refuse material. The applicant will be mixing the coal wastes with the rock development wastes and compacting the material in four-foot lifts. The proposed method of construction will ensure the stability of the disposal site and adequate mixing of the coal refuse. Therefore, the applicant was found to be in compliance with UMC 817.85.

There are no seeps or springs in the disposal site; therefore, the applicant is in compliance with UMC 817.71(k).

The fill is located on an essentially flat area where the Starpoint Sandstone outcrops. The sandstone layer is a massive, competent layer which will provide an adequate foundation for the fill. The applicant is in compliance with UMC 817.71(l).

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Conversation with the Mine Safety and Health Administration (MSHA) (Mr. Stephen Miller, Denver) on March 12, 1985, indicates that no carbonaceous material has been disposed of underground at the Deer Creek Mine, and there are no indications that the applicant plans to do so (telephone memo, March 12, 1985; decision document concurrence section). Therefore, no MSHA approval for underground disposal is required. The applicant's disposal plans have been found to be satisfactory and in compliance with the requirements of UMC 817.71(m).

The proposed fill is considered a valley fill, and was originally constructed pre-law. As discussed in Section II, Hydrologic Balance, of this document, the applicant has proposed construction of the reclaimed channel over the fill. The requirements of UMC 817.72(d) call for diversions to be routed away from fill. However, the alternative to construction of the diversion over the fill is complete removal of the fill. The applicant's design submittal for construction of the diversion over the fill was found to be sound engineering design and preferable to the detrimental environmental impacts associated with removal of the fill.

The proposed fill is neither a head of hollow fill, nor a durable rock fill. Therefore, UMC 817.73 and UMC 817.74 do not apply.

VII. PROTECTION OF FISH, WILDLIFE, AND RELATED ENVIRONMENTAL VALUES

7.1 Description of Applicant's Proposal

The applicant's plan for protection of fish and wildlife is presented on pages 4-50 to 4-54 (PAP, Vol. 2). The applicant has committed to (1) reporting any golden eagle nesting activity in the vicinity of the mine disturbance areas to the USFWS, (2) consulting with the USFWS if any additional mine-related developments are planned in the raptor nesting zone (Map 2-18, PAP, Vol. 6), (3) placing deer crossing signs along the access road within the permit area, (4) reporting the occurrence of deer road-kills to the UDWR, and (5) providing wildlife educational instruction to all employees to reduce the potential for harassment of wildlife. The UDWR is currently conducting a deer road-kill monitoring program that includes the Deer Creek Mine access road. If any hazardous areas are identified along the road within the permit area, the applicant will consult with the UDWR for appropriate mitigation measures.

The applicant has supplied a map showing the location of golden eagle nests in relation to the mine facilities (PAP, Map 2-18) and has committed to consulting with the USFWS if any additional activities are planned in the raptor nesting zone (page 4-53, PAP, Vol. 2).

To limit sedimentation in Deer Creek and its effect on aquatic wildlife, surface water from undisturbed areas is diverted past the mine disturbance area in buried culverts. In addition, storm runoff waters from the portal facilities area are diverted into a sedimentation pond prior to release into Deer Creek.

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The 12 kilovolt (KV) line that serves as the power source for the Deer Creek Mine has been determined to be raptor-safe by the USFWS (letter dated November 10, 1982, to UDOGM). The line is constructed without a cross arm, precluding perching by raptors.

Following cessation of mining, the applicant will restore stream channels and revegetate disturbed sites. Plant species selection and planting patterns were designed to restore wildlife habitat as a principal post-mining land use. Details of the revegetation plan are provided on pages 4-22 through 4-28-A of the PAP (Vol. 2) and in Section X of the TA.

Because of the importance of springs as a water source for the area's wildlife, the applicant has stated (page 4-50, PAP, Vol. 2) that any surface-water disturbance resulting from subsidence associated with the Deer Creek Mine will be replaced or repaired by the following methods:

1. "Streams will be bridged across bedrock fractures by culverts until sediments fill the cracks."

2. "Springs will be replaced with a series of guzzlers adequate to replace lost flow."

7.2 Evaluation of Compliance

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

Surface disturbances associated with the Deer Creek Mine total approximately 25 acres. This disturbance will last for the life of the mine and until reclamation is completed. Because of the limited areal extent of surface disturbance, wildlife impacts resulting from loss of habitat will remain relatively minor.

None of the areas affected represent any critical habitats for threatened or endangered species (USFWS, Endangered Species Office, January 10, 1984, memo). The bald eagle is a winter visitor to the region but will not be affected by mining activities. Also, since the Deer Creek Mine will not reduce downstream flow in Deer Creek or Huntington Creek, OSM has determined that populations of the Colorado squawfish and the humpback chub in the Colorado River will not be impacted by continued operation of the Deer Creek Mine (USFWS, Endangered Species Office, March 5, 1985, memo).

Other mine-associated wildlife impacts that may be more important than direct loss of habitat include (1) human harassment of all wildlife, (2) mule deer road-kills, and (3) the potential effects of subsidence on springs and raptor cliff nesting habitat.

The effects of human harassment on wildlife, either inadvertent or purposeful, are extremely difficult to quantify. At a minimum, mining activities will likely preclude raptor nesting use of potential nest sites within 1 kilometer of the Deer Creek Mine facilities.

The applicant has shown, in a study on the effects of the Deer Creek Mine C-2 overland conveyor on mule deer migration (submitted to UDOGM, June 2, 1983), that the conveyor is not a barrier to mule deer movement.

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The potential for mule deer road-kills is greatest during the winter months when mule deer congregate in critical winter range traversed by the Deer Creek Mine access road. However, unless a particularly hazardous area is identified by UDWR monitoring, this impact is not expected to be significant.

Mine-related subsidence could impact springs on East Mountain and raptor cliff-nesting habitat, particularly in areas where surface fracturing is possible. Future monitoring will be required to provide sufficient information regarding the extent of impacts related to subsidence.

With regard to subsidence impacts on raptor cliff nesting habitat, the applicant will be mining under a few miles of cliff where the Castlegate Sandstone and Price River Formation are exposed in Meetinghouse and Deer Creek Canyons. Mining under these types of escarpments may have a significant impact on their stability. To date, fracturing of the Castlegate and Price River Formations has occurred over the Des-Bee-Dove Mine Complex and in Grimes Wash (see the annual Subsidence Reports, 1982). It can be expected, therefore, that there will be surface fracturing in the Castlegate Sandstone and/or Price River Formation in Meetinghouse and/or Deer Creek Canyon. This represents an acceleration of a natural process. Based on the 5-year permit, mining under escarpments may affect only one inactive raven nest (No. 46) (Maps 3-1, 3-2, 3-3, 3-4, 3-5, and 2-18, PAP, Vol. 6). Unless newly constructed nests are affected by subsidence, no significant impacts to raptor nesting habitat is anticipated, since subsidence-related fracturing of cliff faces would not be expected to eliminate cliff faces, but merely create new escarpments.

In the event that existing or new nests are affected, the nests could be damaged or lost depending on the degree of subsidence. The applicant has not committed to mitigate this potential impact.

7.3 Conditions

6. Existing raptor nests adversely affected by mine related subsidence shall be replaced or otherwise mitigated by the permittee in consultation with the USFWS and the Utah Division of Wildlife Resources according to the requirements of UMC 784.21 and UMC 817.97. Notification of the loss to the above-named agencies and the regulatory authority shall take place within two working days of the permittee becoming aware that the loss has occurred.

VIII. BACKFILLING AND GRADING

8.1 Description of the Applicant's Proposal

The Deer Creek Mine is located in Deer Creek Canyon, a steep-sided drainage which flows perennially. The mine facilities are built on benches which have been constructed using cut-and-fill techniques. The only other surface disturbances associated directly with the mine are ventilation breakouts which provide intake air. These breakouts have been or will be constructed from within the mine. There are no facilities located at these sites and the entrances are fenced to prevent access. Five entries and one exhaust shaft are located in the Deer Creek facilities area and five air intakes (breakouts) will be located in Meetinghouse Canyon (see Drawing CM-10473-DR). Two of the

breakouts are in the north fork and three in the south fork of Meetinghouse Canyon. A development waste and coal waste disposal site is located within the facilities area and is an extension of the bench area where the portals are located. Backfilling and grading of this site are discussed in Section VI, Disposal of Underground Development Waste, of this document.

The major earthen structures at the facilities area are shown on Drawing CM-10385-DR. The fill is situated on the level with the portals and provides area for storage, offices, and maintenance facilities. For the most part, this fill was constructed from material excavated on the south side of the canyon on a steep slope. This slope is a pre-law disturbance and has not been utilized by the applicant since SMCRA was enacted. Above the portal level are smaller cuts and fills associated with the fan pad and water tank. Below this area is a coal bin which is cut into the existing rock. It handles run-of-mine coal prior to screening and transport to the power facility.

The applicant is proposing to backfill and grade the Deer Creek facilities area to essentially premining topography except where the pre-law fill and development waste disposal site are located. This operation will entail backfilling on-site material. The backfilling and grading operation is described in the PAP on pages 4-3 to 4-6. Volume of material to be handled and cross sections showing the postmining slopes are shown on Drawing CM-10551-DR. All backfilled slopes will be at or less than 2H:1V. Asphalt and toxic or acid-forming material will be buried in the coal bin area which has sufficient capacity for this material. The steep cut slope will not be backfilled because this disturbance is pre-law and the applicant has not utilized it since its fill construction.

Most of the non-carbonaceous underground waste produced during mining will be disposed of in underground workings. The remainder of the waste will be disposed of above ground by extending existing fills. Laboratory analyses indicate that waste rock with high sodium adsorption ratios could be included in the rock waste. These samples are not indicative of most of the waste to be generated. The applicant has committed to sample and dilute waste having high SAR values with waste rock exhibiting low SAR values during grading.

Several other potentially toxic and acid-forming materials have been identified by the applicant. Provisions for disposal have been provided. All coal waste and any highly pyritic material will be diluted with low-sulfur rock and will be buried under four feet of fill. Sediment from the sediment pond and asphalt road base will be buried under four feet of non-toxic fill.

8.2 Evaluation of Compliance

UMC 817.99 Slides and Other Damage

Specific plans have been provided for reporting slides to UDOGM should they occur. The applicant is in compliance with this section.

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UMC 817.100 Contemporaneous Reclamation

Revegetation of a number of existing fill slopes will commence the first appropriate season following permit approval. This revegetation will be in the form of test plots as described on pages 4-13 to 4-22, Vol. 2. The remaining existing disturbed areas are required for mine operation.

Structure removal and portal backfilling will begin at the conclusion of mining operations, year 2032. Revegetation operations will begin the following September on all disturbed areas. The sediment pond will remain in operation following revegetation and through the ten-year responsibility period. It will then be graded and revegetated.

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

UMC 817.101 Backfilling and Grading: General Requirements

The applicant is planning to return the surface disturbances associated with the Deer Creek Mine to a suitable postmining topography capable of supporting the intended postmining land use. The pre-law fill supporting the surface facilities will remain. The location of this fill in the canyon will not be inconsistent with the surrounding topography. The stability of the fills (see Chapter VI of this analysis for a discussion on the stability of the waste bank) as they exist and after reclamation has been evaluated and meets the requirements of the regulations. This conclusion is based upon analyses presented by the applicant, and empirical evidence of stability. The environmental and economic factors associated with the alternative of removing the fill are considered detrimental when compared to the applicant's proposal and designs for leaving the fill. The post-mining drainage system has been evaluated in Chapter II of this TA and has been found to be adequate. The applicant was granted a variance from the requirements of UMC 817.72(d) which calls for diversions to be routed away from fill.

Specific plans have been provided for grading along the contour. The applicant is in compliance with this section of the regulation.

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

Coal waste and pyritic materials will be diluted with low-sulfur rock and fill and will be buried under four feet of fill. Road base material and sediment from the sediment pond will be buried under four feet of non-toxic fill. The applicant is in compliance with this section of the regulations.

UMC 817.106 Regrading or Stabilizing Rills and Gullies

Plans have been submitted for the repair of rills and gullies in the bond estimate. Based upon the current maintenance program, 32 hours of work per year are needed to repair rills and gullies. The applicant has described the methods used to repair rills and gullies. The applicant is in compliance with this section.

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IX. SUBSIDENCE CONTROL PLAN

9.1 Description of Applicant's Proposal

The applicant's subsidence control plan (PAP, p. 4-41) is to utilize complete extraction methods (i.e., primarily longwall mining), to achieve, as much as possible, an even lowering of the surface. The applicant intends to mine areas as wide and long as feasible in order to minimize the area which would be on the sloping edge of the subsidence trough. Pillars which are located between extraction panels are designed to yield and eventually crush as mining progresses past them. This will have the effect of maintaining an even subsidence trough.

All mining, except for planned breakouts, is planned to be discontinued at a minimum distance of 200 feet from any outcrop line in the mine area.

The applicant has stated that full extraction panels have been oriented parallel to the major faults and joints. This alignment with respect to jointing is proposed to prevent the formation of irregular sawtooth subsidence cracks in the overlying surface lands.

On the operation maps, areas of partial extraction have been identified under the transmission line and Rilda Canyon. However, mining under Rilda Canyon is not to be included in the review of this permit application since additional information is to be submitted at a later date. Under the transmission line only first mining will occur (i.e., only pillar development will take place). Pillars to be retained in the buffer area are 80 feet by 80 feet, with 20-foot entries, and have been sized by the applicant to be stable over the long term.

The applicant has proposed a subsidence monitoring plan which is described in Appendix X of the permit application. In general, the plan consists of a combination of photogrammetry methods tied in with conventional survey methods. The survey will be conducted once a year in mid-summer when the survey can be run in conjunction with the U.S. Forest Service vegetational studies. A ground-control survey will be established on a grid system as shown on the survey location map to provide a scale for the photography. By expanding and monumenting the control survey, a primary grid will be established for measuring both horizontal and vertical displacement. Grid spacing for the areas which are shown ranges from 100 to 600 foot spacings. The location of the primary controls for the 1980 survey is shown on Map 4-5, submitted September 17, 1984.

The applicant has stated that if there are any subsidence impacts to structures, they will be mitigated. Structures will either be repaired or the owner will be compensated for damage to the structure. In addition, any road damaged by subsidence will be repaired and regraded to restore it to its pre-subsidence usefulness.

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The applicant has committed to mitigate any adverse subsidence impacts to perennial streams if any occur.

The applicant has stated that public notices have been submitted to the affected surface owners which detail the areas in which mining is to take place and the planned date of the mining activity.

9.2 Evaluation of Compliance

A. Description of Subsidence Effects Observed To Date

Monitoring of subsidence to date has included studies by the U.S. Bureau of Mines (USBM) using standard ground survey methods, and by the applicant using photogrammetric methods, conventional survey methods and helicopter fly-overs. These data have been compiled in the applicant's annual subsidence reports and in the permit application package.

The USBM has been studying subsidence at the Deer Creek and Wilberg Mines since 1979. The initial study monitored subsidence over two longwall panels which were developed in the Blind Canyon upper seam between 1979 and 1980. The depth of cover over these panels ranged from 1,600 feet to 1,450 feet. A baseline survey was conducted in October 1978 over Panels 5 East through 8 East (Deer Creek PAP, Vol. 6 Drawing No. CM-10473-DR, Sheet 2, Five-Year Mining Plan). These panels run in an east-west direction with Panel 5 East being the northernmost (see Figure 8, Deer Creek Longwall Subsidence Study, USBM). Just north of Panel 5 East is a room and pillar section where the pillars have not been pulled. The first surface indication of subsidence occurred in September 1979 over Panel 5 East, which was mined first. At a minimum, the face had advanced 460 feet before subsidence occurred. Three inches (0.25 feet) of subsidence were measured on the surface at this time. In July 1980, when the next measurements occurred, subsidence had increased to a maximum of 1.6 feet over Panel 5 East. Mining in Panel 6 East immediately adjacent to 5 East had progressed 1,200 feet. Subsidence continued to be recorded, but by November 1980 no additional subsidence had occurred over the first 700 feet mined in Panel 5 East, indicating that subsidence from mining occurs fairly soon after mining. The maximum subsidence measured was 2.7 feet which had occurred by December of 1980, when the analysis in the USBM report ends. This subsidence occurred near the midpoint of the panels and just north of the chain pillars separating Panels 5 East and 6 East but within Panel 5 East. This shows that the chain pillers crushed out and did not significantly affect the subsidence trough. The barrier pillars and the pillar sections to the north of Panel 5 East did not crush and effectively stopped subsidence except for angle-of-draw effects. The maximum slope of the subsidence trough at this time was 0.06 inches per foot in this area. No surface cracking was evident over the mine with this slope.

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Additional data collected as part of the USBM study have been supplied by the applicant showing monitoring information through September 1983. Between 1980 and 1983, mining continued in Panels 7 East and 8 East in the Blind Canyon seam (upper seam), and Panel 9 Right had been mined in the Hiawatha seam (lower seam, see Drawing CM-10479-WB) almost directly below Panel 5 East (upper seam) and slightly under the room-and-pillar section to the north of Panel 5. The maximum subsidence measured on the surface to date is almost six feet over Panel 6 East (upper seam). Panels have been completely extracted to the north and south of 6 East. Therefore, it is probable that the maximum amount of subsidence which will occur due to mining in a single seam under the conditions in this area has been observed (over Panel 6 East). However, no second seam mining has yet occurred under this panel, and thus the subsidence effects of multiple seam mining in this area have not yet been observed. The closest longwall mining (to Panel 6 East) which has occurred in the lower (Hiawatha) seam is Panel 9 Right in the Wilberg Mine, located approximately 300 feet to the north. In addition, a barrier pillar is located in the Hiawatha seam in the area separating mining between Panels 6 East and 9 Right, and the subsidence troughs over these panels do not overlap at the maximum point of subsidence.

Subsidence has continued to occur over Panel 5 East, which was the first panel to be extracted in this area (in 1979). A maximum of almost five feet of subsidence was measured over 5 East in September 1983. Though subsidence over Panel 5 East has continued since 1979 (for over four years), this is due to the initial extraction in Panel 5 East and later mining in Panel 9 Right. Since mining subsequently occurred in the Hiawatha seam (Panel 9 Right) almost directly below Panel 5 East, subsidence has continued due to multiple seam mining with a possible minor residual affect from single seam mining. It is expected that subsidence over mined areas within the permit area will not continue more than a few years once all mining in an area is complete.

The subsidence profile continues to show that the chain pillars are crushing out and not creating any significant variation in the profile. The barrier pillars which are located at the ends of the panels to protect the mains from mining in the panels and the pillar section to the north of Panel 5 East do not appear to be crushing at all, and effectively stop subsidence except for angle-of-draw effects. The maximum slope measured at the edge of the subsidence trough as of June 1983 was over Panel 6 East and was 0.09 inches per foot (0.43 degrees or 0.75 percent). No surface cracking has been observed at this site to date.

Recently data have been obtained over the Panel 3 West in the Wilberg Mine in the Hiawatha Seam as part of the USBM study (PAP, Vol. 5, Drawing No. CM-10479-WB). This panel is under approximately 2,100 to 1,775 feet of cover and undermined a steep hillside with a gradient of 20 degrees. Retreat mining is occurring in Panel 2 West just to the north of

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previously mined Panel 3 West. There has not been any multiple seam mining in this area. The Panel 3 West was probably mined in early 1981, as the first subsidence measurements are recorded in August 1981 and the monuments were installed and initially measured in September 1980. The maximum subsidence which has occurred to date over this panel is 2.5 feet, as of September 1983. The subsidence over Panel 3 West has undoubtedly been enhanced by mining in Panel 2 West since the maximum amount of subsidence occurred slightly off center of Panel 3 West towards the north. This amount of subsidence is similar to what was observed over Panel 5 East, indicating that the depth of cover in this isolated case does not seem to be significantly decreasing the amount of subsidence observed in the areas of thick overburden cover where the Castlegate and Price River Formations exist.

Several other subsidence occurrences over the UP&L mines have been noticed by aerial inspections conducted by the applicant in a helicopter and then mapped in the field. These disturbances were recorded by the applicant in the annual Subsidence Reports and in an August 3, 1982, letter to UDOGM. One area is located in the right fork of Grimes Wash over an area which had been retreat mined in both the Blind Canyon (1980) and Hiawatha seams (1981). The area encompasses about 40 acres of land, 35 of which are located on a steep slope and cliff area formed by the Castlegate and Blackhawk Formations. Subsidence offsets up to 12 feet were measured and toppling failure of the cliff has occurred. The area is currently fenced to protect livestock and the public. The depth of cover in this area is approximately 900 feet to the Blind Canyon seam and 1,050 to the Hiawatha seam. The slope which slid is essentially vertical and 250 feet high. Surface cracking has also been observed in the Blackhawk Formation in this area. A second area is located over a section of the Deer Creek Mine where retreat mining occurred in the Blind Canyon seam under approximately 850 feet of cover. The fractures are located in the Price River Formation, which outcrops along a steep hillside in this area to form a cliff face. The disturbed area is approximately 10 acres. The size of the fractures was not noted by the applicant. The mining in this area occurred in 1977 and the fractures are old, as evidenced by the growth of vegetation in the the cracks. Another area is located over the Des-Bee-Dove Mine in the Castlegate Sandstone near a steep slope and cliff area. The area of disturbance encompasses approximately 10 acres and contains several northeast trending fractures. The area overlies retreat mining which took place in October 1981.

Additional monitoring information has been provided by the applicant on subsidence observed over the Des-Bee-Dove Mine in the annual subsidence reports for mining over Panel 4 West section of the Beehive Mine. Monitoring in this area is difficult to interpret due to the extensive mining that occurred prior to the subsidence surveys. However, 2.5 feet of subsidence has been measured over the area for single seam mining. The surface over this section of the mine does not have any cliff areas

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and the depth of cover is between 1,300 and 1,600 feet. As of 1982, although both seams in this area had been mined, no surface cracking was evident. However, it is not possible to extrapolate this lack of surface cracking to the longwall operations in the Deer Creek and Wilberg Mines. The operations at Des-Bee-Dove are room-and-pillar operations and large barrier pillars exist between the extraction panels which are most likely not crushing out, and would tend to decrease the effects of subsidence. This may also be the case with respect to the cliff areas which have been undermined in the Des-Bee-Dove operation but have not failed. The barrier pillars would effectively decrease the width of the opening in the mine, and the critical width (i.e., the width at which surface subsidence is greatest) is probably not achieved.

B. Evaluation of Probable Subsidence Effects

B.1. Lowering of the Land Surface in Areas Underlain by the Castlegate and Price River Sandstones

The effects of subsidence on the surface will likely be regionally modified by the occurrence of the thick layers of the Castlegate Sandstone and the Price River Formation. These effects would tend to mitigate the possibility of surface cracking where the sandstone layers are continuous through the area. However, it can still be expected that the land surface will be significantly lowered. The maximum extent of this lowering is not known, since the maximum lowering had not yet occurred by the time the most recent annual subsidence monitoring report was submitted.

The maximum subsidence which would be expected over a single seam maximum extraction area under 1,500 feet of cover has probably been identified in Panel 6 East in the Blind Canyon seam and is almost six feet, as shown by data collected for September 1983. Between June 1983 and September 1983 the surface only dropped an additional 0.08 feet, indicating that subsidence has probably stabilized in this area over a period of approximately three years. Depth of cover over this panel is approximately 1,500 feet. As such, the Castlegate Sandstone and the Price River Formation occur over this panel with approximately 100 feet of the North Horn Formation. It would be expected that the sandstone layers would provide a certain amount of bending action over the Blackhawk Formation as it crumbles above the underground workings. This bending action of the more competent sandstone would tend to reduce the amount of subsidence from what might be expected if only weaker strata existed above the mine. As of the last reported ground survey in 1982, no surface cracking was evident in this area.

If the information from Panel 6 East were doubled to reflect mining in two seams, then a lowering of the surface of almost 12 feet might be expected where the cover was approximately 1,500 feet and maximum extraction occurred. The applicant has estimated a maximum of 10 feet of subsidence where cumulative extraction from the two minable seams will

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not exceed 20 feet. The applicant's estimate may be reasonable for areas of the mine where the depth of cover is greater than 1,500 feet given the thickness of the interburden between the Blind Canyon seam and the Hiawatha seam. In areas where the depth of cover is less than 1,500 feet, and in particular in areas where the sandstone layers do not exist, the amount of subsidence may be greater than the projected 10 feet.

Even settling of the land surface by complete extraction methods is not the primary concern associated with subsidence at the Deer Creek Mine. The major problem will be associated with areas where uneven subsidence takes place. This can occur where subsidence is unevenly distributed by (1) barrier pillars, (2) over the course of longwall-mining, and (3) during retreat mining. An advancing subsidence trough will occur on the surface. In these areas the ground surface will tilt, causing areas of tension and compression on the surface. In the case of the advancing mine face, these effects are transient and not as pronounced. However, where a barrier pillar remains, the surface tension and compression effects will remain and cause horizontal strains. The maximum slope measured to date is in the vicinity of Panel 6 East (Blind Canyon seam), and slopes at 0.09 inch/foot under 1,400 feet of cover. Although this amount seems to be a very minor slope, it would cause severe damage to an existing structure situated on the surface where the slope occurred. The slope would be expected to steepen as mining in the Hiawatha Seam (lower seam) progressed and increased the amount of subsidence within the trough. This effect has been observed in the area being monitored, where subsidence has increased from 2.7 to almost 6 feet and the slope has increased from 0.06 inch/foot to 0.09 inch/foot.

Depending upon the thickness of the overlying North Horn Formation, plastic deformation of this strata could occur, resulting in no visible effects on the surface. In areas where the depth of cover of the North Horn decreased and the sandstone layers were close to the surface or exposed at the surface, surface cracking may become evident. Continued monitoring in this area during the permit term, and possibly for a few years afterward, should identify the effects of multiple seam mining on the surface both with respect to lowering of the surface and to slope effects at the edge of the subsidence trough.

In the areas of high strain, steep slopes in the North Horn Formation may be susceptable to failure. The North Horn Formation consists of a high percentage of clay layers, and given the right moisture conditions, could slump. This has apparently occurred in the past in areas in the North Horn Formation, where in 1979 a slump 150 feet long was recorded (Memo to Coal File, UDOGM, September 6, 1979). This slump was located in an area where no mining had yet occurred in the UP&L operations. To date, no other slumps in the North Horn Formation have been recorded, even though retreat mining has occurred under steep slopes in this formation and extremely wet conditions existed in the spring of 1983. However, given

certain conditions, subsidence could potentially trigger slope failures in this formation. It would be difficult to determine if the failure were due to subsidence, or if the slope would have failed naturally, as was the situation with the 1979 failure.

B.2. Lowering of the Land Surface in Areas not Underlain by the Castlegate Sandstone

Portions of the land in the Meetinghouse Canyon area will be undermined where the strata overlying the operation consist only of the North Horn Formation. As such, the surface protection provided by the thick sandstone layers of the Castlegate and the Price River Formations will not exist.

As mining progresses in these areas of shallow cover, (150 to 750 feet of cover) surface cracking may occur along barrier pillars or between extraction panels until both panels are mined. The applicant has stated that the caving height can range from 35 to 50 times the thickness of the coal seam, therefore surface fracturing could be expected where the depth of cover ranges from 150 to 350 or 500 feet. As mentioned before, mining under this depth of cover occurs in portions of the mine area. In addition, surface cracking in the Blackhawk Formation has been observed near the Wilberg Mine facilities area.

In these areas of shallow cover, subsidence can be expected to be greater than measured to date. Since 60 percent of the seam thickness has been reflected in subsidence at the surface over Panel 6 East, it would not be unreasonable to assume that a greater percentage of the seam thickness might be reflected in subsidence at the surface in areas where the Castlegate Sandstone does not exist. Therefore, mining in these areas with shallow cover will cause greater subsidence impacts. In addition, the effects of uneven settling of the land surface will probably be more pronounced. Continued monitoring in these areas will identify the effects of subsidence and the need for mitgation of impacts if necessary (see proposed conditions).

B.3. Disturbance to Springs, Seeps and Ponds

Potential disturbance to springs, seeps and ponds in the permit area is not well understood at this time (see Chapter IV, of this document). Depending upon the location of the water source, the effects of mining will be quite different. A few springs are located in areas either just above the Price River Formation where the thickness of the North Horn Formation is minimal, or in the Price River Formation. In these areas, a stronger potential exists for disruption of the springs, since cracking in the Price River may extend to the source of the springs. In most areas, the North Horn Formation is probably thick enough to minimize this effect, as evidenced by the lack of surface cracking (as of 1982) over the areas which have been mined out as part of the USBM studies.

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Springs, seeps, and ponds are located in the areas at the edge of the subsidence trough where horizontal strains can be expected to be high. In these areas, cracking in the formations would be expected to be at a maximum. For instance, Surging Spring, Burnt Tree Spring, and Cove Reservoir are all located at or near the edge of a barrier pillar under which both seams will be extracted. The depth of cover in this area ranges from 1,600 to 1,750 feet. Therefore, the Castlegate and Price River Sandstones exist in their entirety, along with almost 500 feet of the North Horn Formation. The effects of subsidence as mining progresses on Burnt Spring will be quantified through discharge-recession studies. Mining will occur in a single seam under these springs and under the reservoir during this permit term in the Blind Canyon seam as part of the proposed Deer Creek operations. It is not known when mining of the Hiawatha seam might recommence at the Wilberg Mine, since this mine has been recently shut down because of fire. As multiple seam subsidence monitoring information is obtained in other areas of the mine, the effects of multiple seam mining will be better understood before multiple seam mining begins under these surface waters. No mining during the permit term is planned under Elk Spring, a very high-yield spring over the Deer Creek operations. Data will be available at a later date to evaluate potential effects to that spring prior to actual mining.

B.4. Disturbance to Escarpments

The applicant will be mining under several major escarpments of the Castlegate Sandstone and the Price River Formation along the perimeter of portions of the Meetinghouse Canyon area. Mining under these types of escarpments may impact their stability.

As mining progresses from the outcrop barrier to the end of the panel, mining will occur first under areas where the Castlegate Sandstone does not occur. Eventually, depending upon the location of the particular panel, mining will progress under the Castlegate Sandstone and then progress to a barrier pillar located adjacent to the mains. This type of mining operation will create cantilevering in the Castlegate Sandstone because the shallow areas not covered by the Castlegate can be expected to cave fairly soon after mining, whereas the stronger Castlegate will tend to resist caving longer. A cantilever would then form, and cracking at the surface would be expected.

This type of situation may be what caused the 12-foot subsidence offsets in the right branch of Grimes Wash. From evaluating the map shown in the applicant's August 1982 letter recording subsidence occurrences, it is difficult to determine exactly where the surface cracks occurred, but it appears that mining in this area would have created an unsupported section of the Castlegate approximately 200 to 500 feet long. Fracturing occurred within two years of retreat mining in this area. The orientation of the fractures is north-south. The subsidence fractures which occurred over the Deer Creek Mine were also similar to the scenario above Grimes Wash. Mining began retreating from a section of the mine

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where the cover was only the Blackhawk Formation. Mining progressed under the Castlegate, and fracturing occurred in a northeast direction approximately 100 feet back from the outcrop of the Castlegate. The size of these fractures was not identified by the applicant. The fractures identified above the Des-Bee-Dove Mine repeat this same type of occurrence.

Within the Deer Creek Mine, a few miles of cliff formed by the Castlegate Sandstone and the Price River Formation are exposed in Meetinghouse and Deer Creek Canyons, and portions will be undermined using longwall mining or retreat mining of room-and-pillar sections. This cliff is located in the raptor nesting zone. It is reasonable to assume that there will be surface fracturing in the Castlegate Sandstone and/or the Price River Formation along this cliff. The applicant will monitor these cliffs to determine the effects of longwall mining under the escarpments and impacts to raptor habitat.

B.5. Disturbance to Perennial Streams

The applicant will be mining under the creeks in Meetinghouse Canyon, North Fork of Meetinghouse Canyon, Deer Creek and Whetstone Creek, and mining has already occurred under the North Fork of Grimes Wash. These streams are considered perennial all or in part. The applicant has not proposed to leave any buffer zones under these streams therefore, a determination must be made as to whether or not material damage to the streams will result from the proposed mining operation.

Mining under the left fork of Grimes Wash in the Blind Canyon seam has recently been completed. The depth of cover to the coal seam in the area mined ranges from approximately 900 to 1,400 feet. Along parts of the stream, the channel is located in the Price River and Castlegate Formations. As such, there is concern for surficial cracking of the sandstone, resulting in loss of part or all of the stream flow. This impact could possibly be enhanced because the mains cross under the stream approximately in the middle of the undermined section with the panels to the east and west of the mains. This would create a situation where the tensile stresses on the surface would be expected to be greatest. To date, no impacts to the channel have been identified. Therefore, for the other streams which will be undermined it is not expected that there will be material damage to the streams where the depth of cover is greater than 900 feet and single seam mining occurs. As multiple seam mining subsidence data are submitted for the USBM study area, the effects of multiple seam mining will be evaluated and this information extrapolated prior to second-seam mining under the perennial streams. To ensure protection of these streams, the applicant shall be required to present these data and interpretations prior to second-seam mining (Condition 7).

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With respect to the other creeks, most of them are adequately protected by the depth of cover similar to the conditions discussed for the left fork of Grimes Wash. For the areas that occur under shallower cover, protection is afforded by the buffer zone for the transmission line, barrier pillars located at the end of panels, or lack of mining due to thin seams. As such, it is not expected that there will be any material damage to these creeks. If damage does occur, the applicant has committed to mitigating these impacts. There are not expected to be any significant short-term effects between the time the damage might occur and the mitigation effort.

C. Evaluation of Compliance

UMC 817.121 Subsidence Control: General Requirements

As mining progresses and additional information is collected, the impacts associated with subsidence will be more clearly identified. Thus, the applicant's monitoring program and its interpretation are critical. The program proposed by the applicant uses photogrammetry survey methods and helicopter surveys. Survey monitoring of subsidence by the U.S. Bureau of Mines will continue at least through September of 1985. The applicant has committed to continue monitoring the USBM study area after the Bureau has finished (Appendix X of the PAP).

The applicant is in compliance with the requirements of UMC 817.121.

UMC 817.122 Subsidence Control: Public Notice

The applicant has provided for public notice to all affected landowners and residents within the area above the underground workings. The notification will identify the areas in which mining will take place and the planned date of mining. The applicant is in compliance with UMC 817.122.

UMC 817.124 Subsidence Control: Surface Owner Protection

The applicant has proposed to mitigate impacts to structures and roads. As mining progresses and additional information is obtained on subsidence impacts, additional mitigation measures may be necessary. At this time it is not possible to determine the precise effects to springs in the area or the extent of disruption of the surface or of escarpments. The applicant has committed to monitor these features and evaluate the effect of subsidence on them. Mitigation plans will be developed by the applicant and submitted to the regulatory authority for evaluation and approval, and a final mitigation plan implemented by the applicant. Specific mitigation plans will be developed by the applicant as necessary and submitted to the regulatory authority within three months of data collection and analysis and reiterated in the annual subsidence report. With the monitoring stipulations from chapter 4, Probable Hydrologic Consequences, the applicant is in compliance with UMC 817.124.

UMC 817.126 Subsidence Control: Buffer Zones

A buffer zone has been identified to protect transmission lines, which can be damaged by even the slightest tilting. In this area, pillars will

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be left to prevent surface subsidence. Pillar sizing was based on successful surface protection by the 80 feet by 80 feet pillars used in other portions of the mine where overburden is as much as 2,000 feet. In addition, studies by A.H. Wilson (June, 1972, article in The Mining Engineer, titled, "Research into the Determination of Pillar Size") and C.T. Holland (March, 1963, in Mechanization, titled, "Pressure Arch Techniques") indicate that the proposed pillars are adequate to protect these structures. The applicant has not proposed any buffer zones around the perennial streams across the mine. Accumulation of data regarding the cumulative effects of mining two seams by longwall methods at the Deer Creek Mine is not yet complete.

The steep and narrow characteristics of stream channels in the permit area make the standard application of a 100 foot buffer zone around the perennial streams inappropriate. The resulting buffer zones would incorporate large areas of uplands with no resulting increase in stream protection. Accordingly, condition 7 uses the application of a very conservative angle of draw value of 35 degrees from vertical, measured from the limit of the mined area of the lowest seam to the center of the stream channel to establish an effective buffer zone. Bureau of Mines subsidence studies indicate that actual subsidence in the vicinity of the perennial streams is unlikely to reach 35 degrees; therefore, a buffer zone of no ground movement is built into the 35 degree figure at the stream channel. The condition ensures that the streams will be protected while appropriate information is collected to evaluate the overall effect of second seam mining.

Uniform subsidence associated with longwall mining reduces the concern for disruption of streams due to subsidence. Historical effects of subsidence to streams at the Deer Creek and Wilberg Mine areas supports the applicant's contention that little or no damage to streams will occur due to subsidence. Damage that might occur to streams by surface cracking would be mitigatable by temporarily bridging the cracks with culvert material and allowing the cracks to seal with sediment and overburden material through natural processes. A finding of no material damage to the streams for single seam mining has been made, and the proposed plan has been approved. With the stream protection addressed in Condition 7, the applicant is in compliance with UMC 817.126.

9.3 Conditions

7. Prior to beginning second seam mining inside a perennial stream buffer zone as defined by a 35 degree angle of draw from vertical, measured from the limit of mining in the lowest seam, to the center of the stream channel, the permittee shall present a detailed evaluation of the anticipated effects of multiple seam mining on perennial streams as required by UMC 817.126(a). This evaluation must be based upon subsidence monitoring information collected on multiple seam mining in areas with similar overburden depths and surface topography.

X. REVEGETATION

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10.1 Description of Applicant's Proposal

Interim Stabilization and Vegetation Plan (Vol. 2, revised pp 4-13 to 4-30)

The objectives of this plan are to (1) control erosion on two major existing fill slopes, (2) evaluate revegetation methodologies, plant species adaptability, and potential revegetation success, (3) develop an alternate "soil" material to be applied to final graded slopes, and (4) record "soil" productivity over the life of the mine. The applicant proposes that by establishing vegetation on these slopes, the upper 18 to 24 inches of this fill material will, due to increased organic matter content, increased microbial populations, and incorporated seed, serve to increase revegetation potential. "Soil" developed as a result will be placed on random sites over the final graded surface to a depth of 6 to 12 inches. The plan is to be initiated the first appropriate season following the granting of this permit.

To revegetate each slope, the surface will be cleared of debris and the proposed seed mixture and fertilizer (at rates based on soil test results) will be broadcast. Seeding shall take place in the fall. Two tons of alfalfa hay mulch per acre will be spread over the slope surface. The surface will then be raked up-slope to cover the seed and fertilizer. Partial incorporation of mulch into the seedbed will also result. The slopes will be covered with "Vexar" netting and the netting anchored. The following spring, containerized shrub and tree stock shall be planted in test strips with species located randomly in rows. Basins are to be formed around each seedling and a fertilizer tablet placed in the backfill for each plant. A "Vexar" tube will be placed over each seedling to protect the seedling from browsing. Each seedling will be watered after planting.

Irrigation will be practiced only if a planting failure occurs after the first year. Slopes will be cultivated for two years to eliminate weeds. Plantings are to be evaluated in August. Permanent line intercept transects shall be employed to record species composition and ground cover. Shrub and tree plantings will be evaluated for species survival rate and vigor. Copies of evaluation reports will be forwarded to the regulatory authority. Samples shall be taken of seedbed material at five-year intervals to record productivity changes.

A wide variety of grass, forb, shrub, and tree species will be evaluated. Most species proposed are considered drought-tolerant. Four introduced species (Artemisia abrotanum, Kochia prostrata, Melilotus officinalis, Medicago sativa) are scheduled for testing. The majority of species to be evaluated are proposed for use during final revegetation.

Final Revegetation Plan - Mine Proper (Vol. II, revised pp 4-22 to 4-30)

Final revegetation shall be initiated the first appropriate season following grading. Three vegetative communities are to be established.

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These are the pinyon-juniper, mixed conifer, and riparian. Techniques for final revegetation described below may be revised given the results of the "Interim" plan.

Following grading, tops of fills, terrace cuts, and road surfaces will be ripped and disced. Steeper slopes and stream banks shall be hand-raked to prepare the seedbed. Drawing CM-10548-DR (PAP) indicates that the top terrace will be stabilized through revegetation to the Mixed Conifer community. "Soil" developed as a result of "Interim" plantings will be randomly spread over the graded surface to a depth of 6 to 12 inches. Seed mixtures and fertilizer (at rates based on soil test results) will be broadcast onto the seedbed in the fall. On more level sites the soil surface will be turned with a drag to cover the seed and fertilizer. Steeper slopes shall be hand-raked to accomplish this activity. Alfalfa hay mulch will then be spread over the seedbed at the rate of approximately two tons per acre. Steep slopes are to be covered with "Vexar" matting to anchor the mulch. No mulch anchoring techniques were identified for lesser slopes. In the following spring, containerized shrub and tree stock shall be planted. Species will be planted in random clumps to enhance wildlife habitat. During planting, a fertilizer tablet will be placed with the backfill for each seedling. Basins to collect water are to be formed around the seedlings. Each seedling will be hand-watered at the time of planting. Seedlings will be protected by "Vexar" tubes.

The applicant has committed to irrigate the pinyon-juniper and mixed conifer plantings if initial plantings fail. Sprinkle irrigation techniques would be used. Slopes shall be cultivated for two years to eliminate weeds.

The majority of plant species selected for revegetation are either native to the area or are considered to be appropriate additions to species diversity. Melilotus officinalis, Agropyron intermedium, and Poa praetensis are introduced species currently proposed for planting.

The applicant has identified the means by which parameters for measuring revegetation success will be obtained. These measures are briefly described on pages 4-29, 30 (PAP, Vol. 2) and include methods and statistical limits similar to those used when the reference areas were established.

The applicant has also committed to using a "student's t-test" of the sample means to compare sampled parameters for eventual release of bond. This includes a commitment to re-establish ground cover and woody plant density to within acceptable statistical confidence limits as defined by UMC 817.116 (b.3.iv) and UMC 817.117.

10.2 Evaluation of Compliance

UMC 784.13 Reclamation Plan: General Requirements (Revegetation)

The vegetation data collected from reference areas show that these sites are acceptable areas and representative of the floral community which existed prior to mining.

The proposed revegetation schedule conforms to accepted standards. Revegetation will be accomplished during recognized planting seasons.

Seeding/planting rates and methods are appropriate. Species to be seeded and planted are acceptable. The mulching technique proposed for steeper slopes is in accordance with standard practices. Proposed plans for irrigation, if initial plantings fail, are acceptable. The evaluation of compliance with regard to a soil testing plan is treated under UMC 817.21-.25.

The applicant has complied with the requirements of this section.

UMC 817.111 Revegetation: General Requirements

The applicant has complied with the requirements of this section.

UMC 817.112 Revegetation: Use of Introduced Species

Melilotus officinalis, Agropyron intermedium, and Poa praetensis are introduced species proposed for planting. These species are acceptable in Utah because of their high potential for establishment and wide endemic range.

UMC 817.113 Revegetation: Timing

The applicant has complied with the requirements of this section.

UMC 817.114 Revegetation: Mulching and Other Soil Stabilizing Practices

The applicant has complied with the requirements of this section.

UMC 817.116 and 817.117 Revegetation: Standards for Success and Tree and Shrub Stocking for Forest Land

The applicant has compiled with the requirements of this section.

Reclamation Feasibility

The proposed disturbed area receives from 16 to 18 inches of precipitation annually. Grading will result in a relatively high percentage of steep slopes (2:1 or greater) approximating the original slopes. No soil is available for redistribution over regraded areas. The majority of fill and construction materials available for use as seedbed materials have been shown to be non-toxic. Materials of poor quality will be diluted and/or buried under four feet of non-toxic cover. Grass, forb, shrub, and tree species proposed for planting either occur adjacent to the existing mine site and are assumed to have occurred as part of the pre-disturbance vegetation communities, or are adapted to expected site conditions. All disturbed areas will be mulched following seeding. Shrub and tree species will be established using transplants as opposed to seed. The applicant has committed to using sprinkler irrigation on pinyon-juniper and mixed conifer planted areas if initial plantings fail. In addition, the applicant has committed to revegetate existing fill slopes at the mine site to evaluate proposed revegetation techniques, among other objectives.

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Revegetation is considered feasible, though difficult, on steep slopes. The quality of the planting medium, coupled with the low average annual precipitation, support this premise. It is likely that several years will be required before vegetative cover approaches assumed premining levels. However, the applicant has proposed to use plant species and employ revegetation techniques which are appropriate, given projected post-grading conditions, for attaining revegetation goals. The commitment to irrigate if initial plantings fail significantly increases the feasibility of revegetation. Results of test plot studies will aid in determining the potential success of revegetation and, through appropriate modifications where necessary in the final revegetation plan, increase the feasibility of revegetation.

XI. ROADS

11.1 Description of Applicant's Proposal

There are three facility roads at the Deer Creek Mine operation, identified as follows: (1) public road providing access to the mine, (2) coal facilities access road, and (3) mine fan access road.

The mine access road is asphalt-surfaced, and extends three miles from State Highway 31 in Huntington Canyon. This road is owned and operated by the Emery County Board of Commissioners (February 6, 1985 letter from Clyde Conover, Chairman, Emery County Board of Commissioners, to Melvin Shilling, OSM/WTC; decision document letters of concurrence). All road maintenance and repairs are the responsibility of the Emery County Road Department. A general road plan is shown on Drawings 3-18 and 3-19 (PAP, Vol. VII). The road width averages 20 feet, with an average road gradient of approximately eight percent until it nears the facility area. A 1,000-foot length of road from the truck loadout to the parking lot has a gradient of 18 percent. Steep, narrow canyon terrain allows no leeway for a more gradual gradient. Within the disturbed area, runoff is collected in open ditches, slot drains, and catch basins and routed through the sediment pond. Road drainages outside the portal area beyond the mine gate are maintained by the Emery County Road Department. The County has authorized UP&L's use of this road for mine access.

The coal facilities access road is a 1,000-foot-long winding gravel road up Elk Canyon which provides access to major components of the coal handling circuit. It has variable width and a grade up to approximately 25 percent; the overall grade is approximately nine percent. The road is utilized daily at low speeds by coal handling facilities labor and service personnel. Road construction was limited mainly to shallow blade work in the existing canyon soils. Runoff from this road is collected in open ditches and carried to the sediment pond.

The mine fan access road is a 1,500-foot-long gravel road winding up Deer Creek Canyon behind the office-bathhouse to the mine ventilation fan. Road gradient averages approximately 20 percent. Travel on this road is limited to once a day at low speed. The road width averages 12 feet. Drainage from the mine fan access road is collected in an open ditch in the "disturbed" drainage system.

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11.2 Evaluation of Compliance of Proposal

Steep canyon terrain allows no leeway for a more gradual gradient. Based on topographic and other information submitted by the applicant, it appears that major construction of a complying roadway would increase environmental degradation. Its limited use at low speeds satisfies safety considerations, and the additonal benefit associated with upgrading of the road does not justify the potential environmental damage. The applicant meets the requirements of Section 515 (b)(17) of SMCRA concerning access roads.

XII. ALLUVIAL VALLEY FLOORS

12.1 Description of Applicant's Proposal

The facilities of the Deer Creek Mine are situated in narrow canyons with steep sides and valley slopes. The canyons lack topsoil and do not contain irrigible land which could be used for agriculture purposes. The canyons in which the surface facilities are located contain colluvial deposits from mass movements, slope wash, debris erosion, and sheet runoff. The area is classified as an upland nonirrigible area, and therefore is not an alluvial valley floor. Disturbance or interruption of aquifers within the underground mine complex will have no effect on downstream alluvial valley floors, insomuch as the water will eventually reach the downstream portions of the drainage system. Both surface- and ground-water quality at the Deer Creek Mine is good, as well as water discharged from the mine (Probable Hydrologic Consequences; and Cumulative Hydrologic Impact Assessment Summary, Attachment A of this document).

12.2 Evaluation of Compliance of Proposal

UMC 785.19 Underground Coal Mining Activities on Areas or Adjacent to Areas Including Alluvial Valley Floors in the Arid or Semiarid Areas of Utah

As there are no alluvial valley floors on or adjacent to the permit area, and underground disturbance of aquifers will not affect downstream alluvial valley floors, the applicant is in compliance with this section.

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XIII. POSTMINING LAND USE

13.1 Description of Applicant's Proposal

Premining use of the permit area was for livestock grazing and wildlife habitat. Cattle now graze the lower portions of the permit area in the spring and the upper portions (East Mountain) during the summer months. The permit area provides habitat for elk, deer, and raptors during various seasons throughout the year.

The applicant intends to return the disturbed portions of the Deer Creek mine permit area to its premining land use of livestock grazing and wildlife habitat. Following cessation of mining, the disturbance areas will be recontoured to blend into the existing topography and revegetated as described in the Reclamation Plan (pp 4-1 through 4-36, PAP, Vol. II). Vegetation will be reestablished and will be comparable to species diversity, cover, density, and productivity of the established reference areas.

13.2 Evaluation of Compliance of Proposal

UMC 817.133 Postmining Land Use

The applicant has complied with the requirements of this section.

XIV. AIR RESOURCES

14.1 Description of the Applicant's Proposal

The applicant is currently using several fugitive-dust control practices at the Deer Creek Mine. The applicant proposes to continue these practices throughout the life and subsequent reclamation of the mine site.

The main service road and parking lots are asphalt. Service roads to the mine fan and coal handling facilities are not paved. Vehicular traffic on these roads is controlled to minimize contribution of fugitive dust. Vehicle speeds on the main service road are restricted to 35 mph; speed limit signs are posted. Travel on the mine fan service road is limited to once a day at low speed. The service road to the coal handling facilities is used daily at low speeds for access by service and labor personnel. The steep natural terrain restricts unauthorized travel on other than established roads.

Revegetation procedures have been implemented on all areas adjacent to roads or travel ways. The applicant states that reseeding is repeated until vegetation is established. Revegetation is applied on all disturbed and regraded surfaces as soon as season and weather permit.

Fugitive-dust control procedures are implemented throughout the coal handling process. All frequently used belt conveyors are covered and equipped with belt scrapers to prevent coal dust generation. Transfer points are enclosed and chute inlets and outlets are rubber curtained to minimize open areas.

The high moisture content of the coal at Deer Creek Mine aids in the fugitive dust control throughout the coal handling process. Analysis of samples taken during processing shows an average of 9.4 percent inherent and surface moisture content in 248 samples.

Because the Deer Creek Mine product is transported directly to the Huntington Power plant for use, the possibility of spontaneous combustion conditions developing is eliminated. Long-term stockpiling within the permit area is not proposed.

14.2 Evaluation of Compliance of Proposal

UMC 817.95 Air Resources Protection

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

XV. BONDING

15.1 Description of Applicant's Proposal

Estimated costs are in 1984 dollars and include lands having been disturbed for the purpose of handling, crushing, storing, and transporting coal extracted through the Deer Creek Mine. Cost estimates are based on engineering analyses and standard references such as the Caterpillar Performance Handbook and Rental Rate Bluebook for Construction Equipment. A summary of the applicant's estimated costs is shown below:

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APPLICANT'S PROPOSAL

	Category	Amount ($)
1.	Surface facilities removal	335,832
2.	Portal sealing	26,520
3.	Hauling, backfilling, compaction and grading	99,395
4.	(Not used in applicant's estimate)	0
5.	Install riprap drainage channels	181,641
6.	Temporary sedimentation control facilities	40,152
7.	Soil sampling and seed bed preparation	15,434
8.	Fertilizing and mulching	25,237
9.	Seeding and planting	94,002
10.	Plant monitoring and disease and pest control	19,984
11.	Soil stabilization - rills and gullies	17,265
12.	Contingent seeding and planting	8,260
13.	Revegetation inventory for bond release	5,417
14.	Sediment-control structure removal	24,135
15.	Overland conveyor belt revegetation	19,877
	Mobilization	10,000
	10% Contingency	91,315
	TOTAL (1984 Reclamation Cost)	1,014,466
	Escalation at 6.78% for 5 Years	1,408,274

Therefore, the amount of $1,408,274 has been proposed by the applicant as the bond amount sufficient to cover reclamation costs should the operator default at any time through the Year 1989.

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15.2 Evaluation of Compliance of Proposal

UMC 800.11 Requirements to File a Bond

1. a. The applicant has requested a permit term of five years.

   b. The revegetation liability period pursuant to UMC 817.116(b) shall be ten years as permit area precipitation is substantially less than 26 inches.

UMC 800.12 Requirements to File a Certificate of Liability Insurance

The applicant has complied with the requirements of this section.

UMC 800.13 Regulatory Authority Responsibilities

OSM has analyzed the bond estimate and supporting calculations provided by the applicant. The estimates have been found to be generally adequate. A calculation mistake was apparently made by the applicant on ITEM 3-J; based on information provided, the amount for this section should be $8,965, not $7,942. With this change, the following summarizes the bond requirement for this operation:

OSM'S DETERMINATION

Subtotal of all Reclamation Activities	$ 924,174
10% Contingency	92,417
TOTAL (1984 Reclamation Costs)	1,016,591
Escalation at 3.79 percent per year for 5 years	1,224,402

An escalation factor of 3.79 percent per year is the current figure applied to all coal mining bonds in Utah by the Utah Division of Oil, Gas and Mining. The required bond amount is, therefore, rounded to $1,224,000. This figure is sufficient to insure funds through 1990.

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Attachment A

Cumulative Hydrologic Impact Assessment
Summary

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ATTACHMENT A

Cumulative Hydrologic Impact Assessment Summary
Deer Creek Mine

Surface-Water Hydrology

The Deer Creek Mine is located at the junction of Deer Creek Canyon and Elk Canyon. The permit area lies within the Cottonwood Creek and Huntington Creek drainages (Figure 1.1). Deer, Meetinghouse Canyon and Rilda Canyon Creeks are tributaries of Huntington Creek. North Cottonwood Creek, Left Fork and Right Fork of Grimes Wash are tributaries of Cottonwood Creek. Deer Creek and Left Fork of Grimes Wash are perennial streams within the mine permit boundary. The base flow of these streams is sustained by springs that arise within the permit boundary. The other drainages are classified as intermittent except for Meetinghouse Creek which is considered perrenial below the confluence of the left and right forks. However, more flow records are needed to substantiate the character of these latter two creeks.

Approximately 65 percent of the streamflow in the creeks occurs during the April-June snowmelt runoff period. Average annual precipitation ranges from 17 inches at the Deer Creek Mine portal area to over 20 inches per year on East Mountain. The water is a calcium-bicarbonate type and reflects the influence of the carbonate rocks which cap the ridges and peaks in the basin. Total dissolved solids (TDS) concentrations range from 200 to 500 milligrams per liter (mg/l). Downstream of the cumulative impact area (CIA), water quality is degraded by natural runoff and irrigation return-flows which pass over Mancos Shale-derived soils. The gypsiferous Mancos Shale contributes substantial concentrations of salts to the surface-water system. TDS concentrations in the San Rafael River, 28 miles southeast of Deer Creek Mine, typically average 2,000 to 4,000 mg/l.

Mine discharge water contains approximately 590 mg/l TDS. All water leaving the mine is used at the Huntington Power Plant. This water is used in exchange with water rights that UP&L has on Huntington Creek.

Geologic Setting

The lowermost stratum of importance on the area is the Masuk Shale Member of the Mancos Shale Formation, which crops out downstream of the Deer Creek Mine. Above the Masuk Shale are: the Starpoint Sandstone; the coal-bearing Blackhawk Formation; the Castlegate Sandstone; the Price River Formation; the North Horn Formation; and the Flagstaff Limestone. All but the Masuk Shale crop out within the permit area boundary. Faults known to exist within the permit boundary include the Deer Creek, Pleasant Valley, and Roans Canyon faults. No igneous intrusions are known to exist within the permit area.

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There are two minable coal seams in the area, the Hiawatha seam at the base of the Blackhawk and the Blind Canyon seam averaging 70 to 80 feet above the Hiawatha seam.

There is overlap of the mining operations between the Deer Creek Mine in the Huntington Creek basin and the Wilberg Mine in the Cottonwood Creek basin. The Wilberg Mine operates in the lower coal seam (Hiawatha seam); and the Deer Creek Mine operates in the upper coal seam (Blind Canyon seam). The mining operations of the Deer Creek Mine partially overlie the operations of the Wilberg Mine. The overlap of these mining operations occurs at the boundary between the Huntington Creek and Cottonwood Creek drainages (Figure 2-3, TA). As discussed later in this CHIA summary, the surface-water drainage boundary is assumed to be the same as the ground-water basin divide. Mine inflows from Wilberg will be discharged in the Cottonwood Creek drainage and mine inflows from the Deer Creek Mine will be diverted to the Huntington Power Plant. For purposes of the ground-water analyses performed in the CHIA documents for Cottonwood Creek and Huntington Creek, the effect of this overlap was considered to be approximately equal and opposite for the two mines; therefore, the net effect of the overlapping nature of these two mines is considered to be hydrologically insignificant.

Ground-Water Hydrology

Ground water occurs under perched, water table, and confined conditions in the general area of the Deer Creek Mine. Numerous springs have been identified, ranging from ephemeral seeps to perennial springs. Most of the springs originate in the North Horn Formation as perched springs.

At present, ground water enters the Deer Creek Mine at flow rates of 347 gallons per minute (gpm) (1983, Annual Hydrology Report, p. 53), with the potential for more water to be encountered intermittently as mining operations extend further and intercept fault zones and saturated fluvial channel sandstones.

Ground-water quality is characterized as a calcium-magnesium-bicarbonate type, and is similar to that of surface water in the area. TDS concentrations measured from springs range from 66 to 790 mg/l and consistently average around 300 to 350 mg/l. Such values are similar to concentrations observed in surface waters.

A more detailed discussion of the ground-water resources of the Deer Creek Mine area is presented in the introductory chapter of the TA.

Anticipated Mining

Coal mining operations have been in existence in the Deer Creek area since the 1890's. All anticipated mining within the Huntington Creek cumulative impact area is shown in Table 1.

Delineation of the Cumulative Impact Area

Surface Water

The furthest downstream location at which potential impacts from mining operations in Huntington Creek can directly be manifest is immediately below the confluence of Fish Creek with Huntington Creek. Therefore, the cumulative impact area for the assessment of material damage has been defined as the drainage area contributing to Huntington Creek above this location. All present and anticipated mining operations with the potential for materially affecting Huntington Creek are located in the lower one-third of the basin. The Huntington Creek cumulative hydrologic impact area and location of the mine lease areas are shown on Figure 1.1.

Ground Water

The lack of piezometric data in the various water-bearing units within the Huntington Creek basin does not allow precise determination of ground-water divides in the area. Available data indicates that the ground-water basin coincides with the surface water basin. The Pleasant Valley, Joe's Valley, Roans' Canyon and Trail Canyon Faults may act as conduits for interbasin movement of ground water into or out of Huntington Creek basin. Lines and Morrisey (1981) state that potentiometric surface data from the Emery area, approximately 35 miles south of Huntington Creek basin, indicate that the Ferron sandstone member of the Mancos Shale is recharged mainly by subsurface flow from the Wasatch Plateau along the Joe's Valley fault system. Additionally, the regional dip of permeable strata (less than four degrees to the south) may cause the ground-water divide to be offset from the topographic divide slightly. However, for purposes of the following analysis, these effects are considered to be negligible. The massive Masuk Shale member of the Mancos Shale underlies the Star Point Sandstone and crops out within the downstream limits of the cumulative impact area. The shale effectively limits the amount of ground water which can leave the basin as underflow. This is the singlemost important hydrogeologic control which allows delineation of the ground-water cumulative impact area.

Summary of Cumulative Hydrologic Impacts

The hydrologic impacts of present and future coal mining activity within the Deer Creek Mine CIA have been addressed both quantitatively and qualitatively. Quantitative assessments presented in the CHIA report focus primarily on surface-water impacts which result from the

discharge of intercepted ground water. This analysis utilizes average monthly water quality, ground-water inflow, and discharge records from Huntington Creek and the Deer Creek Mine in combination with anticipated future mine inflows to predict future quality and quantity impacts.

Qualitative analysis of the effect of mine dewatering and subsidence on the ground-water system has been presented in the CHIA, with particular emphasis on the potential for diminution of spring flows. Impacts to surface-water quality of Huntington Creek are expected to gradually increase over the next 20 years as underground mining operations advance at Crandall Canyon Mine, Huntington Canyon No. 4 Mine, Wild Horse Ridge Mine, Rilda Canyon Mine, and Bear Canyon Mine. The primary impact is associated with the discharge of intercepted ground water which is expected to reach a maximum between the years 1990 and 2010. Although ground water is intercepted at Deer Creek Mine, this mine is considered a non-discharging mine because the intercepted ground water is transported to the Huntington Power Plant. At present, no mine discharges ground water to Huntington Creek on a continuous basis. Impacts are quantified by flow-weighting the estimated TDS concentrations of the mine discharge water with that of the average monthly water quality and discharge of Huntington Creek. The maximum predicted impacts for this period indicates that the highest percentage increase in TDS is predicted to occur during the period from November to March, representing a maximum increase of 13 mg/l over the baseline TDS concentration, or approximately 5 percent. This contrasts with the increase of over 1,500 mg/l TDS resulting from irrigation return flows in the reach of Huntington Creek immediately downstream of the mining area.

The Utah Division of Health specifies a maximum recommended TDS concentration of 1,200 mg/l for agricultural use (irrigation and stock watering). TDS limitations for other uses are adjusted on a case-by-case basis. The U.S. Public Health Service provides guidelines for drinking-water standards which recommend a maximum TDS concentration of 500 mg/l for primary standards and 1,000 mg/l for secondary standards. Additionally, the U.S. Environmental Protection Agency has published recommended limits for various irrigation hazards and industrial uses.

As a result of all anticipated mining upstream from the Deer Creek Mine, a maximum increase of 13 mg/l in TDS concentrations in Huntington

Creek (yielding a TDS value of approximately 300 mg/l) will not degrade or preclude anticipated uses below the CIA. This is in contrast to the marked degradation which presently occurs downstream of the mined area due to irrigation activity on Mancos Shale soils. This downstream activity increases TDS concentrations to levels which exceed the recommended limits for almost every use.

The maximum increase in the discharge of Huntington Creek can be estimated by assuming that all of the ground-water which is intercepted by mining activities is "new" water to the basin (i.e., that which would not be present normally). The assumption is overly conservative but serves to define an upper limit on the magnitude of the potential increase.

Similarly, the maximum decrease in the streamflow during the hydrogeologic resaturation period following the cessation of mining can be estimated. By assuming that the diminution of natural streamflow during this period is equal to the peak rate of mine dewatering (ground-water recharged and storage components), the upper limit of potential streamflow reduction can be estimated.

The greatest percent in streamflow volume change occurs during the non-irrigation season, November through April. Changes to the average monthly flow of Huntington Creek during the growing season are less than 10 percent. Thus, even if changes to the ground-water system were as great as these conservative estimates indicate, the timing of the impacts within the yearly cycle is such that minimal impacts occur during the period of greatest demand, May through October. This is due to a combination of effects, including the natural hydrologic cycle, regulation of flow from Electric Lake, anticipated amounts of future mine dewatering based on present inflow rates and basin characteristics, and seasonal effects.

After mining is completed, strata dewatered during the mining process will start to resaturate. This will result in a reduction of the base flow in Huntington Creek on the order of 4 cfs. This represents 5 percent of the mean daily flow rate of Huntington Creek and is a result of the cumulative effect of all mines within the basin (Table 1). Seasonally, the largest percent depletion of discharge during retreat mining will occur during the non-irrigation period, November through March, when average monthly flows may experience depletions of 12 to 17 percent.

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Impacts Associated with Subsidence

The results of a USBM subsidence study above longwall panels at the Deer Creek Mine (unpublished), immediately adjacent and overlying part of the Wilberg Mine, indicate that topographic modification due to subsidence can be manifested over 1,500 feet above longwall-mined areas. Subsidence effects at the study location have been limited to topographic modification in the form of a broad, swale-like trough with no subsidence cracking or mass movement evident. The factors limiting cracking and mass movement are primarily:

a. The presence of the massive Castlegate Sandstone which is resistant to caving and which separates the mine workings from the major spring-bearing strata, and

b. The presence of substantial thicknesses of clay shales in the overlying Blackhawk Formation, which tend to swell and seal internal tension cracks.

Where the thick sandstone layers of the Castlegate Sandstone and Price River Formation do not exist, there is a greater potential for subsidence effects to alter the hydrologic balance of the area. Tension cracks have a greater opportunity to extend to the surface, thus rerouting surface and subsurface flow into the mine workings. Topographic modification of surface features may result locally in increased erosion rates, areas of closed drainage or other undesirable surface effects. Risk of damage to the hydrologic system decreases in the direction of increasing overburden thickness.

Dimunition of flow of several springs due to subsidence could occur within the permit area. These springs are located near the upper contact of the Price River Formation with the North Horn Formation or in the Price River Formation (as mapped by UPL). A thorough analysis of existing data indicates that such damage is unlikely. The CHIA recognizes only the potential risk to these resources. Because of the complex geological, hydrological, structural, and climatic interdependence, continual monitoring would be required to accurately assess hydrologic damage. The most promising avenue of approach in this regard appears to be the use of discharge recession curves for each spring to document unnatural changes to spring flow characteristics.

Impacts

Increases in TDS (primarily sodium, calcium, magnesium, bicarbonate, and sulfate) and TSS will occur; however, these increases have been determined not to cause damage to the surrounding hydrologic balance.

Possible dimunition of spring flow due to subsidence-related effects may occur, but is considered unlikely. An extensive recession curve monitoring system is in place, and the surface effects of subsidence are thoroughly analyzed before undermining perennial streams.

Postmining base flow dimunition will result as the resaturation of dewatered strata occurs once retreat of the mining operations commences. Dimunition of base flow in Huntington Creek will continue until such time that the strata resaturates and the ground-water system has reached an equilibrium. Worst case base flow diminution is estimated to be about 5 percent of the mean daily flow rate of Huntington Creek. Seasonally, the largest percent depletion will occur during the non-irrigation period from November through April when this impact will be least felt by downstream users.

Findings

The assessment of the probable cumulative hydrologic impacts with respect to the Deer Creek Mine and all anticipated mining in the area has been made. The proposed Deer Creek mining operation and all other anticipated mining have been found to be designed to prevent material damage to the hydrologic balance outside the permit area over the entire projected life of the mining operation.

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DERAL
R-5

NOTE: Where one signs by virtue of Power of Attorney for a surety company, such Power of Attorney must be filed with this bond. If the principal is a corporation, the bond shall be executed by its duly authorized officers with the seal of the corporation affixed.

UTAH POWER & LIGHT COMPAY
Principal (Company)

By _____ Vice Pres
Company Official - Position

Date: March 15, 1985

AMERICAN CASUALTY COMPANY OF READING, PA
Surety (Company)

By _____
Official of Surety - Position
L. Kent Bills, Attorney-in-Fact
FRED A. MORETON & COMPANY
PO Box 8139
Salt Lake City, Utah 84108

DATE: March 15, 1985

APPROVED AS TO FORM:

By _____
Assistant Attorney General

EXHIBIT A

3
DERAL
MR-5

AFFIDAVIT OF QUALIFICATION

L. Kent Bills, being first duly sworn, on oath deposes and says that she is the (officer or agency) Attorney-in-Fact of said Company, and that she is duly authorized to execute and deliver the foregoing obligations; that said Company is authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations.

(Signed) L. Kent Bills

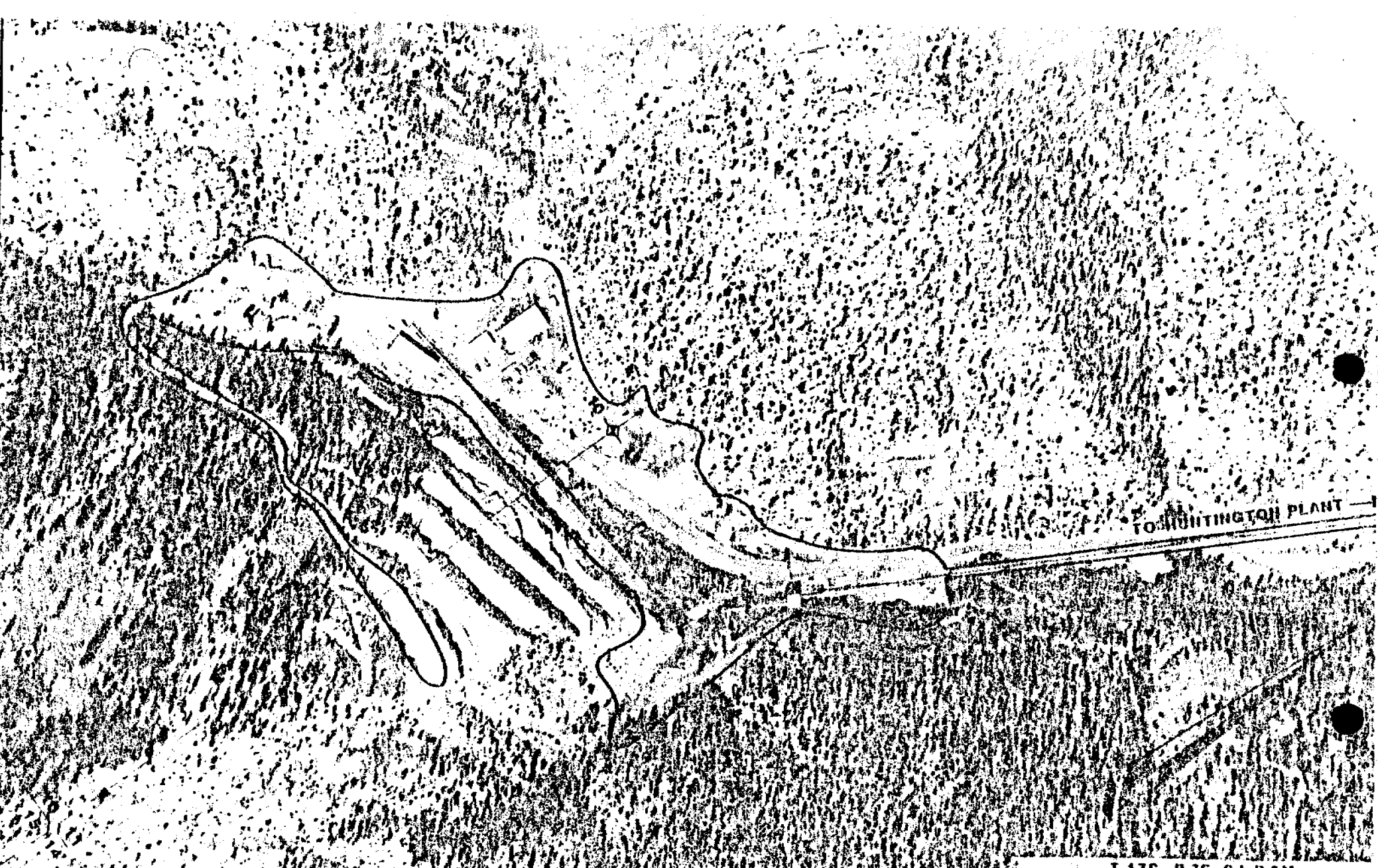
Subscribed and sworn to before me this 15th day of March, 19 85.

Susan J. Rushton
Notary Public
Susan J. Rushton

My Commission Expires:

9-2, 19 85.

1282R



T. 17S., R.7E. S.L.B.&M.

MINE AREA 21.5 ACRES

CONVEYOR AREA 5.0 ACRES
(9000' x 25')

DEER CREEK COAL MINE

EMERY COUNTY, UTAH

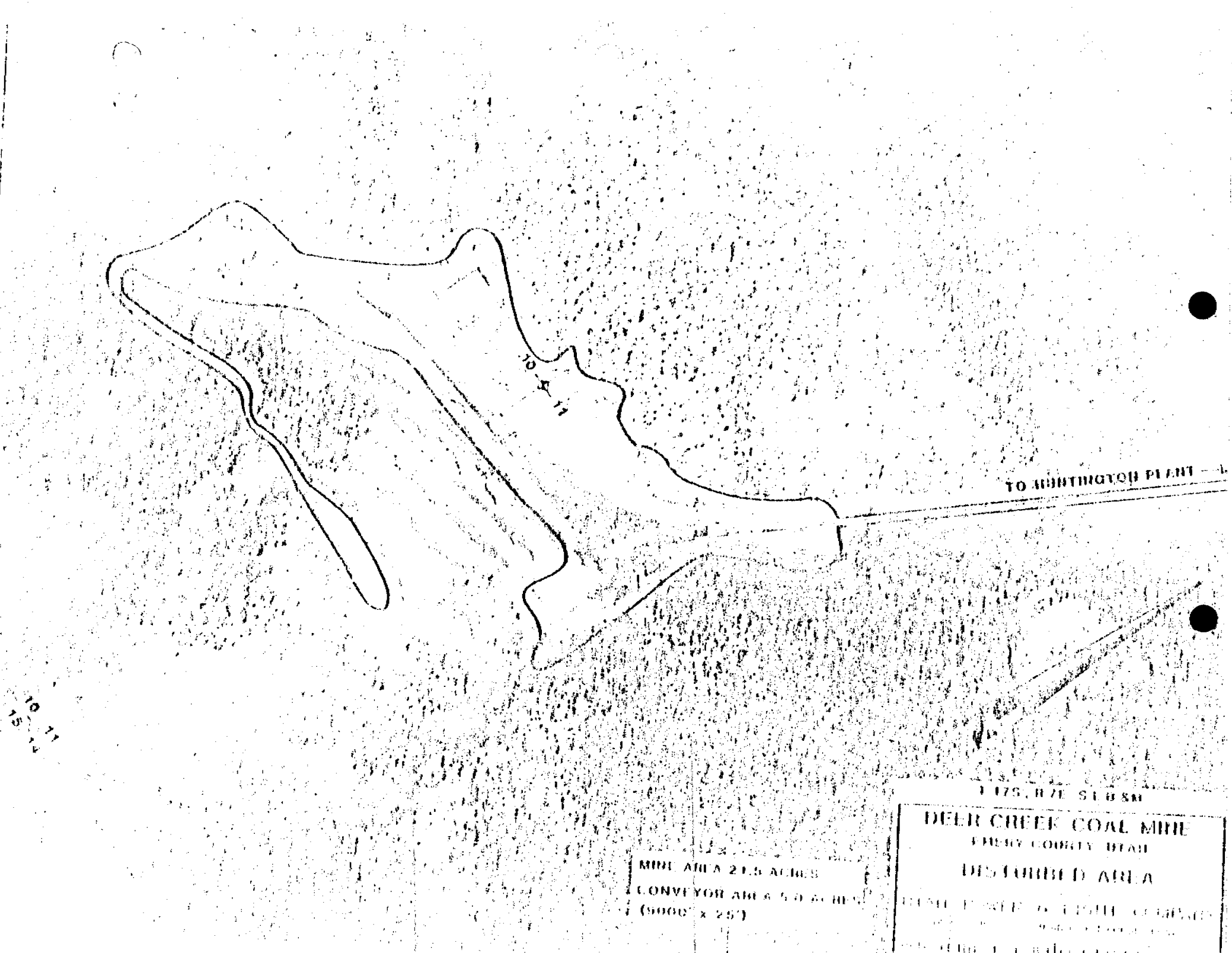
DISTURBED AREA

UTAH POWER & LIGHT COMPANY

DEPARTMENT OF MINING & EXPLORATION

DATE APRIL 1, 1984 | BY L.J. GUM

SCALE 1" = 500' | EXHIBIT A



TO HUNTINGTON PLANT
10 11
15 14
MINE AREA 21.5 ACRES
CONVEYOR AREA 5.0 ACRES
(9000' x 25')
DEER CREEK COAL MINE
EMERY COUNTY UTAH
DISTURBED AREA