IMACS SITE FORM

Part A - Administrative Data

INTERMOUNTAIN ANTIQUITIES COMPUTER SYSTEM
Form approved for use by
BLM - Utah, Idaho, Nevada
Division of State History - Utah
USFS - Intermountain Region

*1. State No. 42Em1633
*2. Agency No.
3. Temp No. AERC 797R/1

4. State Utah County
5. Project Utah Power & Light - East Mountain Mine Projects
*6. Report No.
7. Site Name Old Johnson Mines
8. Class ☐ Prehistoric ☒ Historic ☐ Paleontologic ☐ Ethnographic
9. Site Type Mine Portals and Service Area
*10. Elevation 7250 ft.
*11. UTM Grid Zone 12 483,575 m E 4,351,900 m N
*12. SW of SW of NE of Section 25 T. 17S R. 6E
*13. Meridian Salt Lake B&M
*14. Map Reference Hiawatha, Utah 15 Minute USGS
15. Aerial Photo NA
16. Location and Access The site is situated in Cottonwood Canyon about three miles to the north of the junction of Highway 29 which goes from Orangeville to Joe's Valley. The historic site is on the east slope of the canyon opposite the Trail Mountain Mine.

*17. Land Owner Private
*18. Federal Admin. Units Forest District
*19. Planning Units (USFS only)
20. Site Description The Johnson Mine is an historic site which was active in mining coal from 1909 until 1948. It included the Twin City, Shumway, and Cottonwood Mines (see Doelling, H. H., 1972 Central Utah Coal Fields Monograph Series No. 3, UGMS, Salt Lake City). At the present the Johnson Mines site includes two walled-in portals, a mine terrace associated with the portals, the remnants of a coal slide or shute, a storage area under a rock walled boulder, an outhouse, and the old weigh house structure.

*21. Site Condition ☐ Excellent (A) ☐ Good (B) ☐ Fair (C) ☒ Poor (D)
*22. Impact Agent(s) Road development and slope construction and stabilization above the Cottonwood Canyon road have disturbed some site loci. Vandalis
*23. Nat. Register Status ☒ Significant (C) ☐ Non-Significant (D) ☐ Unevaluated (USFS only) (Z)
Justify Site as an integral unit is significant.

24. Photos Roll 797R-1 (Frames 1-20)
25. Recorded by F. R. Hauck
*26. Survey Organization AERC *28. Survey Date 5-22-83
27. Assisting Crew Members None

*Encoded data items

BLM 8100-1
FS R-4 2300-2
5/82

Part A - Environmental Data

Site No.(s) 42Em1633
797R/1

*29. Slope 0 to 50 % Slope 250° Aspect (Degrees)

*30. Direction/Distance to Permanent Water 250° Bearing (Degrees) 1 x 100 Meters

*Type of Water Source ☐ Spring/Seep (A) ☒ Stream/River (B) ☐ Lake (C) ☐ Other (D)

Name of Water Source Cottonwood Creek

Distance to Nearest Other Water Source/Type NA

*31. Geographic Unit Basin and Range - Colorado Plateau: Wasatch Plateau

*32. Topographic Location (check one under each heading)

PRIMARY LANDFORM	PRIMARY POSITION	SECONDARY LANDFORM		SECONDARY POSITION
☐ mountain spine(A)	☐ top/crest/peak(A)	☐ alluvial fan(A)	☐ playa(M)	☐ top/crest/peak(A)
☐ hill(B)	☐ edge(B)	☐ alcove/rock shelter(B)	☐ pont.geo.feature(N)	☐ edge(B)
☐ tableland/mesa(C)	☒ slope(C)	☐ arroyo(C)	☐ plain(O)	☐ slope(C)
☐ ridge(D)	☐ toe/foot/bottom/mouth(D)	☐ basin(D)	☐ ridge/knoll(P)	☒ toe/foot/bottom/mouth(D)
☐ valley(E)	☐ saddle/pass(E)	☐ cave(E)	☐ slope(Q)	☐ interior(G)
☐ plain(F)	☐ bench/ledge(F)	☐ cliff(F)	☒ terrace/bench(R)	☐ step(H)
☒ canyon(G)	☐ rimrock(G)	☐ delta(G)	☐ talus slope(S)	☐ riser(I)
	☐ interior(H)	☐ detached monolith(H)	☐ island(T)	☐ patterned ground (N)
		☐ dune(I)	☐ outcrop(U)	☐ face(O)
		☐ floodplain(J)	☐ spring mound/bog(V)	☐ saddle/pass(P)
		☐ ledge(K)	☐ valley(W)	
		☐ mesa/butte(L)	☐ cutbank(X)	
			☐ riser(Y)	

Describe The old mine site is situated on the southwest facing slope of East Mountain near the Canyon floor.

*33. On-site Depositional Context

☐ fan(A)	☒ outcrop(O)	☐ morraine(J)	☐ desert pavement(P)
☐ talus(B)	☐ extinct lake(F)	☐ flood plain(K)	☐ stream bed(R)
☐ dune(C)	☐ extant lake(G)	☐ marsh(L)	☐ aeolian(S)
☐ stream terrace(D)	☐ alluvial plain(H)	☐ landslide/slump(M)	☐ none(T)
☐ playa(E)	☒ colluvium(I)	☐ delta(N)	☐ residual(U)

34. Vegetation

*a. Life Zone ☐ Arctic-Alpine(A) ☐ Hudsonian(B) ☒ Canadian(C) ☐ Transitional(D) ☐ Upper Sonoran(E) ☐ Lower Sonoran(F)

*b. Habitat 1 - Primary On-Site 2 - Secondary On-Site 3 - Surrounding Site

☐ Aspen(A)	☐ Lodgepole Pine Forest(F)	☐ Shrub Woodland(K)	☐ Big Sagebrush(P)
☐ Spruce-Fir Forest(B)	☐ Other/Mixed Conifer Forest(G)	☐ Riparian(L)	☐ Little Sagebrush(Q)
☒ Douglas Fir Forest(C)	☐ Pinyon-Juniper Woodland(H)	☐ Grassland/Steppe(M)	☐ Barren(R)
☐ Alpine Grassland(D)	☐ Wet Meadow(I)	☐ Desert Lake Shore(N)	☐ Marsh/Swamp(S)
☐ Ponderosa Forest(E)	☐ Dry Meadow(J)	☐ Salt Desert Shrub(O)	☐ Lake-Reservoir(T)
			☐ Agricultural(U)

Describe Predominant species on site include Douglas fir, Aspen, Juniper, Wild rose, Buckbrush.

*35. Miscellaneous Text

36. Comments/Continuations

Form must be accompanied by a site map; photocopy of U.S.G with T., R., scale, and quad name; photographs of the site; and artifact sketches (if applicable).

Part C - Historic Sites

Site No.(s) 42Em1633

797R/1

1. Site Type Historic Coal Mine Site

*2. Historic Theme(s) Coal Mine (mn)

*3. Culture

AFFILIATION	DATING	AFFILIATION	DATING
Euro/American	1909-1948		

*4. Oldest Date 1909 Recent Date 1948

How Determined? Reference in Doelling, H. H., 1972 Central Utah Coal Fields

5. Site Dimensions 400 (NW-SE) m x 300 (NE-SW) m *Area 120,000 sq m

*6. Surface Collection/Method

- ☒ None (A)
- ☐ Grab Sample (B)
- ☐ Designed Sample (C)
- ☐ Complete Collection (D)

Sampling Method

*7. Estimated depth of fill

- ☒ Surface (A)
- ☐ 0-20 cm (B)
- ☐ 20-100 cm (C)
- ☐ 100 cm + (D)
- ☐ Fill noted but unknown (E)

How Estimated
(If tested, show location on site map.)

*8. Excavation Status ☐ Excavated (A) ☐ Tested (B) ☒ Unexcavated (C)

*9. Summary of Artifacts and Debris

- ☐ Glass (GL)
- ☒ Metal (ME)
- ☒ Nails (NC, NW)
- ☐ Bone (BO)
- ☐ Ceramics (CS)
- ☐ Fabric (FA)
- ☐ Leather (LE)
- ☐ Wire (WI)
- ☒ Tin Cans
- ☐ Ammunition (AM)
- ☐ Wood (WD)
- ☐ Rubber (RB)

Describe Round-headed nails; siding is of basic groove-overlap type wire mesh screen on windows; modern style glass panes with a pale green tint; brick chimney on wooden supports; door and window hardware is missing; wall covering includes cardboard boxes, cotton cloth, tar paper; a thick paper was used to line the outer walls before the siding was nailed to the wooden frame. There are no evidences of plumbing or wiring for electricity.

Names carved in weighhouse walls include Clate Kofford; others are illegible without special preparation.

*10. Ceramic Artifacts

QUANTITY	TYPE	QUANTITY	TYPE

Describe None observed

Part C - Historic Sites

Site No.(s) 42Em1633

797R/1

*11. Glass

QUANTITY	MANUFACTURE	COLOR	FUNCTION

Describe Window pane glass-pale green tint, ca. 20 mm. thick.

12. Maximum Density-#/sq m (glass and ceramics)

*13. Non-Architectural Features (locate on site map)

- [x] Trail/Road (TR)
- [x] Tailings (MT, ML)
- [x] Rock Alignment (RA)
- [x] Dump (DU)
- [ ] Depression (DE)
- [ ] Cemetery/Burial (CB)
- [ ] Dam, Earthen (DA)
- [ ] Ditch (DI)
- [x] Inscriptions (IN)
- [ ] Hearth/Campfire (HE)
- [ ] Quarry (QU)
- [ ] Other (OT)

Describe An old mule trail extends from the canyon bottom up above the house to the portal terrace. The only tailing area is situated in the slide zone where the coal shute from the upper terrace in front of the south portal carried the coal down to the weighhouse level. Several support posts are still standing in the tailings-shute zone. Rock alignments are associated with an enclosed overhang which probably served as a storage area and powder house

*14. Architectural Features (locate on site map)

QUANTITY	MATERIAL	TYPE	QUANTITY	MATERIAL	TYPE
1	Wood	Weighhouse			
1	Wood	Outhouse			
1	Rock Wall	Walled Overhang			
2		Mine Portals			
1	Wood-rock	Root Cellar			

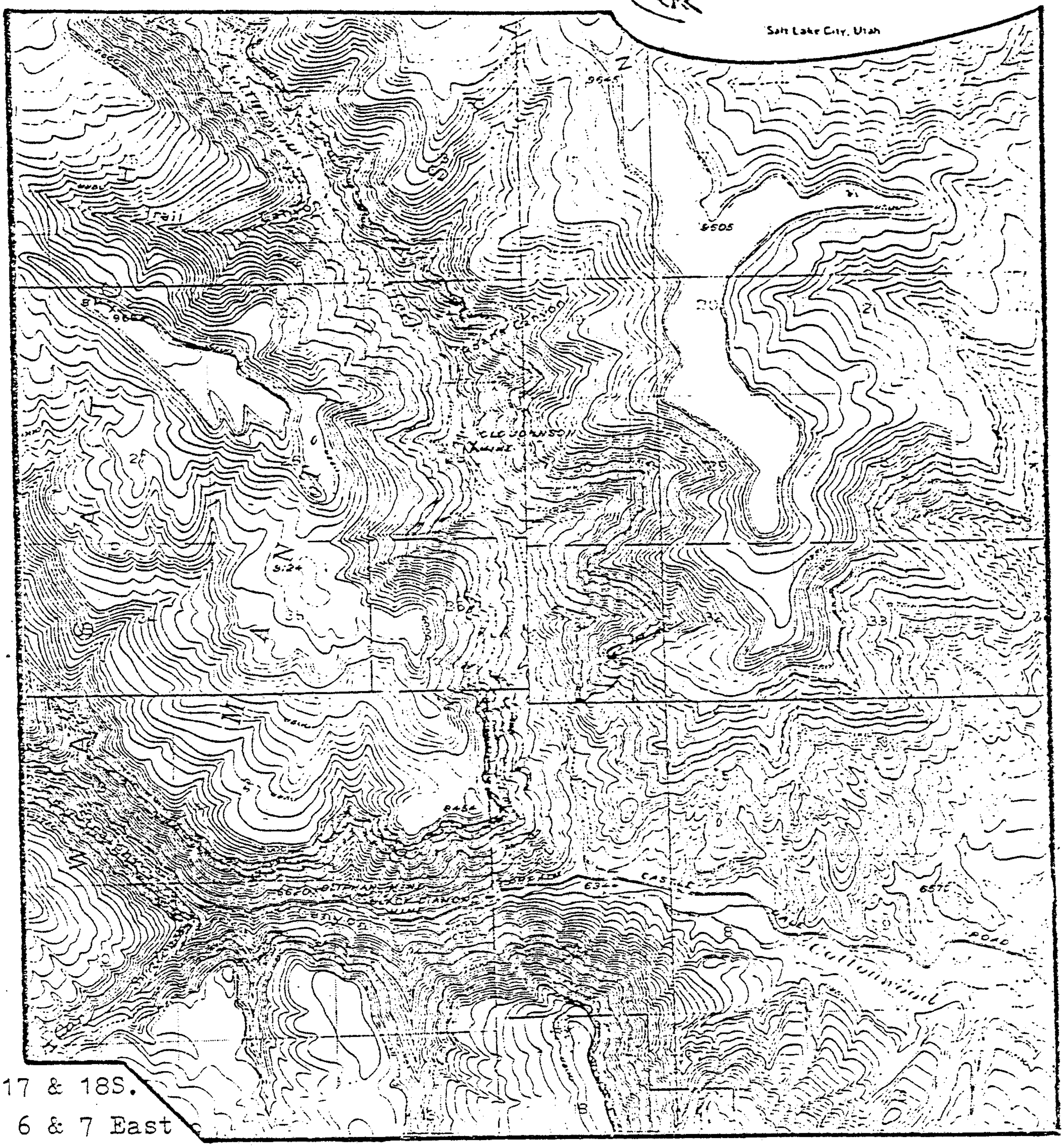
Describe Weighhouse is two story, wooden frame structure featuring a cedar shingle roof, trimmed wood siding, round headed nails and a rock footing foundation. Outhouse is of pine plank construction and contains a concrete floor and seat support. The walled overhang is above the house and outhouse and is adjacent to the coal shute slope below the portal terrace. It may have been used as a storage area and possibly a powder house. The mine portals have both been*

15. Comments/Continuations

*14 cont. walled up to prevent entry. The root cellar is of a log superstructure constructed on <u>in situ</u> boulder and rock wall base. The door into the root cellar was cut out after the weighhouse had been constructed. There is in the weighhouse evidence of a fire starting in the roof around the chimney. The roof planking which had been burn most severely had been replaced and the roof repaired. Weighhouse measures 7 x 5.5 meters. Root cellar is ca. 3.5 x 3 meters. Outhouse is ca. 1.25 x 1.25, also has cedar shingles. The walled-in overhang measures ca. 3 x 12 meters and contains a wooden framed window encased in the loose rock wall.

ARCHEOLOGICAL-ENVIRONMENTAL RESEARCH CORPORATION

Salt Lake City, Utah



T. 17 & 18S.

R. 6 & 7 East

Meridian: Salt Lake B. & M.

Quad: Hiawatha, Utah

15 minute-USGS

Project: UPL-83-2

Series: Central Utah

Date: 5-26-83

Location of the Old Johnson Mines in the Cottonwood Canyon Locality of Emery County, Utah

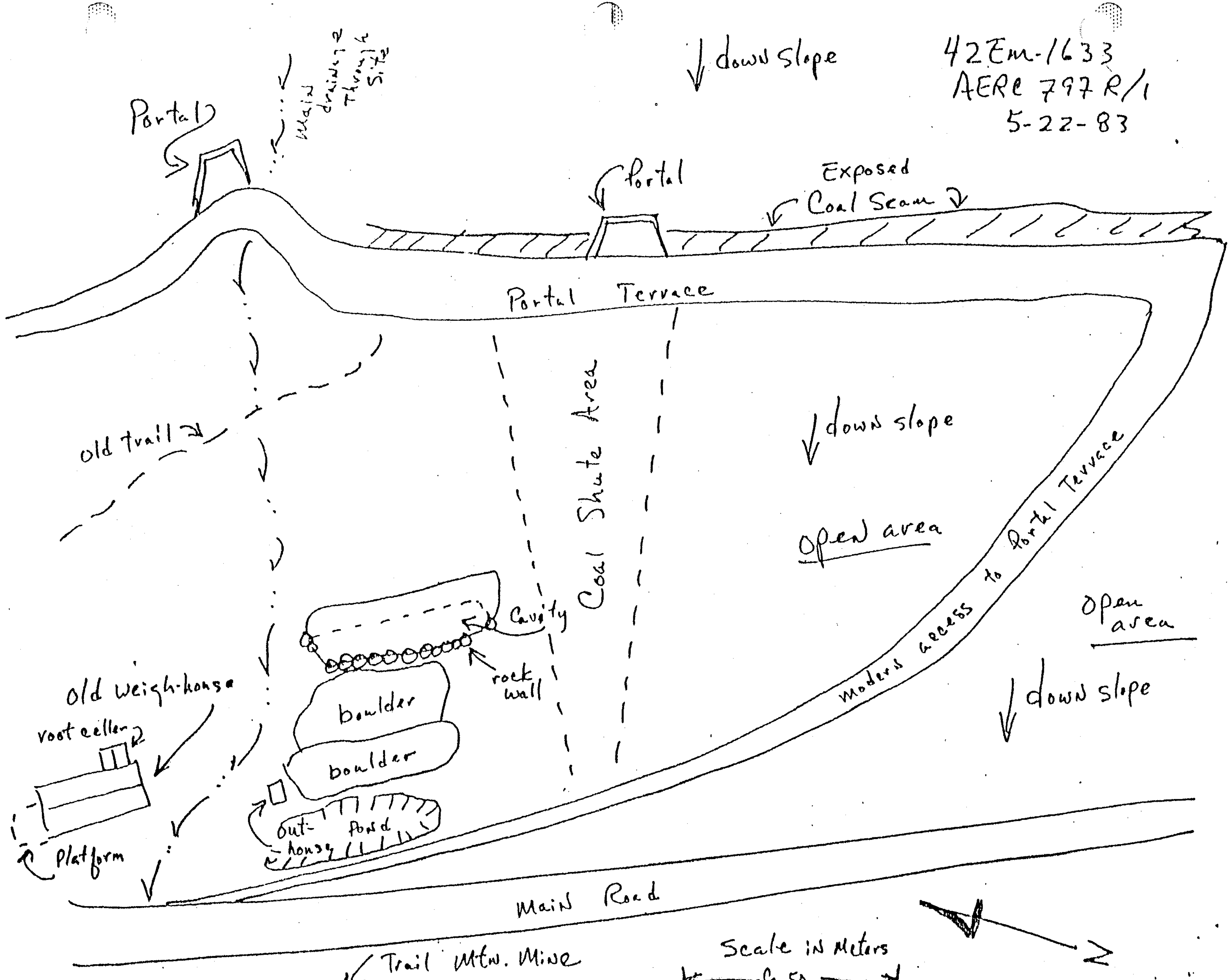
Legend:

Mine Site (42Em1633) x

1 0 1 2 M.

0 1 2 K.

Scale



42Em-1633
AERC 797 R/1
5-22-83
down slope
Portal
Portal
Exposed
Coal Seam
Portal Terrace
Coal Shute Area
down slope
old trail
open area
Open area
modern access to Portal Terrace
Cavity
rock wall
boulder
boulder
down slope
Old weigh-house
root cellar
Platform
out-house
Pond
Main Road
Trail Mtn. Mine
Scale in Meters
N

5/82

IMACS ENCODING FORM

To be completed for each site form.
For instructions and codes, see IMACS Users Guide.

Encoder's Name: [signature]

A

1 State Site Number: 42-Em-ØØ1633
2 Agency Site Number: -
6 Agency Report Number:
10 Elevation: Ø725Ø
11 Zone: 12 · Easting: 483575 · Northing: 43519ØØ

12 ¼: SW · ¼: SW · ¼: NE · Sec.: 25 · T.: 17 S · R.: ØØ6 E
13 Merid.: I
14 USGS Map: HIAWATHA, UTAH
17 Owner: FS
18 Forest: 1Ø · District: 41

19 Capab.: · Anlys.: · Mngmt.:
21 Cond.: D
22 Impacts: PR ER VA
23 N.R.: C
26 Organ.: AF
28 Survey Date: Ø5-22-83
29 %: 5Ø · Aspect: 25Ø

30 Water: degrees/dist./type: 25Ø ØØI B
31 Geog.: DA
32 Location: 1st GC · 2nd RD
33 Dep.: Q
34 Vegetation: C HCC
35 Misc. Text:

B

2 Culture/Date:
3 Area:
4 Coll.:
5 Depth:
6 Exca. Status:
7 Artifacts: #/type:
8 Lithic Tools: #/type:
9 #: · Flaking Stages:
11 Ceramics: #/type:
13 Features: #/type:
14 Architecture: #/material/type:

C

2 Historic Themes: MN
3 Cultures/Dating: EAI
4 Dates: 19Ø9 1948
5 Area: 99998
6 Coll.: A
7 Depth: A
8 Exca.: C

9 Artifacts: #/type: 9 NT · 3 GL · 2 MN · 3 FA · 4 RR · 2 ME · 9 PA · 9 NW · 9 TC
10 Ceramics: #/type: AAA
11 Glass: #/mnft./color/funct.: BADI
13 Features: #/type: 2 IN · 3 RA · 1 MT · 1 TR · 1 DE

14 Architecture: #/material/type: 2 I AN · 1 C AS · 1 C CP

Lettering Guide: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 Ø

State of Utah

Division of State History
(Utah State Historical Society)
Department of Community and Economic Development

Norman H. Bangerter
Governor
Max J. Evans
Director

300 Rio Grande
Salt Lake City, Utah 84101-1182
801-533-5755

August 8, 1990

RECEIVED
AUG 15 1990
POWER SUPPLY
FUEL RESOURCES

Mr. Scott Child
Utah Power & Light Company
P. O. Box 26128
Salt Lake City, UT 84129-0128

Dear Mr. Child:

RE: "Archaeological Sample Survey and Cultural Resource Evaluations of the East Mountain Locality in Emery County, Utah"

In Reply Please Refer to Case No. M687

Dear Mr. Child:

The Utah State Historic Preservation Office received the above referenced letter. You had requested that our office check to determine if a cultural resource report had been dome for the East Mountain locality. A check of our files indicates that we hold a 1980 report by AERC that was reviewed and accepted by our office and the U.S. Forest Service.

This information is provided on request to assist Utah Power & Light with its Section 106 responsibilities as specified in 36 CFR 800. If you have questions or need additional assistance, please contact me at (801) 533-7039.

Sincerely,

James L. Dykman
Regulation Assistance Coordinator

JLD:M687 OFR

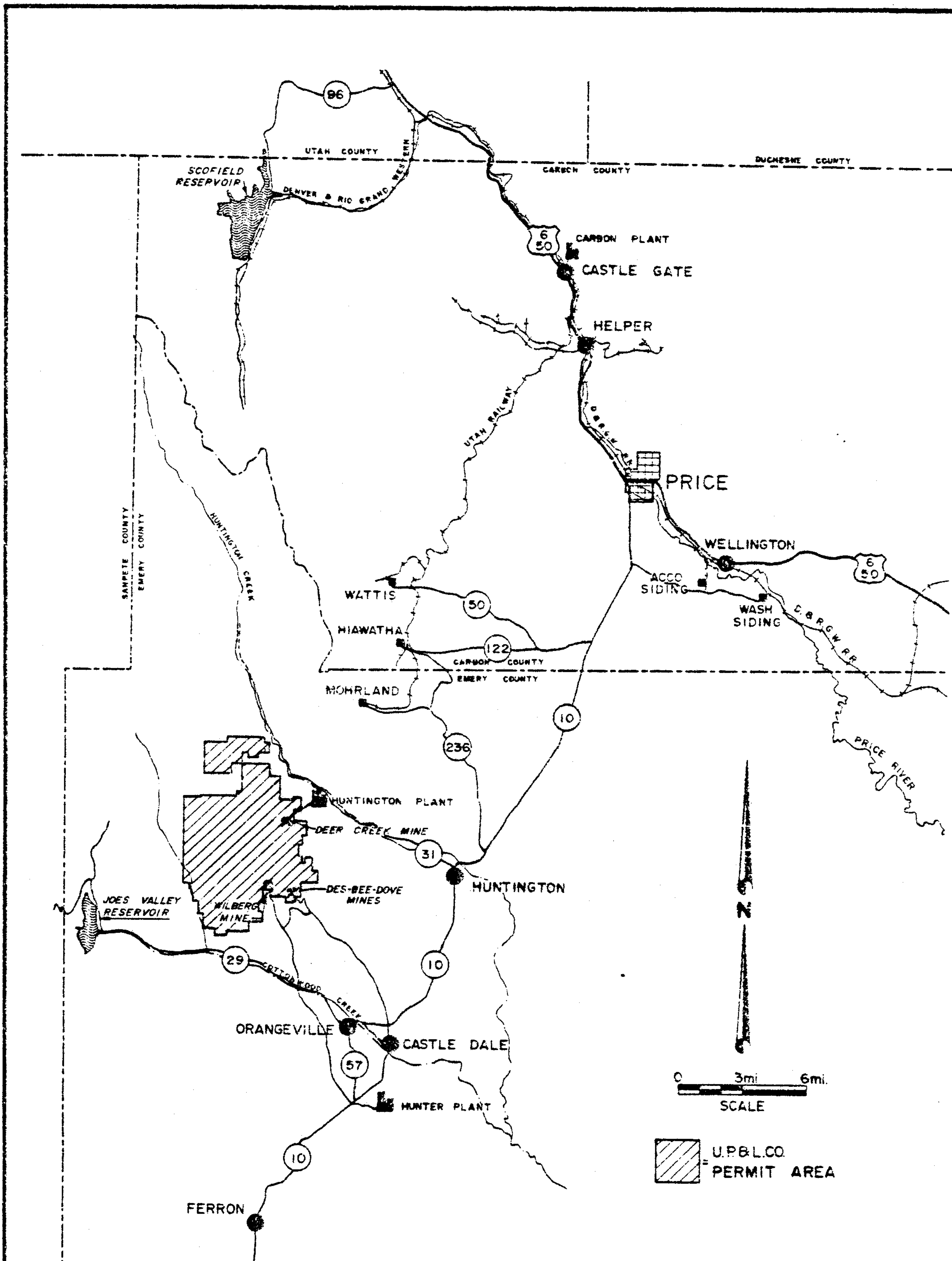
HYDROLOGY AND GEOLOGY GENERAL REQUIREMENTS (783.13)

The Deer Creek Mine area is located in the central portion of the Wasatch Plateau Coal Field in Emery County, Utah (Figure 2-1). Generally, this area is a flat-topped mesa surrounded by heavily vegetated slopes which extend to precipitous cliffs leading to the valley below. The plateau generally has a vertical relief of up to 2,500 feet, rising from Castle Valley below. The following discussion summarizes the structural geology, stratigraphy, hydrology, and economic coal deposits of the region and the Deer Creek Mine area.

Data Collection

Utah Power & Light Company has been collecting data regarding the Deer Creek Mine area and adjacent properties since 1971. As a result, 79 exploration drill holes have been completed from the surface wherein data were collected regarding the coal seams and enclosing strata (see Map 2-1). Nine of these holes were core drilled through the coal zone and all were geophysically logged. Generally, these surface holes are located on about 1/2 to 3/4 mile centers. In addition to these holes, over 90 holes have been drilled from within the mines which provide valuable data on as close as 500 foot centers.

The coal seams exposed on outcrop and within the mine workings have been mapped in detail providing data which is valuable in understanding the coal geology.



96
UTAH COUNTY
DUCHESNE COUNTY
CARBON COUNTY
SCOFIELD RESERVOIR
DENVER & RIO GRAND WESTERN
6
50
CARBON PLANT
CASTLE GATE
HELPER
UTAH RAILWAY
D&RGW RR
PRICE
HUNTINGTON CREEK
SANPETE COUNTY
EMERY COUNTY
WELLINGTON
ACCO SIDING
WASH SIDING
WATTIS
50
HIAWATHA
122
CARBON COUNTY
EMERY COUNTY
MOHRLAND
10
236
PRICE RIVER
HUNTINGTON PLANT
DEER CREEK MINE
31
HUNTINGTON
DES-BEE-DOVE MINES
JOES VALLEY RESERVOIR
WILBERG MINE
29
COTTONWOOD CREEK
10
ORANGEVILLE
CASTLE DALE
57
HUNTER PLANT
N
0
3mi.
6mi.
SCALE
= U.P.&L.CO. PERMIT AREA
10
FERRON

FIGURE 2-1

The interpretations made herein are based on data collected from all of the above sources in addition to the published regional data. All of these data allow the construction of a geologic and hydrologic model which represents the conditions present in the area of the Deer Creek Mine and surrounding areas.

In addition to the data and interpretations submitted herein, similar interpretations have been submitted to the U. S. Geological Survey's Mining Supervisors Office in compliance with #30 CFR 211 and the General Mining Order #1.

The applicant has made a practice of submitting to the BLM, each year, copies of both lithologic and geophysical logs of all drill holes, surface and underground, which are drilled within federal leases or on fee land. At the time the mine permit was completed, copies of all logs had been submitted to the BLM. This practice will continue throughout the lifetime of the Deer Creek Mine.

Structure

The geologic structure of the Deer Creek Mine area is fairly simple. The strata are gently down-folded in the area of the Straight Canyon syncline which is present in the northwest portion of the Deer Creek Mine area (see Map 2-2). Dips in the syncline range from two to six degrees with the north limb dipping the steepest.

The Blind Canyon Seam generally strikes N60°E and dips one to three degrees in a northwest direction throughout the area of the current Deer Creek Mine workings. However,

Revised 11/21/83

to the northwest of the Straight Canyon syncline both the Hiawatha and Blind Canyon Seam dip in a southeast direction at three to five degrees. The dip and strike of the coal seams can be better visualized on Maps 2-2 and 2-3 which are included herein.

The strata within the property has been offset by a series of north-south trending fault zones. Generally, these faults are nearly vertical and do not have significant amounts of fault gouge or drag associated with them. One of the major faults present in the region, the Pleasant Valley Fault, has been crossed in the Deer Creek Mine (refer to Map 2-2).

The Pleasant Valley Fault consists of two parallel fractures which are about 150 feet apart (see Map 2-2 and cross sections 2-4). Its total displacement, where it was intersected in the Deer Creek Mine is 150 feet with its downthrown side on the east. The displacement diminishes to less than one foot where it was intersected in the Wilberg Mine to the south.

Another north-south trending fault is present to the east of the Pleasant Valley Fault. This fault, the Deer Creek Fault, limits the eastward development of the Deer Creek Mine. The displacement of the Deer Creek Fault ranges from 100 to 170 feet with the east block being downthrown.

A fault system has been identified within the Deer Creek Mine area which trends in a northeast-southwest direction along the Straight Canyon synclinal axis (see Map

2-2 and 2-13). In the northeast corner of federal lease U-084923, this structure called the Roans Canyon Fault graben, consists of up to six normal faults with displacements up to eighty feet. Within this fault system the displacement has positioned the Blind Canyon Seam in close proximity to the Hiawatha Seam in some cases.

Stratigraphy

The rock formations exposed in the Deer Creek Mine area range from Upper Cretaceous to Tertiary in age (see Figure 2-2). These formations in ascending order are the Masuk shale member of the Mancos Shale, Starpoint Sandstone, Blackhawk, Castlegate Sandstone, Price River, North Horn, and Flagstaff Formations. The coal deposits are restricted to the lower portions of the Blackhawk Formation.

The Masuk Shale is the upper member of the Mancos Shale. It consists of light to medium gray marine mudstones. Usually this formation weathers readily forming slopes which are often covered by debris. This formation is generally devoid of water.

Starpoint Sandstone

Overlying and intertonguing with the Masuk Shale is the Starpoint Sandstone. In this area the Starpoint consists of three or more cliff-forming massive sandstones totaling about 400 feet in thickness. Generally, they are fine to medium-grained and moderately well-sorted. The upper contact of the Starpoint is usually quite abrupt and readily

Figure 2-2
Stratigraphy of East Mountain
(Doelling, 1972)

System	Series	Group	Stratigraphic Unit	Thickness (feet)	Description
TERTIARY	Eocene		Green River Formation	–	Chiefly greenish lacustrine shale and siltstone.
		Wasatch Group	Colton Formation	300-1,500	Varicolored shale with sandstone and limestone lenses, thickest to the north.
	Paleocene		Flagstaff Limestone	200-1,500	Dark yellow-gray to cream limestone, evenly bedded with minor amounts of sandstone, shale and volcanic ash, ledge former.
CRETACEOUS	? / Maestrichthian		North Horn Formation (Lower Wasatch)	500-2,500	Variegated shales with subordinate sandstone, conglomerate and freshwater limestone, thickens to north, slope former.
		Mesaverde Group	Price River Formation	600-1,000	Gray to white gritty sandstone interbedded with subordinate shale and conglomerate, ledge and slope former.
			Castlegate Sandstone	150- 500	White to gray, coarse-grained often conglomeratic sandstone, cliff former, weathers to shades of brown.
			Blackhawk Formation *MAJOR COAL SEAMS*	700-1,000	Yellow to gray, fine- to medium-grained sandstone, interbedded with subordinate gray and carbonaceous shale, several thick *coal* seams.
	Campanian		Star Point Sandstone	90-1,000	Yellow-gray massive cliff-forming sandstone, often in several tongues separated by Masuk Shale, thickens westward.
	Santonian	Mancos Shale	Masuk Shale	300-1,300	Yellow to blue-gray sandy shale, slope former, thick in north and central plateau area, thins southward.
			Emery Sandstone *COAL (?)*	50- 800	Yellow-gray friable sandstone tongue or tongues, cliff former, may contain *coal* (?) in south part of plateau if mapping is correct, thickens to west and south. *Coal* may be present in subsurface to west.
	Coniacian		Blue Gate Member	1,500-2,400	Pale blue-gray, nodular and irregularly bedded marine mudstone and siltstone with several arenaceous beds, weathers into low rolling hills and badlands, thickens northerly.
	Turonian		Ferron Sandstone Member *MAJOR COAL SEAMS*	50- 950	Alternating yellow-gray sandstone, sandy shale and gray shale with important *coal* beds of Emery coal field, resistant cliff former, thickens to the south.
	Cenomanian		Tununk Shale Member	400- 650	Blue-gray to black sandy marine slope forming mudstone.
	Albian		Dakota Sandstone *MINOR COAL*	0- 60	Variable assemblages of yellow-gray sandstone, conglomerate shale and *coal*. Beds lenticular and discontinuous.

Generalized section of rock formations, Wasatch Plateau coal field.

identifiable on the outcrop. Locally, the Starpoint Sandstone exhibits aquifer characteristics.

Blackhawk Formation

The Blackhawk Formation consists of alternating mudstones, siltstones, sandstones and coal. Although coal is generally found throughout the Blackhawk Formation, the economic seams are restricted to the lower 150 feet of the formation. The sandstones contained within the Blackhawk Formation are fluvial and increase in number in the upper portions of the formation. Many of these tabular sandstone channels form local perched water tables. The total thickness of the Blackhawk Formation in the Deer Creek Mine area is about 750 feet.

Castlegate Sandstone

The Castlegate Sandstone generally caps the escarpment which surrounds the Deer Creek portal area. The Castlegate consists of about 250 feet of coarse-grained, light-gray, fluvial sandstones, pebble conglomerates, and subordinate zones of mudstones. Although this sandstone is very permeable, it lacks water because of insufficient recharge.

Price River Formation

The Price River Formation overlies the Castlegate Sandstone. The formation is about 500 feet thick and forms slopes which extend upward from the Castlegate escarpment. Fine-grained, poorly sorted, sandstones dominate the Price

River Formation but some mudstones are present. The Price River Formation generally lacks water.

North Horn Formation

The North Horn Formation is about 850 to 900 feet thick in the Deer Creek Mine area. Mudstones dominate the rock types present. These mudstones are generally grey to light brown in color. Localized, lenticular sandstone channels are present in this formation throughout. These sandstone beds are more common near the upper and lower contacts of the formation and many times host localized perched water tables.

Flagstaff Formation

The youngest formation exposed in the Deer Creek Mine area is the Flagstaff Formation. It consists of white to light-gray, lacustrine limestone. An erosional remnant of 100 to 150 feet of this formation remains forming a cap on the highest plateaus of the area. The formation is fairly well fractured allowing surface water to percolate down to lower strata.

Economic Coal Occurrences

Two economic coal seams are present within the Deer Creek permit area : the Hiawatha, and the Blind Canyon Seams. The current workings of the Deer Creek Mine are located in the upper or Blind Canyon Seam.

Hiawatha Seam

The Hiawatha Seam is of minable thickness in both the southern and extreme northern portions of the East Mountain property (see Map 2-5). This seam which rests directly on the Starpoint Sandstone ranges in thickness from 16 feet to less than 5 feet. The Hiawatha Seam is not present throughout a major portion of the property. This lack of coal is due to a major distributary river channel which flowed through the coal swamp in an easterly direction. The Hiawatha Seam will only be mined to the north of the distributary channel from the Deer Creek Mine.

Blind Canyon Seam

The second minable seam on the Deer Creek Mine property is the Blind Canyon Seam. This seam is located from 14 to 140 feet above the Hiawatha Seam (see Map 2-6). The average separation between these seams is 70 to 80 feet but does increase up to 140 feet in the southern portion of the property. The Blind Canyon Seam is of minable thickness through most of the Deer Creek permit area (see Map 2-7). This seam ranges in thickness from 16 feet to less than 5 feet. The thickness of the seam thins to less than 5 feet in the southwest portion of the property.

Within the area of the Wasatch Plateau, coal seams are known to be present in two formations, the Blackhawk and the Ferron Sandstone member of the Mancos Shale. Coal seams within the Ferron Sandstone outcrop to the southeast and are of economic importance in that region (Emery Coal Field).

However, the presence of these seams at depth below East Mountain can only be speculated because no data is available to prove their existence. If coal seams do exist in the Ferron Sandstone they would be present at depths 4,000 to 4,500 feet below the Deer Creek Mine workings. The future recovery of these speculative coal reserves will, in no way, be influenced by the present or proposed workings of the Deer Creek Mine.

Figure 2-3 illustrates where the Blind Canyon coal reserves are dedicated to the Deer Creek Mine.

Reserve estimates for in-place, minable and recoverable coal within each lease have been submitted to the Bureau of Land Management, Utah State Office, Branch of Mining Law and Solid Minerals, in compliance with General Mining Order #1. These data will be updated at the BLM request.

Overburden

The coal reserves in the Deer Creek Mine area within the Blind Canyon and Hiawatha Seam are covered by up to 2,300 feet of overburden. Because the topography of these lands displays much relief, the thickness of the overburden is highly variable (see Maps 2-8, and 2-9 and cross sections 2-4). The overburden is the greatest in the western and northern portions of the property where the plateau is capped with the Flagstaff Limestone. In these areas the overburden ranges from 2,200 - 2,300 feet. However, the overburden above most of the coal is less than 1,800 feet.

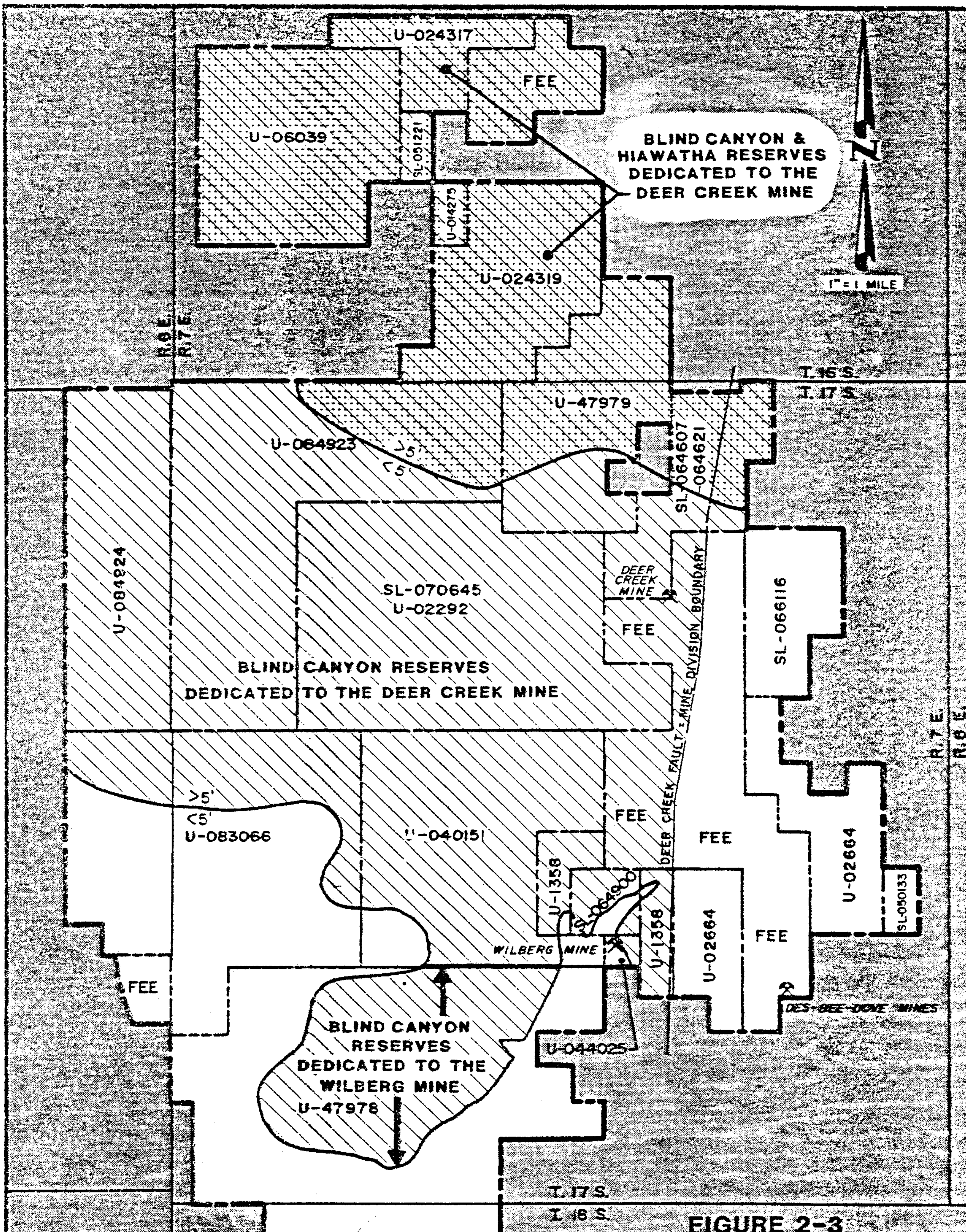


FIGURE 2-3

COAL RESERVES DEDICATED TO THE DEER CREEK MINE

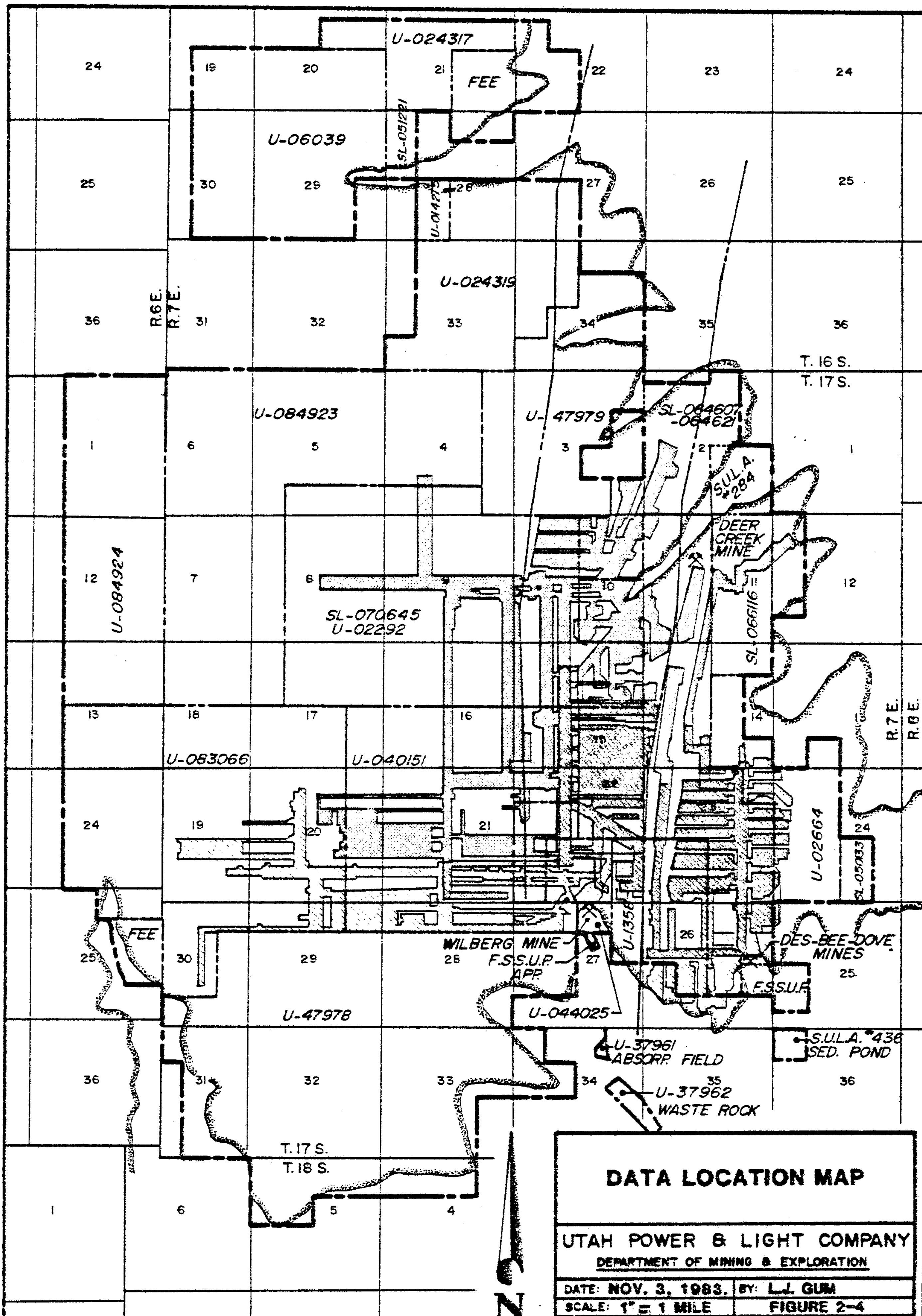
UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

Chemical Composition

In the development of the Deer Creek Mine and associated surface facilities, some of the strata and alluvium covering the coal seam was excavated to accommodate the facilities. In order to better understand the chemical and physical characteristics of the rock material that was excavated, over 130 samples from both outcrop and core from drill holes were analyzed.

Four drill holes were selected as data points in which core samples were analyzed for their chemical and physical properties (see Figure 2-4). These core drill holes were selected to give the best representation of the same rock sequence which was excavated at the Deer Creek Mine portals. Two of the holes were drilled from the surface of East Mountain (EM-12C and EM-23C), and two of the holes were drilled from within the Deer Creek and Wilberg Mines (A-25 and B-124).

Samples of rock core were collected from each lithologic unit that was penetrated within the selected drill holes. These samples consisted of a representative section of core averaging 0.3' in length usually taken from the center of each lithologic unit. Samples of rocks which were immediately overlain by minable coal seams were collected at the coal seam contact. The rock zones sampled and the sample numbers are shown on the core logs for each drill hole (see core logs in Appendix).


U-024317
FEE
U-06039
SL-051221
U-014275
U-024319
R.6E.
R.7E.
T. 16 S.
T. 17 S.
U-084923
U- 47979
SL-064607
-064621
S.U.L.A. #284
DEER CREEK MINE
U-084924
SL-070645
U-02292
SL-066116
R.7E.
R.8E.
U-083066
U-040151
U-02664
SL-050133
FEE
WILBERG MINE
F.S.S.U.P. APP.
U-1358
DES-BEE-DOVE MINES
F.S.S.U.P.
U-47978
U-044025
U-37961
ABSORP. FIELD
S.U.L.A. #436
SED. POND
U-37962
WASTE ROCK
T. 17 S.
T. 18 S.
N
DATA LOCATION MAP
UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION
DATE: NOV. 3, 1983.
BY: L.J. GUM
SCALE: 1" = 1 MILE
FIGURE 2-4

In light of the recommendation made by the Office of Surface Mining (OSM) each sample was analyzed for the following:

pH	% Iron
EC (electrical conductivity)	% Zinc
% Calcium	% Sulfate
% Magnesium	% Molybdenum
% Sodium	% Boron
SAR (Sodium Absorption Ration)	
Alkalinity (equivalent $CaCO_3$)	

All of the samples of carbonaceous mudstone that were collected were also analyzed for their percent pyrite/marcasite content. The samples collected from immediately below a minable coal seam were analyzed for their clay content. In addition to these analyses, four or five representative samples of each of the rock types present, sandstone, siltstone, mudstone, interbeds (thinly laminated siltstone and mudstone), carbonaceous mudstone, and coal were tested for their physical properties. These samples were crushed to a size of -1/4" mesh and the product was screened for its percent sand, silt, and clay content.

Front Range Labs, Inc., of Fort Collins, Colorado, was selected to do the analytical work because of their expertise in testing the chemical and physical properties of coal overburden and their ability to perform all of the required analytical work.

Utah Power & Light had previously established an excellent data base regarding the coal quality within the East Mountain property. Within the past four years, samples have been collected from within the Deer Creek and Wilberg

Mines on a daily basis. These samples were analyzed by Standard Laboratories, Inc., in Huntington, Utah. Some of the data reported herein have been gleaned from this work.

Seam	% Moist.	% Ash	% Vol.Mat.	% Fix.Car.	% Sulfur	BTU's/lb
Blind Canyon	8.11	11.23	40.37	40.29	0.44	11,719
Hiawatha	9.43	14.86	37.25	38.46	0.52	10,864

The findings of these analyses are separated by formation, rock type and coal seam in Table A. For each rock type, the mean and standard deviations have been calculated for each of the various chemical and physical parameters. In general, the chemical content within a rock type is moderately consistent as shown by the standard deviations. However, the sulfate content of the sandstones and siltstones are variable due to sulfate enrichment by groundwater in some of these rock types and not others.

The sulfur content of the Hiawatha and Blind Canyon Seams averages 0.52% and generally ranges from 0.49% to 0.59%. Of this sulfur content, 79% is in the form of organic sulfur and 16% is in the form of pyritic including marcasite. The remainder is in the form of sulfate.

Generally, the physical tests which were completed on these samples indicate that all rock types present have the tendency to resist reduction of grain size when excavated and reclaimed and only a minimum of clay-sized particles will be liberated. As may be expected, the coarser-grained rocks, sandstones and siltstones produced much less clay-sized particles when crushed. Generally, the dominant rock type in

TABLE (Revised)
ANALYTICAL SUMMARY
OVERBURDEN ANALYSES

Lithology	Number of Samples: Chemical Tests	Number of Samples: Physical Tests	Chemical Tests: Ca Meg/L	Mg Meg/L	Na Meg/L	SAR[1]	Fe ppm	Zn ppm	SO_4-S ppm	Mo ppm	B ppm	pH (Paste)	E.C.[2] amhos/cm	Sat. %	Physical Tests: Pyrite FeS_2[3]	Sand %	Silt %	Clay %	Crushed Rock Texture
Blackhawk Formation:																			
Sandstone:	26	2																	Sandy
Mean			4.37	8.18	2.13	1.05	8874	11.47	409.6	.1	.06	8.0	1.55	21.7	-	84.5	11.0	4.5	Loam
S.D.			3.91	5.13	1.08	0.69	6672	9.7	353.1	0	.06	0.96	0.89	3.36	-	0.71	1.41	2.12	
Siltstone:	24	5																	Sandy
Mean			3.06	6.24	2.30	1.69	14512.88	38.26	464.41	.1	0.18	7.88	1.41	20.81	2.3	71.6	17.8	10.6	Loam
S.D.			2.63	7.23	2.78	3.72	8782.4	21.29	1222.63	0	0.16	1.08	1.72	1.82	0	23.5	16.57	7.7	
Mudstone:	24	4																	Sandy
Mean			3.12	3.13	4.70	4.28	11074.13	70.31	233.96	.1	0.28	8.0	1.10	23.99	-	71.5	20.5	8.0	Loam
S.D.			2.36	2.89	12.76	12.58	5350.17	79.99	275.10	0	0.23	0.31	1.12	4.88	-	13.77	15.2	3.56	
Interbeds:	15	3																	Loamy
Mean			4.34	7.98	2.79	1.30	10982.13	21.58	346.95	.1	0.12	8.05	1.58	20.56	-	75.33	17.00	7.67	Sandy
S.D.			3.13	6.37	1.85	1.36	6584.59	9.97	359.46	0	0.11	0.23	0.92	1.33	-	7.64	9.54	3.06	
Carb-mudstone:	25	3																	Loamy
Mean			6.19	6.51	3.7	2.4	9933.76	58.04	438.86	.1	0.42	7.53	1.54	34.76	2.3	73.33	18.00	5.76	Sandy
S.D.			4.85	8.42	4.85	3.98	6112.12	38.94	378.81	0	0.34	0.85	1.14	9.94	3.29	20.60	16.82	3.53	
															Sulfur %				
Coal (Blind Canyon)	8	0																	
Mean			1.55	1.81	1.68	1.63	2089.38	10.19	103.88	.1	.06	8.0	.36	60.66	0.44				
S.D.			0.59	2.88	1.35	1.27	2557.56	8.82	66.88	0	.05	0.25	.05	18.59	0.06				
Coal (Hiawatha)	2	0																	
Mean			1.52	2.85	1.41	1.58	2532.41	10.82	97.32	.1	0.12	7.95	0.34	60.24	0.51				
S.D.			0.66	3.64	0.95	1.18	2718.02	8.41	72.14	0	0.21	0.24	0.07	16.84	0.06				
Starpoint Sandstone																Sand %	Silt %	Clay %	
Sandstone	11	4																	Sandy
Mean			5.14	8.58	3.42	3.57	3798	9.47	1457	.1	0.11	6.76	2.49	30.46	-	90.75	4.75	4.50	Loam
S.D.			3.89	4.69	2.97	5.18	2965	6.98	2578	0	0.24	1.54	1.20	4.8	-	4.80	3.50	1.91	

1 SAR = Sodium Absorption Ratio
2 EC - Electrical Conductivity

the area of the Deer Creek Mine is sandstone; therefore, any interpretations made should recognize this fact.

In addition to the aforementioned analyses that were made of the general overburden, the strata immediately above and below the coal seam were analyzed for their potential alkalinity and pyrite/marcasite content and the strata immediately below the coal was analyzed for clay content as well. The results of these tests are as follows:

Zone Sampled	Number Of Samples	pH	% FeS_2 Pyrite/Marcasite)	AB	% Clay	Potential Alkalinity (Equivalent $CaCO_3$ Mg/L)	%
Hiawatha Seam Roof	3	7.8	3.3	115.27	-	218,400	21.84
Hiawatha Seam Floor	3	7.5	1.3	80.17	5.5	127,300	12.73
Blind Canyon Seam Roof	2	8.1	0.5	236.97	-	252,600	25.26
Blind Canyon Seam Floor	3	8.3	1.3	37.125	9.0	3,500	.35

These analyses have identified that the floor of the Blind Canyon Seam has a potentially high sodium absorption ratio and the Blind Canyon Seam roof is potentially high in pyrite/marcasite. No other abnormally high readings were identified.

A review of the data concerning the sodium absorption ratio of the Blind Canyon floor reveals that three out of four samples which were taken of that zone, have values less than 5.0 (4.8, 1.5 and 1.3). One sample has a value of 60.4 which raised the sample mean to 17.36 and created a high standard deviation of 25.14. This indicates that in general the Blind Canyon floor rock will not pose a problem from its sodium absorption ratio but from time to time high concentrations will be encountered. These concentrations

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will be diluted by other rocks with low SAR values upon reclamation.

Three samples of the Blind Canyon Seam roof and floor were tested for their pyrite/marcasite content. Two of these core samples are from drill hole B-124 and the other from EM-12C have a pyrite/marcasite content of 0.2% and 0.5% respectively. The third sample from drill hole EM-23C has a pyrite/marcasite value of 15.8%. This core contained vertical fractures which had secondary deposits of FeS_2. This sample is not representative of the Blind Canyon Seam roof pyrite/marcasite content as a whole but does show that localized high concentrations of iron-sulfides do occur. This periodic high content of pyrite should not pose a problem in reclamation.

The analyses of the overburden samples tested show that in general no toxic or hazardous materials are present. The material excavated near the portal site is slightly alkaline. Generally, the soils in this region which are derived from the strata tested are alkaline as well. The overburden material which has been excavated will not degrade the quality of the soils in the area or of the groundwater percolating through this material.

HYDROLOGY

Groundwater (783.15)

For the past five years UP&L has been collecting data regarding the hydrology of the Deer Creek Mine and surrounding area including quantity and quality of both ground and surface water. This data collection program is part of a hydrologic monitoring program which has been approved by the Utah State Division of Oil, Gas and Mining and the Office of Surface Mining.

Data collected between 1979 and 1982 has been submitted to the Office of Surface Mining, the Utah State Division of Oil, Gas and Mining, the U. S. Forest Service and the Bureau of Land Management each year in the annual hydrologic monitoring reports. All data collected through 1982 are available in those reports; therefore, a duplication of those data will not be made here.

Data has been collected from 79 coal exploration drill holes from within the mine workings and from the spring in the area. These data have not identified any laterally continuous aquifers which are present throughout the area but have identified localized perched water tables in the North Horn Formation and Blackhawk Formation.

Because the North Horn Formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone, its permeability is variable. Lenticular sandstone channels are often times present in the upper portion of this formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into these sandstones forming the perched water tables. The actual lateral extent, or correlation between these perched water tables has not been identified nor is it practical to do so because they are limited in extent and variable in stratigraphic location. Many springs have been identified where these sandstone channels intersect the land surface. These springs will be discussed later in this report. Similar water-bearing sandstone are also present at the base of the North Horn Formation.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. These localized perched water tables intersect the surface of the ground or may be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine has not been identified. The monitoring of the numerous springs located on East Mountain gives Utah Power & Light Company the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

Perched water tables have not been identified in the Price River or Castlegate Sandstones. Both of these formations are relatively permeable but lack sufficient recharge to make them water bearing.

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams. The perched aquifers exist as fluvial channels (ancient river systems) which overlie a scour into the underlying strata, refer to Figure 2-5. The location of the channels shown on Figure 2-5 are based on data collected from in-mine mapping and the numerous drill holes, both in-mine and surface, that have been completed on the property. These channel systems were part of a deltic depositional setting active during and after the coal forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine to medium-grain sand with similar porosity and permeability characteristics as that of the Starpoint Sandstone. The semipermeable and porous nature of these channels allows an effective route of water transport. Other rock type constituents of the Blackhawk Formation (i.e., mudstone, carbonaceous mudstone and interbedded material), generally act as aquicludes which impede water flow unless fracturing or faulting of these units has induced secondary permeability.

The majority of the water flowing into the Deer Creek Mine comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures and in-mine drill holes (see Figure 2-6). For the past six years the water flowing into the mine workings has been measured. The locations in the Deer Creek Mine are shown on Map 2-10. Many locations within the mine have been monitored in the past but only nine

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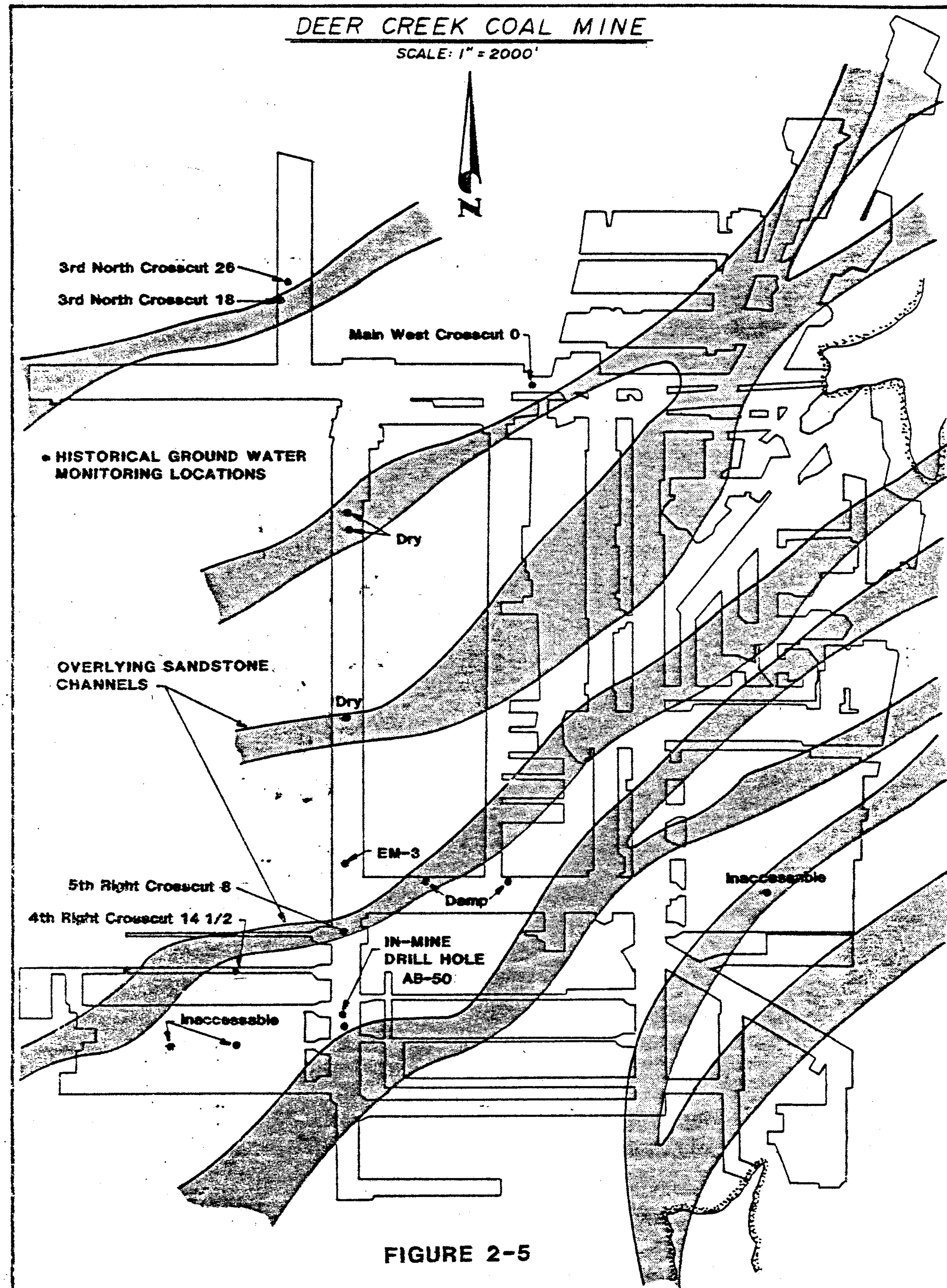
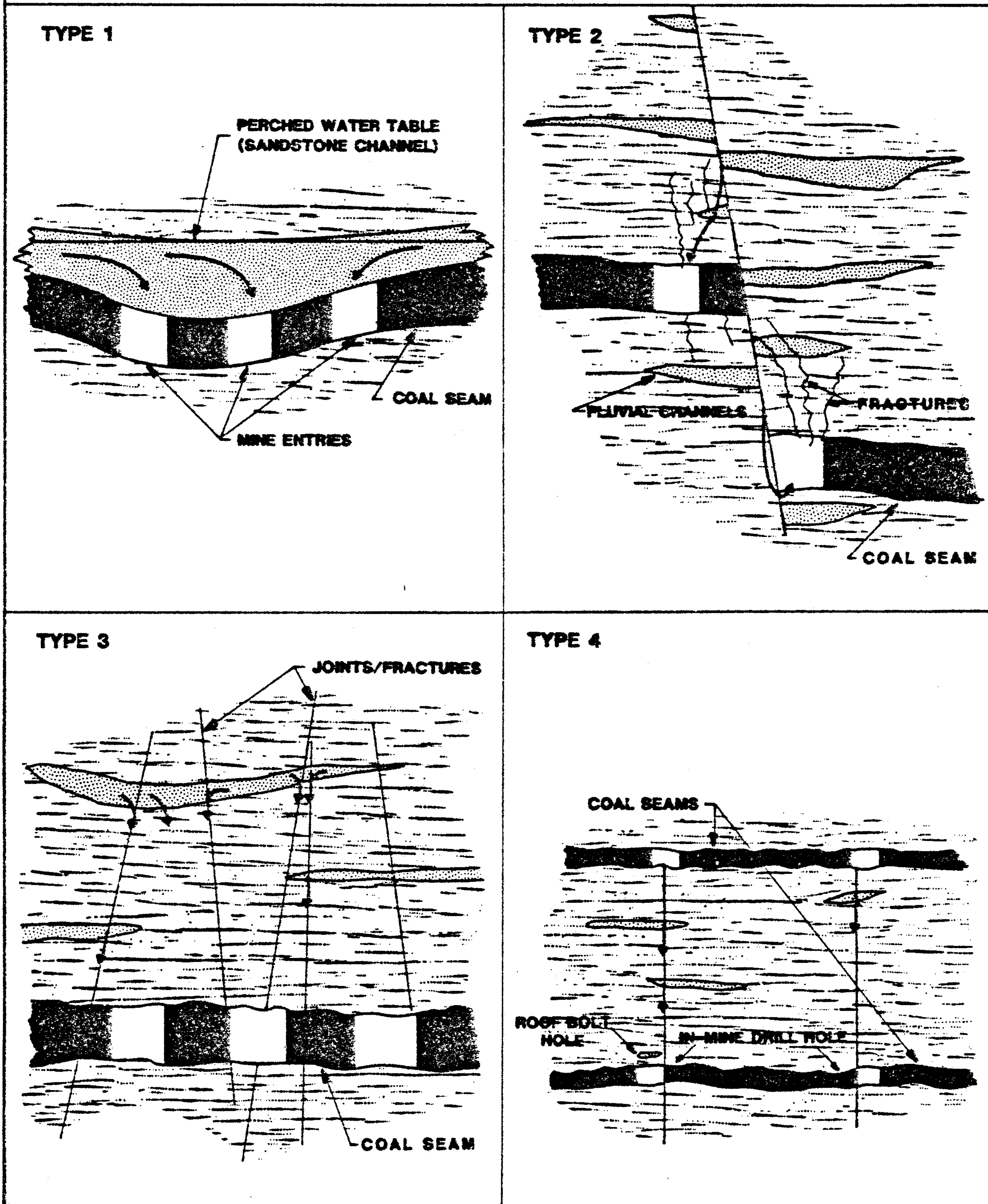

DEER CREEK COAL MINE
SCALE: 1" = 2000'
N
3rd North Crosscut 26
3rd North Crosscut 18
Main West Crosscut 0
• HISTORICAL GROUND WATER MONITORING LOCATIONS
Dry
OVERLYING SANDSTONE CHANNELS
Dry
EM-3
5th Right Crosscut 8
Damp
4th Right Crosscut 14 1/2
IN-MINE DRILL HOLE AB-50
Inaccessable
Inaccessable

FIGURE 2-5

FIGURE 2-6

LONG TERM WATER SOURCES



accessible long-term water monitoring locations now exist. This is because most water producing areas of the mine are dewatered and stop flowing shortly after initial mining in the area.

In several locations of the mine such as retreated longwall panels water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past.

The most accurate measurement of water flowing into the Deer Creek Mine workings is achieved by measuring the total water leaving the mine. This is done and reported annually in the Hydrologic Monitoring Report. The total of water leaving the mine includes metered discharge water which is piped to the Huntington Power Plant and estimated water which evaporates from the mine workings.

To estimate the percentage of total mine water that is flowing into the various areas of the mine the applicant will collect data from the long-term sampling sites and the recently mined entries that have not yet been dewatered. Water flowing from abandoned areas of the mine (retreated

Revised 11/21/83

longwall panels and pillared areas) will be estimated by calculations of pump capacity and hours pumped for each area. This should allow the applicant to estimate the percentage of the total discharge waters that are entering the various sections of the mine. These locations will be monitored quarterly for discharge and quality.

This approach to monitoring the water flowing into the mine was selected by the applicant with the concurrence of hydrologists from the Utah State Division of Oil, Gas and Mining and the Office of Surface Mining. This approach to monitoring the limited perched aquifers in the Blackhawk Formation should provide the data to allow the applicant and the various regulatory agencies to assess what effect mining has on these water-bearing strata.

Several observations have been made concerning the Blackhawk water-bearing strata based on current data. The sandstone, which is semipermeable and porous, affords an effective route of water transport while relatively impervious shale in the Blackhawk Formation prevent significant downward movement of the percolating water. Of the water producing areas, those closest to the active mining face exhibit the greatest flows. As mining advances, the area adjacent to the active face continues to be excessively wet and previously mined wet areas experience a decrease in flow. It appears that the water source is being dewatering since excavated areas of the mine do not continue to produce water indefinitely. The water source must be either of

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limited extent, i.e., a perched aquifer, or have a limited recharge capacity.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicates that many of the fractures become sealed by swelling clays which stops or limits the water transfer. Confirmation of this exists along the numerous faults and fractures over the area. Very few springs are found within the Blackhawk along the extensive faults in the Wasatch Plateau. With the exception of the Main West rock tunnel in the Deer Creek Mine the faults that have been intersected are dry. The fault in the rock tunnel currently produces about one-half gallon/minute. Apparently, fractures seal readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation. The coal seams in the Blackhawk Formation are impermeable and are not water saturated.

The Starpoint Sandstone immediately underlies the Hiawatha Coal Seam. This sandstone unit exhibits some characteristics of an aquifer but experiences little recharge. Most of water recharge in the Starpoint is where it has been intersected by the major canyons in the plateau. This fact plus the fact that the Starpoint is only slightly to moderately permeable allows only limited flow of groundwater through this formation.

To aid in identifying the hydrologic characteristics of the Starpoint Sandstone Utah Power and Light contracted an independent lab to conduct horizontal and vertical permeability tests on drill core. Four pieces of drill core were tested from two different core holes. Two samples were taken from the foreshore deposits of the Starpoint, which immediately underlies the Hiawatha coal seam, and two were taken from the upper shoreface deposits in the upper five feet of the Starpoint Sandstone. The results of the tests are as follows:

Sample	Permeability (Millidarcys) Horz.	Vert.	(Environment)
EM-32C 1498.2-98.7	6.2	7.9	Foreshore
EM-32C 1502.5-03.0	261	258	Shoreface
EM-34C 1446.4-47.0	72.0	5.1	Foreshore
EM-34C 1447.3-47.9	171	210	Shoreface

These tests indicate that the Starpoint Sandstone has very low primary permeability. The one to two feet of strata immediately below the Hiawatha Seam (foreshore) has the lowest permeability. It is believed that the major permeability in the Starpoint is through secondary permeability.

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Revised 2/8/85
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As part of Utah Power and Light's exploration drilling program, every attempt is made to collect data which reflects on the hydrologic conditions present. Unfortunately, water is added to the drill hole during the drilling process raising the water level to artificial horizons. Therefore, attempts to identify the piezometric gradient from these drill holes has been unsuccessful. Whenever possible UP&L records a temperature log of drill holes completed. A rapid change in temperature at changing depth indicates where water flows into the hole. Nowhere has significant water been encountered in the drill holes. Utah Power & Light Company will commit to make every attempt to collect hydrologic data while drilling exploration holes. If significant groundwater is encountered we will, if possible, case the hole and investigate the water occurrence.

Utah Power & Light Company drilled two holes, one in Rilda Canyon (EM-47) and one in Cottonwood Canyon (EM-31), which were cased and developed into water monitoring wells. Both of these holes are drilled in areas which are great distances away from past or presently mined areas. Drill hole EM-31 was drilled and cased to a depth of 280 feet which penetrated through the lower 10 feet of the Blackhawk Formation and the entire Starpoint Sandstone. Drill hole EM-47 was drilled and cased to a depth of 270 feet. This hole penetrated the lower 180 feet of the Blackhawk Formation and the entire Starpoint Sandstone. Water level measurements have been made on these wells monthly (access permitting) since they were completed in 1978. The data collected is reported in the annual Hydrologic Monitoring Report and Utah Power and Light will commit to continue monitoring these wells and reporting data collected in the future.

Seven in-mine drill holes completed in the Deer Creek Mine have been developed into water monitoring holes which are measured quarterly (see Figure 2-7, 2-8 and Map 2-10). The drill hole depth and method of casing the holes are shown in Figure 2-8. Additional in-mine drill holes will be utilized in the future in an attempt to establish a piezometric gradient map for the area on the west side of the Pleasant Valley Fault system.

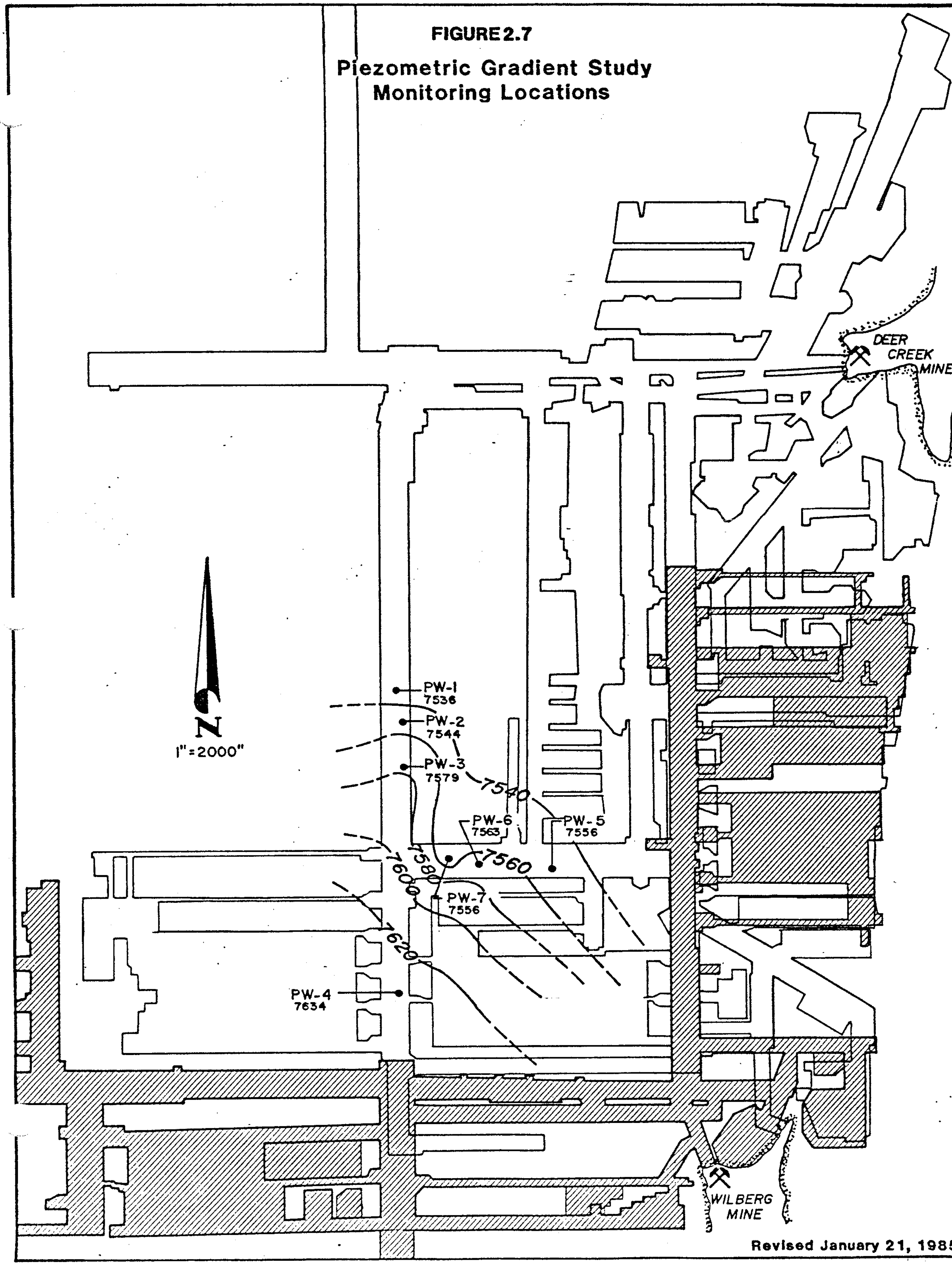
The initial data collected in 1983 regarding the piezometric level in the seven wells showed no obvious trend as can be seen on Figure 2-8. However, in the last quarter of 1984, after the water level in each hole had time to stabilize, the piezometric level in all holes indicated a flow in a northeast direction (see Figure 2-7). This flow direction is parallel to the fluvial sandstone channels deposited within the Blackhawk Formation but is up stratigraphic dip.

Because the in-mine drill hole approach to measuring groundwater in the lower Blackhawk and Starpoint Sandstone offers good potential for identifying the piezometric level the applicant will commit to develop more water monitoring holes to expand the area currently under investigation and to continue monitoring existing and future monitoring wells throughout the mine life. The number and location of additional holes will, however, be limited to areas accessible for long-term periods.

Evidence from dewateration studies reveal that of the water producing areas, those closest to the active mining face exhibit the greatest flows, 1979 Hydrologic Monitoring Report. Data collected in 1978-79 indicates a 90% reduction (or more) in water flows from sampling sites over a relatively short time-frame as the mining face is advanced. It appears that the water source is being dewatered since escalated areas of the mine do not produce water

FIGURE 2.7

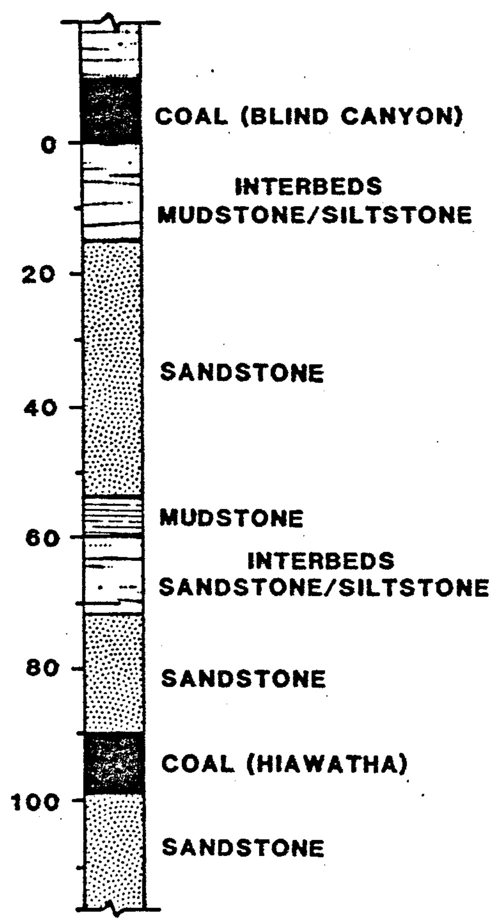
Piezometric Gradient Study Monitoring Locations



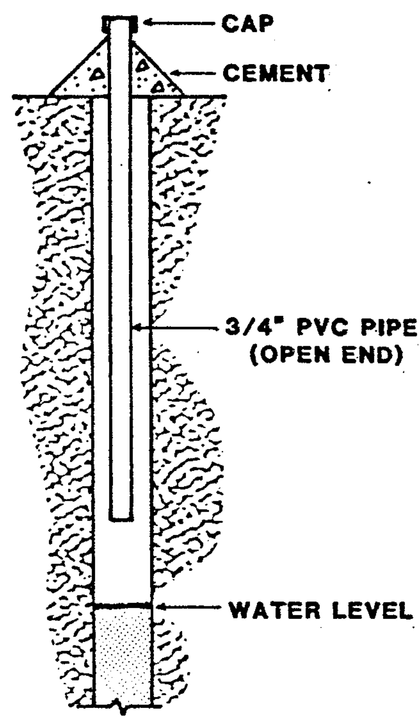
Revised January 21, 1985

MONSEN ENGINEERING CO. 83541

DRILL HOLE #	COLLAR ELEVATION	DEPTH (FT.)	CASING DEPTH (FT.)	LOCATION OF HOLE BOTTOM	WATER DEPTH (FT.)		WATER ELEVATION	
					Initial 1983	1984	Initial 1983	1984
PW-1	7576.0	103.5	20	11.2' Below Top of Star Point	39.9	39.9	7536	7536
PW-2	7582.5	111.5	20	18.8' " "	37.2	38.5	7545	7544
PW-3	7590	94.6	30	10.8' " "	11.0	10.8	7579	7579
PW-4	7638	110.0	80	22.0' " "	16.8	3.9	7621	7634
PW-5	7605.0	98.4	20	21.0' " "	47.9	48.6	7557	7556
PW-6	7603.0	130.5	20	20.0' " "	40.1	39.8	7562	7563
PW-7	7602.8	103.6	20	17.0' " "	49.0	48.0	7553	7555
PW-7A	7602.8	75.0	20	12.0' Above Top of Star Point	49.0	47.0	7553	7556



TYPICAL GEOLOGIC SECTION



CASING DETAIL

Revised January 15, 1985

DEER CREEK COAL MINE Emery County, Utah	
PIEZOMETRIC DRILL HOLE STUDY	
UTAH POWER & LIGHT COMPANY Department of Mining & Exploration	
DATE: JAN. 15, 1985	BY: LINDA J GUM
SCALE: NONE	FIGURE 2.8

indefinitely. The data confirms that perched-limited aquifers exist within the Blackhawk Formation.

Studies conducted by the USGS indicated that the Starpoint Sandstone is of low permeability thus limiting its usefulness as a water producing aquifer.

With the data available it is not possible to compile a piezometric map of the water-bearing strata in the North Horn Formation, the Blackhawk Formation or the Starpoint Sandstone. The data collected from the numerous drill holes completed shows no pattern in the water level of the North Horn Formation water-bearing strata. The data collected in the mine also shows the water level of the sandstone channels in the Blackhawk Formation to be variable and that these strata are rapidly dewatered on mining. Although many drill holes have intersected the Starpoint Sandstone no piezometric level has been observed. Generally when exploration holes are drilled from the surface through the overlying strata into the Starpoint Sandstone, water flows out of the bottom of the hole through fractures which are often present. This indicates that the piezometric level is below the level normally penetrated by the drill holes.

No alluvial aquifers are present within the permit area; however, they are present in Huntington Canyon to the northeast. No data is available regarding this aquifer.

In 1976 the applicant submitted a hydrologic monitoring plan to the Mining Supervisor of the U. S. Geological Survey (MMS). This monitoring plan conforms with the regulations stipulated in CFR 211 and was reviewed and approved by the Office of Surface Mining. This plan meets the regulations stipulated in the Utah Mining Code and will continue to be followed throughout the mining process.

In-Mine Water Quality

The water flowing into the Deer Creek Mine is tested for quality quarterly and the results are reported in the annual Hydrologic Monitoring Report. The quality of the water is fairly uniform in various locations and time. Table B summarizes the quality of water flowing into the Deer Creek Mine.

Excess water not utilized in the mining operation or for domestic use is pumped to storage areas and later discharged. The locations of the main sump areas within the Deer Creek Mine are shown in Figure 2-9. The largest volume of water is stored in the western part of First West, an area that has not been actively mined for several years, and in the old McKinnon Mine workings. That water which is discharged passes first through an oil skimmer, secondly through the recording weir arrangement, then down to Utah Power & Light's Huntington Power plant raw water settling pond via a six inch pipeline. This water is subtracted from UP&L's water shares in the irrigation company, hence, UP&L is using its own water and does not require a separate filing.

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TABLE B : DEER CREEK IN-MINE QUALITY

Location	*3rd North XC 26 2L	Main West XC 0 1E	4th Right XC 14½ 1R	EM-3	4th Right XC 14½ 1R	5th Right XC 8 1R	EM-3	3rd North XC 18 3L	1982 Min.	1982 Max.	1982 Mean	Historical (1976-1981) Min.	Historical (1976-1981) Max.	Historical (1976-1981) Mean
pH	6.8	7.6	7.2	6.8	7.0	7.0	7.4	7.1	6.8	7.6	7.4	7.0	8.2	7.
Alkalinity	396.0	297	396	417	425	410	393	374	297.0	425.0	404.3	214.7	554.4	410.
Calcium	150.0	90.0	120	100.0	130.0	139.0	152.0	140.0	90.0	152.0	138.3	60.8	245.0	149.
Chloride	6.4	8.9	12.8	11.2	11.8	11.4	12.0	5.95	6.0	12.8	10.6	7.2	16.0	10.
Conducitivity	800	470	720	650	920	920	1000	890	1000	470	898.7	620	1700	953.
Magnesium	57.1	16.0	58.0	53.0	59.0	60.0	47.0	57.0	16.0	60.0	51.3	4.4	79.5	51.
Potassium	10.0	5.0	2.24	2.4	3.50	4.0	4.5	3.5	2.2	10.0	4.7	1.99	6.5	4.
Sodium	30.0	46.0	24.0	30.0	27.0	31.0	30.0	29.0	27.0	46.0	34.0	10.22	66.0	37.
Sulfate	240.0	86.4	181.0	115.0	220.0	200.0	230.0	180	86.4	240.0	210.0	40.0	1280	226.
TDS	496	263	421	360	552	517	565	539	263	565	573.7	445.0	982.0	614.
TSS	2	7.0	6.0	2.0	2.0	1.0	0.5	2.0	7.0	0.5	5.1	0.1	26.0	5.

* Example: 3rd North XC 26 2L = 3rd North, Cross Cut Number 26, 2nd Left entry.

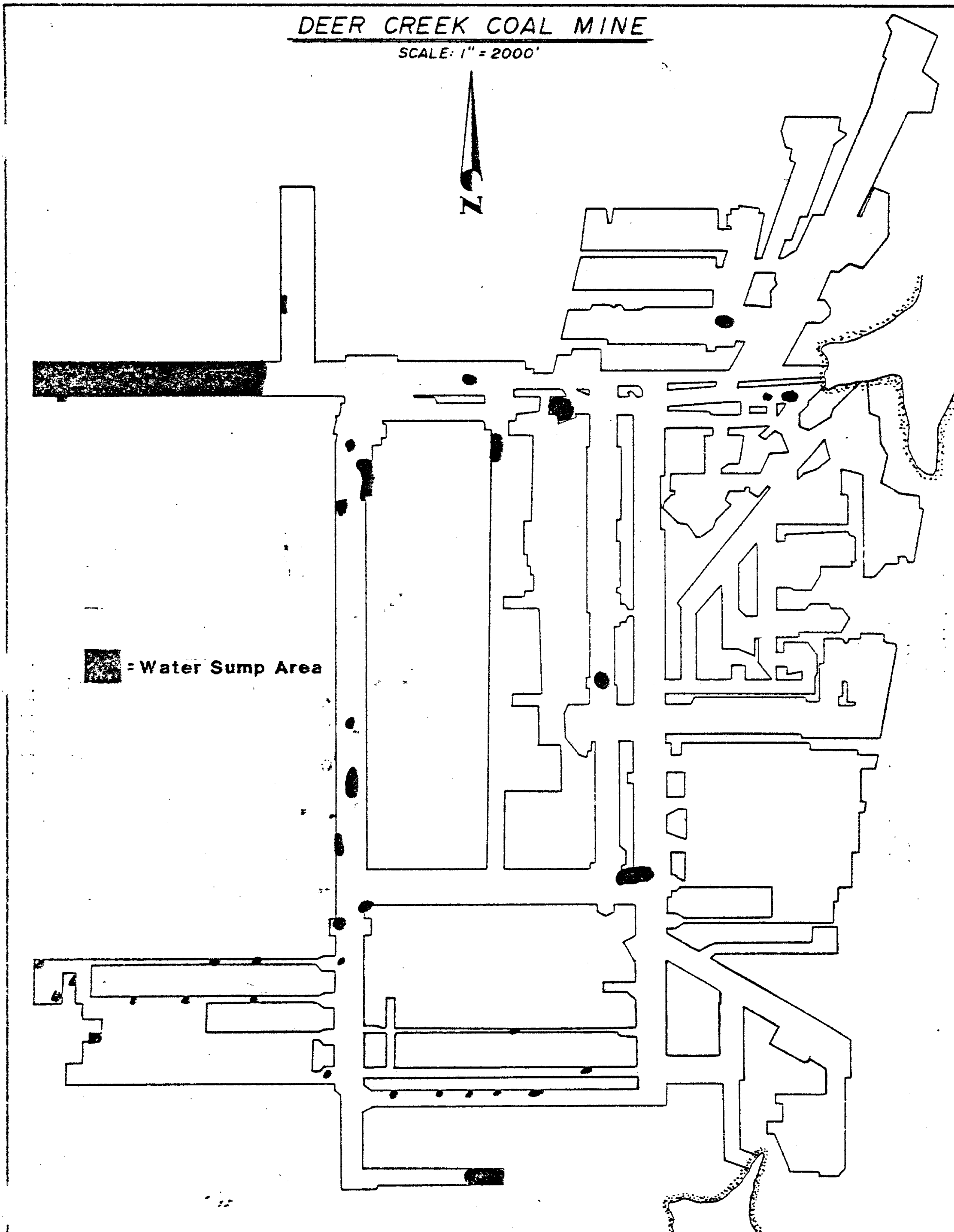
DEER CREEK COAL MINE
SCALE: 1" = 2000'
N
= Water Sump Area
UPDATE 1/14/83

FIGURE 2-9

It should be noted that none of the water leaving the Deer Creek Mine is discharged into the Huntington Creek but is totally consumed in the power plant cooling process.

As stated in the 1980 Hydrologic Monitoring Report, the applicant installed an accurate continuous meter on the Deer Creek discharge water in December 1979. Prior to that time only estimates of discharge were made. Between 1980 and 1981 the discharge increased 23% from 193 gpm to 237 gpm continuous discharge. This represents an increase of water flowing into the mine and is discussed in the 1982 Hydrologic Monitoring Report.

Uses of the Groundwater

The only uses of the groundwater in the Deer Creek Mine area has been for water used in the mining process. The water flowing into the mine is generally pumped into a sump where it is stored. It is, at a later date, pumped to the mine face where it is utilized. No water wells have been drilled within the Deer Creek Mine property.

Surface Waters (783.16)

The surface drainage system on East Mountain is divided into two major drainages; the southwest portion forms part of the Cottonwood Creek drainage and the northeast portion of East Mountain contributes to the Huntington Creek drainage (see Maps 2-11 and 2-12). These drainage boundaries, including minor subdivisions to Cottonwood and Huntington Creeks, are designated on Map 2-11. Both

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Huntington and Cottonwood Creeks flow out of the Wasatch Plateau in a southeasterly direction. The creeks merge with Ferron Creek to form the San Rafael River which is a tributary to the Green River.

Huntington Creek Drainage System

The Huntington Creek is comprised of many smaller tributary streams that feed the main stream. Deer Creek is the only tributary to Huntington Creek that emanates from within the existing Utah Power & Light's coal mine portal areas.

Huntington Creek flow data are recorded on a continuous basis by Utah Power & Light at two locations; one station is located near the Huntington Power Plant, the other being below Electric Lake which is about 22 miles upstream from the Huntington Plant. Flow records are maintained by Utah Power & Light Company in order to determine water entitlements and reservoir storage allocation for the various users on the river.

The Utah Power & Light station near the plant was established in the fall of 1973. Prior flow records were obtained from the U. S. Geological Survey station located about one mine downstream from Utah Power & Light's existing station. The U. S. Geological Survey station was established in 1909, was discontinued in 1970 in order to determine available water supply for Electric Lake Dam. The dam was completed in December 1973 and water storage commenced shortly afterward.

The following table (Table C) shows a summary of actual Huntington Creek flows below Electric Lake, at Huntington Plant, and calculated natural flow at Huntington Plant. The calculated natural flow considers actual flow recorded at the plant, plant diversions, Electric Lake storage change and lake evaporation. The average daily discharges for the 1979 water year (October 1978 - September 1979) at the two stations plus the calculated natural flow are found in the Hydrologic Monitoring Plan Annual Report.

During the 1979 spring runoff period, approximately 10,000 acre feet of water was impounded behind Electric Lake Dam. On June 27, 1979 the lake reached the maximum contents of 28,211 acre feet which is about 94% of full capacity. Fishery releases, power plant water needs and lake evaporation dropped the lake volume to about 25,000 acre feet by September 30, 1979 (end of water year).

A comparison of runoff values from 1978 and 1979 is presented in Table D to demonstrate the great fluctuation in surface discharges from year to year.

TABLE C: Huntington Creek Water Flows

	Huntington Creek Below Electric Lake	Huntington Creek at Plant	Calculated Natural Flow at Plant
Total Yearly Flow (Ac. Ft.)	10,880	54,640	68,931
% of Normal	50*	78*	98
Average Discharge in Cubic Feet per Second (CFS)	15	76	95
Peak Discharge (CFS)	152	360	592
Date of Peak Discharge	August 8, 1979	May 28, 1979	May 28, 1979
Minimum Discharge in CFS	12	13	10
Date of Minimum Discharge	October 14, 1978	November 27, 1978	November 27, 1978

*Due to upstream storage in Electric Lake.

TABLE D: Comparison of 1978 and 1979 Runoff Values

	1978		1979		
	Amount	% of Normal	Amount	% of Normal	% of 1978
Runoff Stored in Electric Lake (Ac. Ft.)	14,000	150	10,000	107	71
Calculated Natural Flow at Plant (Ac. Ft.)	86,000	123	69,000	98	80
Actual Peak* Discharge at Plant (CFS)	585	-	360	-	62

* Peak flow is the maximum recorded for a 24-hour period.

Water quality information on Huntington Creek was compiled on a monthly basis during 1979. Vaughn Hansen Associates conducted the sampling program and the analyses were performed by Ford Chemical Laboratory. The location of water quality sampling stations on Huntington Creek that were considered for this report are listed below (refer to Map 2-11).

1. Below Electric Lake
2. Above the Forks
3. Above the Power Plant Diversion
4. Below the Power Plant

Specific water quality constituents which were analyzed are shown in Table E. Values are in milligrams per liter unless otherwise noted. Raw data can be found in Appendix to the Annual Hydrologic Monitoring Report.

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In general, the water shows a gradual increase in concentration of dissolved minerals as the flow proceeds down Huntington Canyon.

The values at the station below Electric Lake do not express the actual natural drainage water quality characteristics because of the lake effect but it appears that the surface flow in Huntington Canyon is of very high quality in the upper reaches with some natural degradation occurring as the flow proceeds to the canyon mouth.

The comparison of water quality characteristics within the Huntington drainage for 1978 and 1979 is presented in Table F. This comparison merits consideration in order to evaluate the changes in water quality from year to year. Average values are presented in milligrams per liter.

An examination of Table F indicates that the values for 1978 and 1979 are fairly consistent and uniform in comparison. TDS, specific conductance, turbidity, alkalinity and total hardness values were somewhat higher in 1979 while other constituents were about the same.

Deer Creek is a tributary to Huntington Creek and flows from the same canyon in which the Deer Creek portal is located. Permanent runoff sampling sites were established in 1980. They include the following locations (see Map 2-11):

TABLE E: Huntington Creek Water Quality

Parameter	Below Electric Lake Avg.	Max.	Min.	Right Fork Above Left Fork Avg.	Max.	Min.	Above Power Plant Avg.	Max.	Min.	Below Power Plant Avg.	Max.	Min.
pH (N.U.)	7.6	8.5	7.0	8.0	8.7	7.1	7.4	8.6	7.4	8.1	8.7	7.5
Diss. Oxy.	8.8	10.4	7.6	9.1	11.8	7.9	9.5	12.3	8.1	9.3	10.7	8.1
Sulfate	53	194	14	13	19	10	25.3	52	8.2	52	108	21
T. Susp. Solids	3.3	8.0	1.0	20	114	4.0	81	227	8.0	79	166	6.0
T. Diss. Solids	197	400	120	203	250	140	232	310	148	281	399	179
Spec. Cond. (umhos)	279	430	220	317	380	240	364	470	230	437	610	280
Turbidity (FTU)	3.6	10	0.5	5.5	30	0.4	-	-	-	-	-	-
Alkalinity (TOT.)	135	142	124	195	218	178	154	220	134	194	232	142
T. Hardness	153	170	138	196	222	174	202	250	136	233	298	158

TABLE F: Huntington Creek Water Quality Comparison 1978-1979

Parameter	Below Electric Lake 1978	1979	Right Fork Above Left Fork 1978	1979	Above Power Plant 1978	1979	Below Power Plant 1978	1979
pH (N.U.)	7.6	7.6	7.9	8.0	8.0	7.4	8.0	8.1
Diss. Oxy.	9.2	8.8	9.4	9.1	9.5	9.5	9.6	9.3
Sulfate	17	53	27	13	25.2	25.3	42.4	52
T. Susp. Solids	-	3.3	-	20	27.5	81	74.2	79
T. Diss. Solids	160	197	215	203	214	232	246	281
Spec. Cond. (umhos)	245	279	330	317	329	364	380	437
Turbidity (FTU)	1.6	3.6	4.2	5.5	18.8	-	28.4	-
Alkalinity (TOT.)	133	135	176	195	182	154	186	194
T. Hardness	142	153	187	196	195	202	214	233

1. Above the Mine

Location: (Approximately 600 feet upstream from the mine facility) 2,000 feet North, 800 West of the Southeast corner of Section 10, Township 17 South, Range 7 East.

2. Below the Mine

Location: (Approximately 12,000 feet downstream from the mine facility) 480 feet South, 3,360 East of the Northwest corner of Section 1, Township 17 South, Range 7 East.

To obtain accurate flow measurements during runoff periods Parshall flumes were installed at each of the sampling locations in the Deer Creek drainage. The installation took place during the month of May 1982. The first set of runoff samples were collected before the installation of the flumes, only estimated flow data was recorded. These sites were selected because they would allow optimum conditions for flow measurement and sampling and they would provide data showing any water quality change in the disturbed area.

A water sampling schedule was established in 1981 which includes collection of water quality samples (grab type) along with quantity measurements. This information is collected on a monthly basis during the first or second week of each month throughout the duration of the runoff season. In all cases, samples are taken above and below the Deer Creek Mine (disturb area) with an hour interval. Permanent

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sampling locations and consistent scheduling should help in correlating water quality with runoff flow fluctuations from a year to year basis.

The location of the flumes are such that they are accessible all year long. Some discussion has been made indicating that permanent recorders be used to collect the data. The applicant feels that the present method is preferred because the flumes must be cleared of sediment before each reading to insure accuracy and in winter months, a stilling well used in a continuous recorder would freeze rendering the data useless. The data collected to date and reported in the annual Hydrologic Monitoring Report (stream discharge hydrographs) shows clearly the base flow of the stream and its annual flow pattern.

The results of the 1982 quality analysis are listed in Table G and H. The minimum, maximum and mean values are given for each year in which data was collected along with the historical results. Values are in milligrams per liter unless otherwise noted. Complete raw data can be found in Appendix C of the 1982 Hydrologic Monitoring Report. It is apparent from the tables that the quality of the Deer Creek runoff degradates slightly from the upper to the lower sampling point. The quality of the lower sampling point is possibly affected by the Mancos Shale which surrounds the sampling location. An examination of Tables G and H indicates that the data for 1982 follows closely with the historical data, except for total suspended solids and iron, in which these parameters show a considerable decrease for both locations.

Meetinghouse Stream

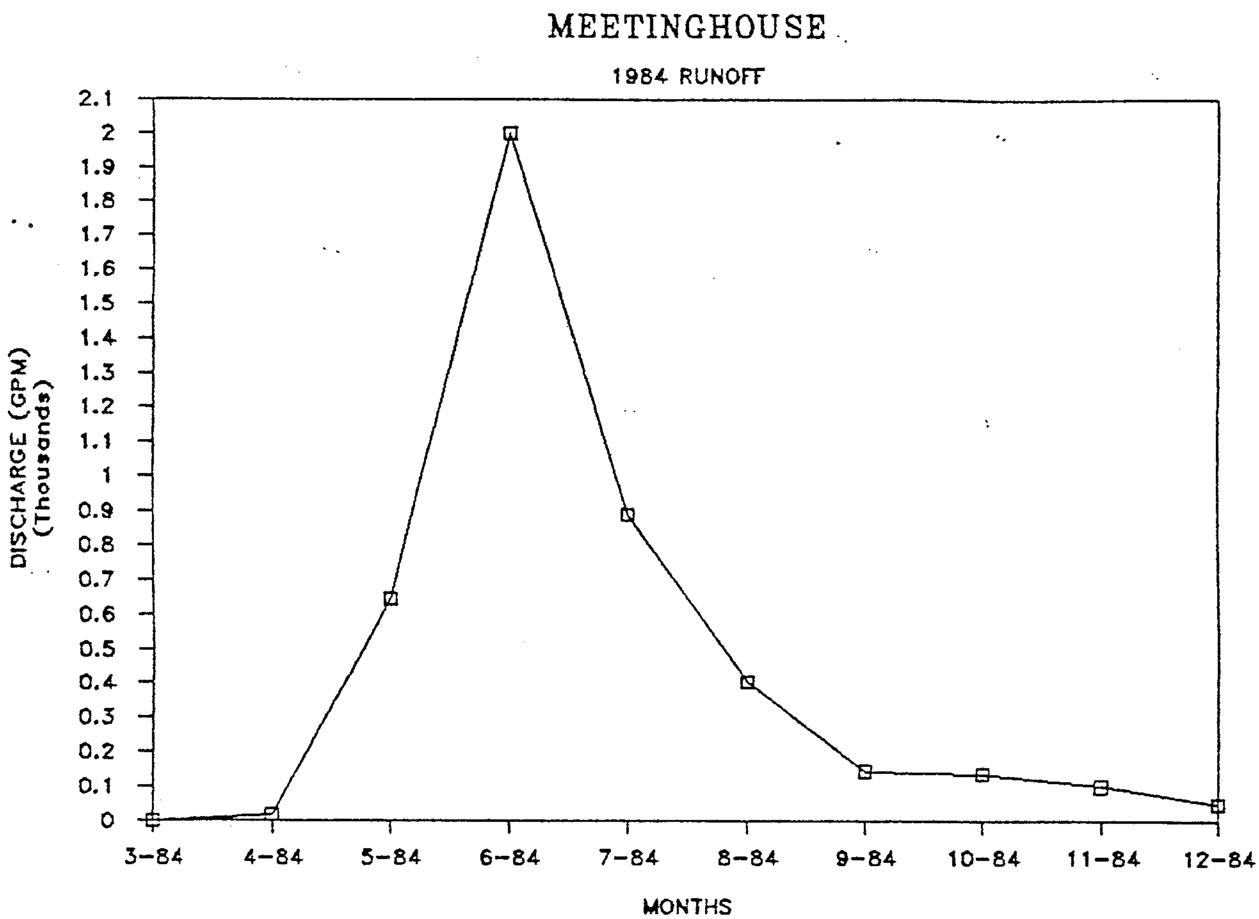
Meetinghouse stream is a tributary to Huntington Creek. This stream is fed by two forks, the north fork, which is perennial, and the south fork, which is Whetstone considered intermittent.

In 1984 Utah Power & Light Company installed a Parshall flume in Meetinghouse Creek. Flow measurements have been collected monthly since that time and have been plotted on a hydrograph shown on the following page. The maximum flow recorded occurred in June with a flow of 2000 GPM. Baseline flow in September-October is at or slightly less than 100 GPM. In the months of March and April 1984 the water was frozen thus yielding no, or minimal, flow.

Elk Springs is the major water source for the south fork of Meetinghouse Creek and the creek is considered perennial below Elk Springs.

Rilda Stream

Rilda stream is a tributary to Huntington Creek. Like Meetinghouse Creek, this too bifurcates into a north and south fork. Both the north and south forks are ephemeral but below the forks water contributed to the creek from north and


MEETINGHOUSE
1984 RUNOFF
DISCHARGE (GPM)
(Thousands)
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
3-84
4-84
5-84
6-84
7-84
8-84
9-84
10-84
11-84
12-84
MONTHS

south springs supports perennial flow as documented by piezometric wells drilled by the West Appa Coal Company.

Utah Power and Light has not collected flow of this tributary in the past but will begin recording flow on the same schedule established for other drainage systems as part of our hydrologic monitoring program.

Stream Status Determination

With the exception of the Rilda Canyon drainage all the streams which emanate from within the designated Deer Creek permit area are monitored.

Physical characteristics of the individual streams are found in the hydrological section of the permit application. Flow measurements and water quality are collected and summarized in Utah Power & Light Company's annual Hydrological Monitoring Report.

Rilda Canyon drainage has been studied extensively by others, such as North Emery Water Users Association, Northwest Carbon and West Appa Coal Company. This information will be provided at a later date in conjunction with future mining development in this area.

It has been determined, as evidenced by springs located near the bottom of this canyon, that such springs are fed through a geological feature crossing the canyon at an obtuse angle. However, this fractured system is located below the outcrop of the coal seams allowing the proposition that above the springs the drainage is intermittent whereas below the springs it is perennial in character. Therefore, mining in Rilda Canyon does not take place beneath or adjacent to a perennial stream.

Cottonwood Creek traverses a small portion of the southwest corner of the permit boundary due to the thin coal seam (less than 5 feet), no mining is planned beneath Cottonwood Creek in the Deer Creek Mine.

Three small drainages, Grimes Wash, Meetinghouse and Whetstone/Meetinghouse streams conduit surface waters from the permit area. During the past six years it is evident from the data collected that all three streams, by the State's definition, are perennial in character. However, it may be misleading to assume, based on the limited data and the above normal precipitation levels experienced during the last few years, that all three streams are indeed perennial.

Applicant has submitted an area map encompassing all coal mine properties associated with the Deer Creek, Wilberg and Des-Bee-Dove Mines. See map in Pocket 2-11.

As most of these streams are short in reach and are, for the most part, fed by springs and limited ground water, only the lower portions can be classified as perennial. This designation is appropriately marked in the map for each stream. Mining beneath, or adjacent to, streams which have been determined as perennial requires a finding by the Division that subsidence will not cause material damage resulting in environmental degradation.

Included in this application are mine planning maps (5-year mine plan) depicting those areas which have been mined and areas to be mined beneath designated perennial streams. Mining methods, sequencing and dates of mining are found in pages following 3-5.

TABLE G: DEER CREEK SURFACE WATER QUALITY

ABOVE THE MINE

1982 Sample Dates	pH (Units)	Conductivity UM HOS/CM	TDS	TSS	Iron Total	Manganese
5-3	8.0	510	289	92	0.87	0.18
6-1	7.3	510	280	52	0.80	0.16
7-6	7.8	500	276	9.0	0.81	0.13
8-3	7.9	510	281	0.5	0.76	0.12
9-15	8.2	490	308	1.5	0.19	0.06
10-11	8.1	640	359	12.0	0.15	0.12
Min.	7.3	490	276	0.5	0.15	0.06
Max.	8.2	640	359	92.0	0.87	0.18
Mean	7.9	526.7	298.8	27.8	0.6	0.13
1978*						
Min.	7.0	360	235	521	0.29	0.19
Max.	7.0	360	235	521	0.29	0.19
Mean	7.0	360	235	521	0.29	0.19
1979						
Min.	7.7	470	260	4.6	0.32	-
Max.	8.5	470	310	1400	40.1	-
Mean	8.1	470	285	702.3	20.2	-
1980						
Min.	7.9	570	337	0.5	0.07	0.01
Max.	8.0	820	533	3592	0.20	0.24
Mean	7.9	695	435	1796.3	0.13	0.13
1981						
Min.	8.3	600	332	0.5	0.09	0.01
Max.	8.3	700	482	3.5	0.20	0.02
Mean	8.3	633.3	384.7	1.7	0.13	0.01
Historical 1978 - 1981						
Min.	7.0	360	235	0.5	0.07	0.01
Max.	8.5	820	533	3592	40.1	0.24
Mean	8.0	588.6	353.6	690.4	5.2	0.08

* Only one sample collected.

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TABLE H: DEER CREEK SURFACE WATER QUALITY
BELOW THE MINE

1982 Sample Dates	pH (Units)	Conductivity UM HOS/CM	TDS	TSS	Iron Total	Manganese
5-3	8.0	880	520	183	1.78	0.23
6-1	7.7	650	367	54	1.79	0.19
7-6	7.9	720	399	3.5	1.13	0.20
8-3	8.0	900	497	29.5	1.00	0.19
9-15	8.2	1180	649	4.5	0.27	0.09
10-11	8.3	1380	868	2.0	0.10	0.09
Min.	7.7	650	367	2.0	0.10	0.09
Max.	8.3	1380	868	183.0	1.80	0.23
Mean	8.0	951.7	550	46.1	1.01	0.17
1978*						
Min.	6.9	420	273	1124	0.39	0.21
Max.	6.9	420	273	1124	0.39	0.21
Mean	6.9	420	273	1124	0.39	0.21
1979						
Min.	7.4	730	440	40.6	0.65	-
Max.	8.4	730	477	20.540	170	-
Mean	7.9	730	459	10.290	85.3	-
1980						
Min.	7.9	790	452	9.5	0.16	0.01
Max.	8.0	870	567	396	0.30	0.27
Mean	8.0	830	510	203	0.21	0.14
1981						
Min.	8.2	1500	959	2.5	0.09	0.01
Max.	8.3	1650	1021	5.5	0.24	0.03
Mean	8.3	1575	990	4.0	0.17	0.02
Historical 1978 - 1981						
Min.	6.9	420	273	2.5	0.09	0.01
Max.	8.4	1650	1021	20,540	170	0.27
Mean	7.9	993.3	598.4	3159.7	24.5	0.11

* Only one sample collected.

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Cottonwood Creek Drainage System

The western and southern portions of East Mountain are intersected by Cottonwood Creek and its associated tributaries, including Grimes Wash. The Cottonwood Creek drainage is about equal in size to the Huntington drainage and total discharge from each drainage is about 70,000 acre feet per year. The major cultural feature on Cottonwood Creek is the Joe's Valley Reservoir which is located about 12 miles west of the town of Orangeville. The 63,000 acre foot reservoir was constructed by the U. S. Bureau of Reclamation and provides storage water for irrigation, industrial and municipal needs in the Emery County area.

Limited flow information for 1979 was acquired from the Emery Water Conservancy District and the Cottonwood Consolidated Irrigation Company. Joe's Valley storage on September 30, 1978 was 48,530 acre feet. Total storage on September 30, 1979 was equal to 45,040 acre feet, or a net decrease of 3,490 acre feet for the water year.

Joe's Valley filled on June 4, 1979 and spill occurred until July 2. A peak flow of 585 CFS was observed below Joe's Valley Dam on June 15. About 68,000 acre feet of water was delivered for irrigation during the year and net runoff from the Cottonwood Creek drainage was approximately 64,000 acre feet, or 90% of normal. By comparison, the Cottonwood drainage yielded about 85,000 acre feet of water during 1978, indicating that 1979 runoff amounted to 76% of 1978.

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Water quality information for Cottonwood Creek (Straight Canyon) was acquired from the U. S. Geological Survey. The sampling station is located at the USGS stream gauging station site and is shown on Map 2-11. Table I shows the water quality characteristics of the samples obtained during 1979 plus a comparison with 1978 values. Additional quality data can be found in the Hydrologic Monitoring Plan Annual Report.

TABLE I: Cottonwood Creek (Straight Canyon) Water Quality

Parameter	1979 Avg.	1979 Max.	1979 Min.	1978 Avg.	1978 Max.	1978 Min.
pH	8.2	8.8	7.5	7.9	8.5	7.5
Sulfate	57.0	110	24	49	110	21
Total Dissolved Solids	283	353	215	271	372	203
Specific Conductance (umhos)	468	610	380	447	635	360

An analysis of the preceding table and lower Huntington Creek water quality indicates that both creeks have similar water quality characteristics. It would appear that the presence of Joe's Valley Reservoir would likely affect the characteristics of upstream runoff in a manner similar to Electric Lake on Huntington Creek. However, no water quality information is available to support that assumption.

The concentrations of the parameters shown in the table were somewhat higher in 1979 than the 1978 values. Water supplies were lower in 1979, which may account for higher mineral concentrations in the reduced water supply.

Utah Power & Light obtained water samples in two of the tributaries of the Cottonwood Creek drainage system, Cottonwood Creek and Grimes Wash (see Map 2-11).

The location where these samples were taken are as follows:

1. Above the Trail Mountain Mine

Location: 1,000 feet South, 2,100 feet West of the Northeast corner of Section 25, Township 17 South, Range 6 East.

2. Below the Trail Mountain Mine

Location: 1,000 feet North, 1,500 feet West of the Southeast corner of Section 25, Township 17 South, Range 6 East.

3. U.S.G.S. Flume

Location: 1,700 feet North, 200 feet East of the Southwest corner of Section 31, Township 17 South, Range 7 East.

4. Above Straight Canyon

Location: 300 feet South, 1,700 feet West of the Northeast corner of Section 7, Township 18 South, Range 7 East.

These sample data are discussed below.

Cottonwood Creek was sampled by Utah Power & Light in 1979 in the vicinity of the UP&L proposed Cottonwood portal to the Wilberg Mine. Five samples were obtained by Utah Power & Light during the period August through November 1979. The average values of the sample analyses are shown in Table

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J. Complete inorganic analyses of Utah Power & Light samples as well as water quality information furnished by the USGS can be found in Appendix E of the Water Monitoring Report. Location of the sample stations is shown on Map 2-13.

TABLE J: Water Quality of Cottonwood Creek

Parameter	Above Trail Mtn. Mine	Below Trail Mtn. Mine	At USGS Flume	Above Straight Canyon
Alkalinity	262	266	244	272
Iron	0.14	0.20	0.23	0.18
Oil and Grease	1.05	2.48	0.40	0.64
Sulfate	53	50	50	76
Suspended Solids	8.25	9.0	16.0	8.0
Total Dissolved Solids	386	356	332	391
pH	7.5	7.7	7.6	7.8

Limited flow information at the USGS flume on Cottonwood Creek shows that summer discharges vary from 250 to 350 gallons per minute or about 0.67 cubic feet per second on the average. It is assumed that spring runoff is much greater but USGS flow data was not available to support that assumption.

Grimes Wash is a tributary to Cottonwood Creek and flows from the same canyon in which the Deer Creek Mine 9th East breakout is located. Three permanent runoff sampling sites were established in 1980. They include the following (see Map 2-11).

1. Right Fork

Location: (Approximately 1,500 feet upstream from the inlet culvert for the disturbed area.) 550 feet North, 1,500 feet West of the Southeast corner of Section 22, Township 17 South, Range 7 East.

2. Left Fork

Location: (Approximately 50 feet upstream from the inlet culvert for the disturbed area of the Wilberg Mine.) 200 feet South, 2,350 feet East of the Northwest corner of Section 27, Township 17 South, Range 7 East.

3. Below the Wilberg Mine

Location: (Approximately 500 feet downstream from the outlet culvert below the disturbed area.) 1,770 feet South, 1,820 feet West of the Northeast corner of Section 27, Township 17 South, Range 7 East.

These locations were selected because they offer the best conditions for installation of flumes and accurately monitoring flow from the stream. Samples are, and will be, collected and flow measurements made by the applicant at these sites on a monthly basis during the runoff period. The sampling locations upstream from the mine workings are monitored within the same hour as the location which is downstream from the mine.

A sampling schedule was established in 1981 which includes collection of water (grab type) quality samples along with quantity measurements. This information is collected on a monthly basis during the first or second week of each month throughout the duration of the runoff season. If the drainage runoff persists through the winter months sampling will continue on a quarterly basis until the beginning of next runoff period. This sampling should provide data to construct discharge recession curves which will show the base flow of both Grimes Wash and Deer Creek.

The location of the flumes are such that they are accessible all year long. Some discussion has been made indicating that permanent recorders be used to collect the data. The applicant feels that the present method is preferred because the flumes must be cleared of sediment before each reading to insure accuracy and in winter months, a stilling well used in a continuous recorder would freeze rendering the data useless. The data collected to date and reported in the annual Hydrologic Montitoring Report (stream discharge hydrographs) shows clearly the base flow of the stream and its annual flow pattern.

Table K shows the average results of the 1979 sampling in Grimes Wash. Raw data can be found in the Hydrologic Monitoring Report.

TABLE K: Grimes Wash Water Quality

Parameter	Right Fork Above Mine (4 Samples)	Right Fork Below Mine (3 Samples)	Left Fork Above Mine (1 Sample)
Alkalinity	317	252	263
Iron	3.4	6.8	0.8
Oil and Grease	1.9	1.4	0.1
Sulfate	90	128	30
Suspended Solids	677	407	28
Total Dissolved Solids	523	308	327
pH	8.0	8.0	8.7

Revised 11/21/83
Revised 9/17/84
Revised 1/21/85

Of particular interest in Table K are the extremely high suspended sediment values from the Right Fork of Grimes Wash. The samples were obtained during May and June which coincides with the 1979 spring runoff period. It is expected that these high values would be reduced to lower values during low flow conditions occurring in late summer, fall, and winter.

East Mountain Springs

A number of springs and seeps contribute to the surface water bodies on and adjacent to UP&L East Mountain properties. An aerial survey and subsequent field work during the summer of 1979 confirmed the location of over 50 springs producing measurable amounts of water (see Map 2-12).

Table L is a tabulation of flow data and a listing of the formations from which these springs flow. The majority of springs on East Mountain occur in the North Horn Formation with the major flowing springs restricted to this formation. The North Horn Formation is composed of a sedimentary sequence of variegated shales, sandstone, conglomerates and fresh water limestone. The variability of composition of this formation would likewise lead to a variation in permeability.

Overlying the North Horn Formation is the Flagstaff Limestone, a highly fractured unit. The fractured nature of the Flagstaff allows for good vertical transport of water with little lateral movement resulting in the occurrence of few springs. The majority of water percolates down to the North Horn Formation. When an impermeable zone is intersected during the water's vertical movement, a lateral migration is promoted. If the ground surface is intersected by these waters, a spring is formed. This often is the case in the North Horn Formation where a large number of springs is to be found. Some portion of the water will make its way

TABLE L: East Mountain Springs Discharges

Spring	Elevation	Formation	Sample Date	Flow (GPM)	Sample Date	Flow (GPM)
Sheba Spring	9740	TKN-TF	7/10/79	12.0	10/22/79	0.95
Pine Spring	9940	TF	7/10/79	4.1	10/22/79	Dry
Pine Spring Trough	9920	TF	7/10/79	6.6	10/22/79	Dry
Upper Elk Spring	9350	TKN	7/10/79	1000.0 ?	10/22/79	75.0
Lower Elk Spring	9300	TKN	*7/10/79	350.0		
Ted's Tub	9250	TKN	7/10/79	65.0	10/22/79	12.0
Cove North Spring	8980	KPR	7/10/79	0.67		
Burnt Tree Spring	9260	TKN	7/10/79	12.0	10/22/79	1.9
79-1	9650	TKN-TF	7/10/79	40.0	10/22/79	5.0
79-2	9290	TKN	7/10/79	0.5		
79-3	9340	TKN	7/10/79	2.6		
79-4	9910	TF	7/11/79	2.4		
79-5	9910	TF	7/11/79	3.1		
79-6	9720	TKN-TF	7/11/79	0.86		
79-7	9710	TKN-TF	7/11/79	0.53		
79-8	9490	TKN	7/12/79	2.0		
79-9	9650	TKN	7/12/79	4.1		
79-10	9430	TKN	7/12/79	6.0		
79-11	9220	TKN	7/12/79	6.0		
79-12	9320	TKN	*7/12/79	8.5		
79-13	9290	TKN	7/12/79	6.0		
79-14	9340	TKN	7/12/79	1.5		
79-15	9290	TKN	7/13/79	2.0		
79-16	9600	TKN	7/13/79	12.0		
79-17	9450	TKN	7/13/79	0.5		
79-18	9500	TKN	7/14/79	4.0		
79-19	9460	TKN	7/14/79	3.0		
79-20	9500	TKN	7/14/79	40.0		
79-21	9340	TKN	7/14/79	20.0		
79-22	9340	TKN	7/14/79	14.0		
79-23	9030	TKN-KPR	7/14/79	8.5		
79-24	8870	KPR	*7/14/79	34.0	10/22/79	2.4
79-25	8910	TKN-KPR	7/15/79	10.0		
79-26	9340	TKN	7/15/79	8.0		
79-27	9330	TKN	7/15/79	10.0		
79-28	9340	TKN	*7/15/79	3.0	10/22/79	3.0
79-29	9350	TKN	7/26/79	4.0		
79-30	8900	TKN-KPR	7/26/79	1.5		
79-31	9270	TKN	7/26/79	0.6		
79-32	8850	KPR	7/26/79	1.4		
79-33	8710	KPR	7/26/79	1.4	10/22/79	1.3
79-34	9160	TKN	7/26/79	10.0		
79-35	9590	TKN-TF	7/26/79	20.0		
79-36	9080	TKN-KPR	7/27/79	1.3		
79-37	9140	TKN	7/27/79	1.4		
79-38	9070	TKN-KPR	7/27/79	2.0		
79-39	9270	TKN	8/23/79	14.0		
79-40	9030	KPR	8/23/79	0.4		

*No sample collected from these locations
TF - Flagstaff Limestone
TKN - North Horn Formation
KPR - Price River Formation

down to the Price River Formation where a few springs are located.

A review of the flow measurements presented in Table L reflects the influence of seasonal melt waters on spring water production. The large producing springs experienced a decrease in flow from between 82% to 93% from July to October. The smaller springs which are flowing from less permeable strata showed little or no difference in flow rates. These springs have a greater lag time thus responding to variations in recharge supplies more slowly.

The USGS conducted an extensive flow monitoring program on East Mountain during 1979. The results of flow monitoring for specific springs are presented in Table M.

A comparison of 1978 and 1979 discharges from East Mountain springs is presented in Table N. The numbers shown represent average values for each year.

TABLE M: USGS Flow Data for East Mountain Springs

Spring	Elevation	No. of Measurements	Flow (gpm) Avg.	Max.	Min.
Sheba Spring (Roans Canyon)	9,740	5	10.1	27	2.2
Pine Spring	9,940	5	11.8	49	0
Elk Spring	9,350	5	235	566	63
Burnt Tree	9,260	5	17.2	30	10
Jerk Water	-	5	2.3	3.8	1.2
Ted's Tub	9,250	5	51.3	167	3.3

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TABLE N: East Mountain Springs Discharges 1978-1979

Spring	1978 Flow in gpm	1979 Flow in gpm	1979 Expressed as % of 1978
Sheba Spring	4.9	10.1	206
Pine Spring	2.0	11.8	590
Elk Spring	164	235	143
Burnt Tree Spring	7.8	17.2	220
Jerk Water Spring	1.8	2.3	128
Total	180.5	276.4	153

An examination of the table reveals that discharges from East Mountain springs were greater in 1979 for the five springs listed. Total average flow for 1979 amounted to 153 percent of the 1978 flows. Interestingly, surface discharges in Cottonwood and Huntington Creeks were lower in 1979 while East Mountain spring discharges were significantly higher.

The water at all spring locations are highly mineralized but of good quality. Calcium carbonate derived from the dissolution of calcareous strata contributed to the high concentration of dissolved solids and alkalinity. A summary of the average values obtained for specific East Mountain springs is presented in Table O. Raw data for individual springs can be found in the Hydrologic Monitoring Plan Annual Report.

TABLE O: East Mountain Springs Water Quality

Parameter	Sheba	Pine	Elk	Ted's Tub	Cove North	Burnt Tree
pH	8.1	8.4	8.2	7.9	8.3	7.8
Alkalinity	223	392	241	272	256	278
Suspended Solids	0.2	32	1.9	2.3	0.1	0.1
Total Dissolved Solids	250	227	250	295	304	291
Sulfate	7.0	8.2	15.1	20.4	10.7	7.8
Iron	0.4	1.8	0.16	0.1	0.03	0.07
Oil and Grease	0.6	0.1	0.6	2.2	0.1	0.7
Turbidity (NTU)	0.4	6.3	0.6	1.5	5.0	1.2

Uses of Surface Waters

Nine springs have been developed in Huntington Canyon to provide for domestic, industrial and commercial water needs. Presently, Huntington City utilizes two springs in Huntington Canyon, Big Bear Canyon Springs and Little Bear Canyon Springs. The average discharge from these two springs amounted to 390 gallons per minute during 1979. The North Emery Water Users Association also utilizes springs in Huntington Canyon to provide for domestic and industrial water needs in areas outside of Huntington City. Presently, the Association is utilizing water from three springs (North Springs, South Springs and Side Canyon Springs) in Rilda Canyon as well as from four other springs in the general area which are shown on Map 2-11 and 2-12.

Available data indicate that the combined flow from the nine springs is approximately 230 gallons per minute. However, this flow represents average conditions and does not account for seasonal highs and lows.

North Emery Water Users Developed Springs

The three springs located in Rilda Canyon which have been developed for a culinary water supply by the North Emery Water Users Association warrant a detailed discussion because they represent the most significant developed water supply on or adjacent to the area to be mined on East Mountain.

These springs are located in the Starpoint Sandstone and are thought to be fracture related. West Appa Coal Company has studied the fracture systems in Rilda Canyon using stereo photo analysis, landsat imagery and very low frequency electromagnetic surveys. These data all indicate a north south trending fracture system which intersects the spring locations. Also, Vaughn Hansen and Associates has investigated springs located within the Starpoint Sandstone and located within the Huntington drainage and have concluded that the main spring occurrence is along fracture systems.

West Appa Coal Company conducted a detailed piezometric level study in the gravel canyon bottom located both to the east and west of the springs. This study indicated that as one approaches the spring from the west the piezometric level rises nearer the surface. At the spring and to the east, the gravels are saturated and the stream is perennial. They conclude that water is being produced from the fracture system or that water flowing down canyon in the gravel is restricted in flow across the fracture which raises the piezometric level.

The quantity of water discharged from the springs as reported by the West Appa Coal Company is as follows:

Discharge in GPM

Date	North Spring	Side Canyon	South Springs	Total
12- 7-81	123	22	13	158
9-14-82	255	30	15	300
10-15-82	218	25	14	257
11- 9-82	192	22	14	228

Because of the developed use of the water flowing from the Rilda Canyon springs UP&L will commit to closely monitor and study these springs to better understand their mode of occurrence and what effect mining might have on them.

Spring Discharge Monitoring

Water discharge from all the springs identified on East Mountain will be measured in early July of each year by the applicant. Generally, access to all the springs is not possible before early July because of snow drifts. Discharge of the springs that are accessible will also be measured each October to document seasonal flow variation.

In addition to this monitoring, a minimum of thirteen springs will be monitored to establish a discharge recession curve. In general, measurements will be made on a monthly basis during the months of July through September, if weather and reasonable access permits, but when historical data indicate that a spring is short-lived, all efforts will be made to measure discharge from that spring at least three times, equally spaced, within its flow period.

This will be done by measuring head behind a small "V" notch weir or by installing a pipe and measuring flow with a pail and stop-watch. If the flow to be measured has a discharge of less than 20 GPM, the measurement is made by channeling the flow through a three inch PVC pipe, catching the discharge in a one gallon bucket and measuring the elapsed time. When the discharge is between 20 GPM and 150 GPM a five gallon bucket is used and, where possible, two PVC pipes are placed side-by-side. In this case measurements are made of the discharge through each pipe and the values are totaled together. When using the bucket and stop-watch method an average of at least three consecutive readings is used to insure accuracy. When the discharge exceeds 150 GPM a portable V-notch weir is installed allowing for proper ponding upstream from the weir and drop at the weir. The method to measure discharge from each spring will be listed in the annual Hydrologic Monitoring Report. The data collected will then be plotted in the form of discharge recession curves on an annual basis. The springs to be studied in this manner will include: (1) Sheba, (2) 79-10, (3) 79-35, (4) 79-32, (5) 79-26, (6) 80-46, (7) 80-44, (8) 79-23, (9) Burnt Tree, (10) 82-52, (11) Elk, (12) North Springs, and (13) South Springs.

The findings of this study will be included in the annual hydrologic monitoring report.

Baseline water quality data has been established by sampling all of the springs since 1979. These data show little variation of water quality in time. Because of this the applicant will only test water samples annually from the springs that are within the boundary of the area to be mined in the next five years or those that overly the existing mine workings. As the five year mine plan takes in new areas, springs within those areas will be sampled and tested annually.

Figure 2-10 shows the springs which are currently within the area of the Deer Creek Mine workings and their relationship to the mine workings. Water quality samples are collected from all of these springs at least once per year.

Some of the springs on East Mountain have been developed for watering livestock by installing troughs. Also, Elk Springs and Burnt Tree Springs have limited use as culinary water for cabins in the area.

All data collected regarding the hydrology of East Mountain will be summarized by the applicant in an annual Hydrologic Monitoring Report. Copies of the report will be submitted to the OSM, U. S. Forest Service and Utah State Division of Oil, Gas and Mining. In addition, any raw data collected will be submitted to the Utah State Division of Oil, Gas and Mining on a quarterly basis.

Alternative Water Supply Information (783.17)

The mining completed in the Deer Creek Mine may alter or disrupt the flow of water on the surface of East Mountain. Presently, these waters are put to limited use for livestock and wild life, or in a few cases, for culinary water for cabins.

If the mining activities affect the surface waters, water from adjacent springs may be diverted to flow into the areas where other springs may have stopped flowing. Many springs are present in the area which could be diverted.

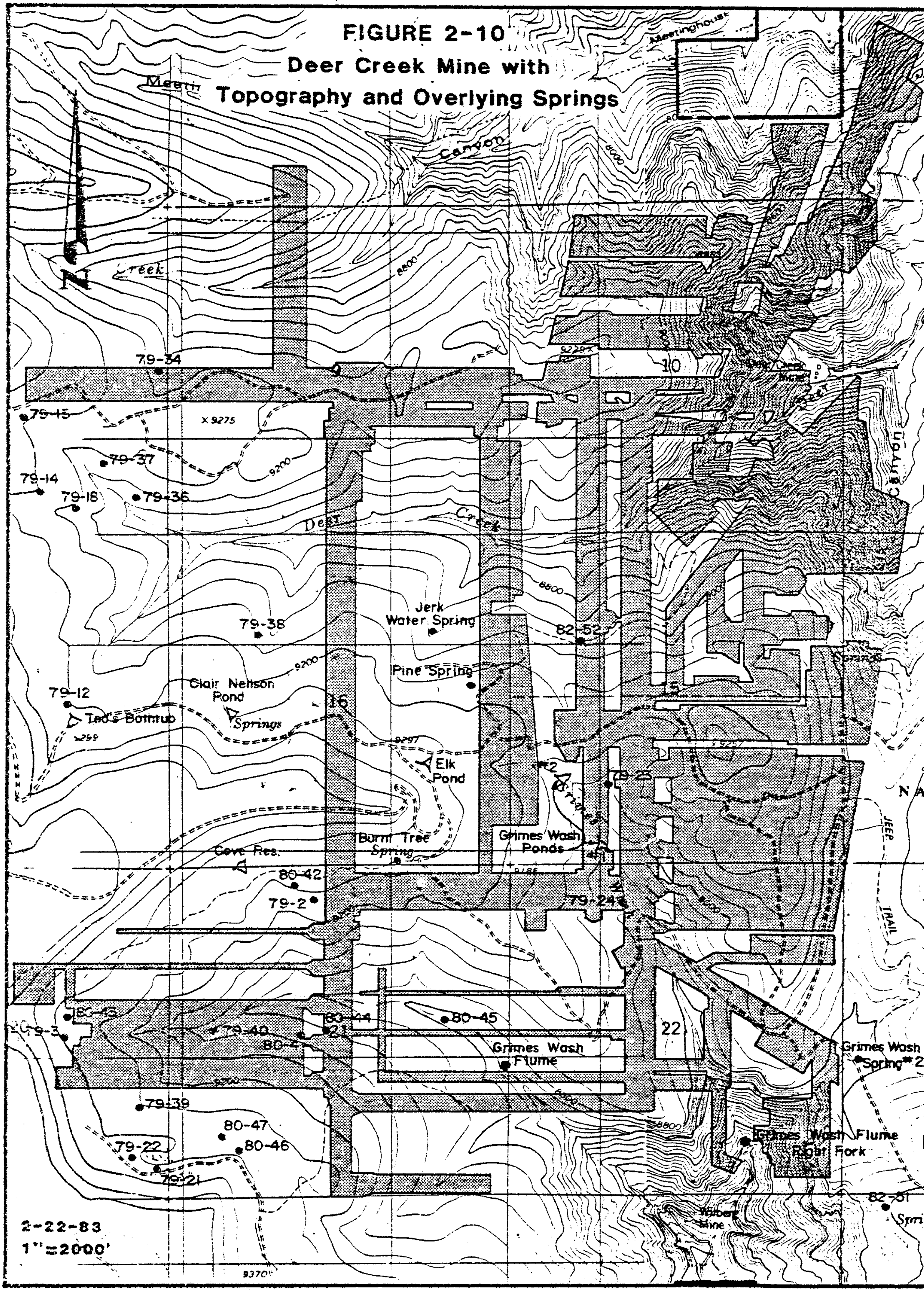
If the springs on East Mountain were not an ample water supply to replace the disrupted water, then water could be pumped to the surface from the Deer Creek Mine, surrounding streams, or wells which could be developed on the property.

CLIMATOLOGICAL INFORMATION (783.18)

Precipitation

Precipitation in Emery County during 1979 followed a pattern similar to the southern intermountain area, being characterized by heavy winter snowfall and light summer and fall rainfall.

FIGURE 2-10
Deer Creek Mine with Topography and Overlying Springs



Precipitation amounts have and will be recorded at the Hunter and Huntington Power Plants, Electric Lake Dam and on East Mountain. Table P shows the historical average precipitation at each location and the 1982 precipitation on a monthly basis. All data collected since 1979 has been documented in the Hydrologic Monitoring Report.

TABLE P: Emery County Precipitation

	Hunter Plant		Huntington Plant		Electric Lake		East Mountain	
	Historical Average[1]	1982[2]	Historical Average	1982	Historical Average	1982	Historical Average	1982
Oct	0.20	0.58	0.95	1.12	2.03	4.18	1.13	1.95
Nov	0.53	0.27	0.65	0.25	2.03	1.44	1.65	0.40
Dec	0.22	0.45	0.47	1.30	2.62	4.79	1.15	0.90
Jan	0.79	0.94	0.80	1.63	2.53	5.26	1.59	2.90
Feb	0.61	0.45	0.61	0.20	2.07	1.66	1.03	0.60
Mar	0.98	0.54	0.79	0.73	2.45	5.06	1.50	1.40
Apr	0.34	0.00	0.47	0.00	1.50	1.11	0.41	0.20
May	0.77	0.02	0.77	0.17	1.76	1.40	0.63	0.40
June	0.03	0.00	0.38	0.00	0.65	0.59	0.07	0.05
July	0.39	0.15	0.67	0.08	1.13	1.26	1.18	1.95
Aug	0.67	1.06	0.87	0.71	1.21	2.29	1.14	1.25
Sep	1.01	1.23	0.84	1.91	1.45	5.38	2.44	2.45
Year Total	6.54	5.69	8.27	8.10	21.43	34.42	13.92	14.45

1. Historical Average:

Hunter Plant	1975-1982
Huntington Plant	1970-1982
Electric Lake	1970-1982
East Mountain	1980-1982

2 1982 Water Year Oct 81 - Sept 82

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Temperature

Temperatures were highly variable during 1979 in Emery County. Winter temperatures were much colder than normal while summer temperatures were much warmer than normal. The average monthly temperatures and departures from normal during the 1979 water year are presented in Table Q.

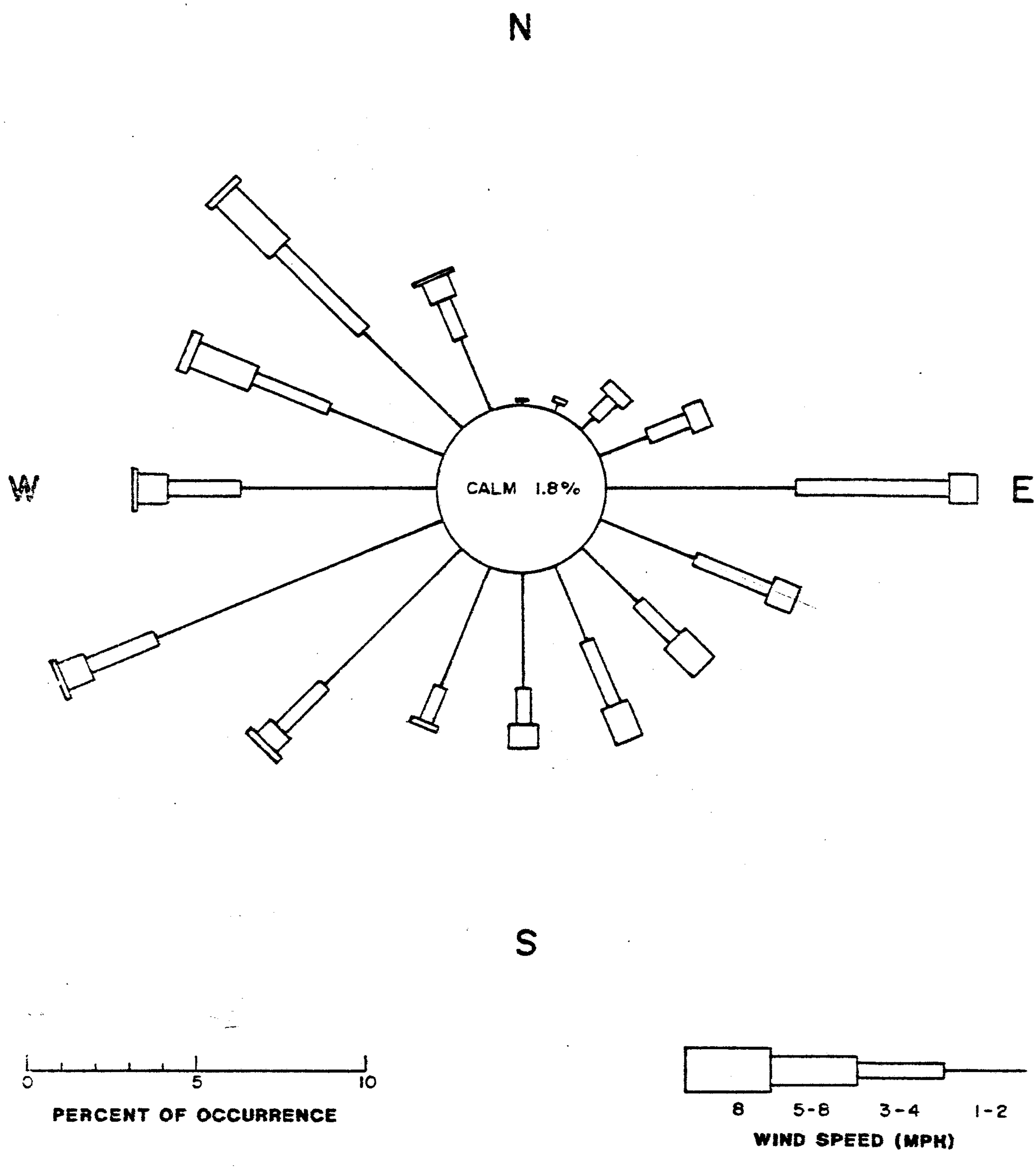
TABLE Q: Temperatures in Emery County, Utah

Month	Average Temp. (°F)	Departure From Normal	Average Temp. (°F)	Departure From Normal	Average Temp. (°F)	Departure From Normal
Oct.	53.4	+5.0	55.2	+5.8	43.4	+5.9
Nov.	37.8	+2.6	38.7	+2.7	27.4	+1.7
Dec.	17.4	-9.3	22.1	-5.3	12.4	-3.4
Jan.	13.4	-10.7	17.5	-6.1	11.8	-2.8
Feb.	20.1	-8.3	24.1	-6.1	17.9	-1.4
Mar.	35.5	-0.3	36.8	-0.9	25.1	+4.3
Apr.	45.9	+1.3	46.0	+0.9	31.7	+3.0
May	56.9	+4.8	55.9	+1.0	38.9	-0.1
June	68.0	+6.6	66.1	+0.3	49.8	+1.2
July	75.4	+7.0	73.5	+1.8	59.0	+3.3
Aug.	71.3	+4.9	67.2	-2.2	56.0	+2.2
Sept.	69.5	+10.8	65.6	+5.2	53.2	+5.7
Oct./Sept.	47.1	+1.2	47.4	-0.2	35.6	+1.7

A weather station was installed on East Mountain adjacent to the Deer Creek Mine permit area in October of 1979 (see Map 2-12 for location). Since that time temperature, humidity, and precipitation has been recorded. The data collected between October 1, 1979 and September 30, 1982 has been summarized in the 1982 Hydrological Monitoring Report, pages 4 to 15.

Winds

The winds in the area are generally variable. The wind rose presented in Figure 2-11 displays this variability for the Meetinghouse Ridge area for January to December 1978.



MEETINGHOUSE RIDGE JAN.-DEC. 1978

ALL TIMES

FIGURE 2-11

Vegetation Information for the Deer Creek Mine

Report Prepared for

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by

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July 1982

Deer Creek Coal Mine is situated in a narrow canyon. Most of the working, or flat areas, were constructed from soil material excavated from soil material excavated from the south canyon wall approximately 1970.

Removal of these materials have left open terraces which comprise an area of approximately 10 acres. Of the six terraces one, the lowest in elevation, is used for mining. The R.O.M. conveyor belt line is located along this cut bench.

This north-facing slope is a mixed conifer vegetational community with open areas of sage brush.

Applicant states that the disturbance was constructed prior to S.M.A.C.R.A. (Public Law 95-87), whose effective date was August 3, 1977 and that excluding the 4.0 acres associated with mining the remaining 6.0 acres is not included in the reclamation plan.

Tables in this report refer to the total 10 acres for reference only.

VEGETATION INFORMATION FOR THE DEER CREEK MINE

This reports the vegetation information for the Deer Creek Mining area. The Deer Creek Mine was existing at the time of vegetational sampling.

Methodology

Six vegetation types were identified within the permit area and adjacent areas and mapped (scale 1:24,000). Aerial photography (scale 1:24,000) and field reconnaissance were utilized to construct the vegetation map. Aerial photography (taken in 1962) and the vegetation of adjacent canyons and areas were used to infer what species composition and aerial cover were before the present disturbance occurred at the Deer Creek mining site (see Map 2-14.

Reference sites to represent vegetation types disturbed by mining were located as close to the disturbed areas as feasible. Differences in species composition, total plant cover, aspect, soil and geology were minimized between the disturbed area and reference site. The reference sites were marked in the field with metal T-posts and located on the vegetation map (Maps 2-15). Pinyon-juniper, mixed-conifer and riparian were the vegetation types disturbed by mining activities.

Vegetation analyses of the reference sites consisted of developing a list of plant species by life form, measuring total plant cover, and determining shrub density and composition. Also, tree density by size class was determined.

Total plant cover was measured by the step-point method. Plant species cover, litter, rock or bare ground was determined every third pace along a 20 point transect. The starting point and direction of each transect was randomly selected.

The point-center quarter method was used to measure shrub density in all reference areas and tree density within the riparian vegetation type. At each sampling point two perpendicular lines were inscribed to delineate four quarters centered over the sampling point. The distance from the nearest plant in each quarter to the sampling point was measured and then the shrub or tree was identified. Shrub and tree density was determined by the following equations:

$$A_j = (Y_1 + Y_2 + Y_3 + Y_4/4)^2$$

$$D = U(\Sigma A_j/N)$$

where:

Y_1 = distance from point nearest shrub in ith quarter,

A_j = mean area per sampling point,

N = sample size,

D = density, the number of shrubs per unit area,

U = unit area.

Five sampling points were placed 15 paces apart along a transect. The starting point and direction of each transect was randomly located.

Tree density was obtained in the pinyon-juniper and mixed-conifer reference areas by a complete enumeration by species. Tree size class was determined by measuring diameter at breast height (DBH) for all tree species except pinyon pine and Utah juniper which were measured at the base.

Statistical adequacy for sample size for aerial plant cover and woody plant density was determined by the following formula:

$$N_{min} = t^2 s^2/(d\bar{x})^2$$

where:

N_{min} = minimum sample size,

t = t-value for a 2-tailed test,

s = standard deviation,

d = allowable change in sample mean,

$\bar{x}$ = sample mean.

Sample size for aerial cover was tested at the 90 percent confidence level ($t_{0.10,\infty}=1.65$) with a 10 percent error of the mean (d=0.10). Plant density sample size was tested at the 80 percent confidence level ($t_{0.20,\infty}=1.282$) with 10 percent error of the mean (d=0.10). Adequacy for aerial cover and density was calculated after 10 and 20 samples, respectively. Table 1 gives the minimum sample size and observed sample size for the reference areas. Data presented hereafter are based on the observed sample size.

Plant composition based on density was determined by the following equations:

$$C = S_i/T$$

$$T = \Sigma S_i$$

where: S_i = total individuals of the ith species,

T = total number of shrubs sampled,

C = shrub composition.

Jaccard's Community Coefficient was used to quantify the similarity in plant species between the reference and disturbed area. The Coefficient is:

$$I.S. = (C/A+B-C)100\%$$

where: I.S. = index of similarity,

A = total species in community a,

B = total species in community b,

C = number of species common to both.

The Shannon Index was used to calculate species diversity for the reference areas. The index is:

$$H' = \Sigma P_i \ln P_i$$

where: H'=species diversity index,

P_i=proportion of the observations found in category i.

Diversity calculations are based on ground cover by species. The maximum possible diversity for a reference area is:

$$H'_{max} = \ln K$$

where: H'_{max}=maximum diversity,

K=the number of categories, i.e., species.

The ratio between H' and H'_{max} is referred to as species evenness. This is calculated as:

$$J = H'/H'_{max}$$

where: J=species evenness.

United States Forest Service and Utah Division of Wildlife Resources personnel located in Price, Utah were consulted on August 15 and 16, 1980 with regards to livestock and big game vegetational use within the permit area.

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Aerial plant cover and tree density measurements for the mixed-conifer, riparian, and pinyon-juniper reference areas were measured on August 12-15, 1980 and analyzed September 8 and 9, 1980. Shrub density data for the riparian and pinyon-juniper reference areas were collected on April 16, 1982 and analyzed April 21, 1982. Shrub density for the mixed-conifer reference area was measured June 17, 1982 with data analyzed June 22, 1982.

Permit Area Vegetation

The mine property permit area is 18,000 acres. Six major vegetation types were identified within the permit area and adjacent land (see 2-14, Vegetation Map). Mixed conifer, pinyon-juniper, sagebrush, grass, riparian and salt desert shrub are the six vegetation types (Table 2). The mixed-conifer type occurs primarily at the higher elevations (above 9,000 ft.) or at lower elevations with a northern exposure. The pinyon-juniper vegetation type is found on the steep, rocky slopes with a southern exposure and the relatively flat ground at lower elevations (7,000 ft.). At the higher elevations and on north-facing slopes, it is common for the pinyon-juniper community to inter-mix with the mixed-conifer community. Elevation for this vegetation type varies from 7,000 to 9,000 feet. The sagebrush and grass vegetation types also occur at the high elevations, but are restricted to the drier sites than the mixed conifer. The riparian vegetation type is located along Deer Creek, Cottonwood and Grimes Wash. This vegetation type is better developed along Deer Creek below the mine, than along Cottonwood and Grimes Wash. The salt-desert shrub vegetation type is not found within the permit area, but is located on adjacent land. It has a southern exposure and elevation varies from 6,600 to 7,600 feet.

Area Disturbed by Mining

Table 3 lists the vegetation types and acres disturbed by mining activities.

The disturbed area of the Deer Creek Mine totals about 20 acres. Elevation is approximately 7,500 feet. The general slope varies around 33-36°. Average annual precipitation varies around 10 inches. The aspect of this area is mainly northern and southern. The vegetation type occurring on the northern exposure is mixed-conifer. A pinyon-juniper vegetation type is found on the southern exposure.

The mixed-conifer vegetational type was dominated by white fir and Douglas fir (Table 4). Common plants were Saskatoon serviceberry, elderberry, mountain snowberry, corymbed eriogonum, Louisiana sage, bluebunch wheatgrass and salina wildrye. Total aerial cover varied around 47 percent. Soils were probably an Argiboroll-Cryoboroll complex. The disturbed area is 10 acres.

The pinyon-juniper vegetation type was characterized by Utah juniper and pinyon pine (Table 5). Saskatoon serviceberry, Morman tea and low rabbitbrush were the common shrubs. Bluebunch wheatgrass, saline wildrye, Indian ricegrass and corymbed eriogonum were the dominant herbaceous plants. Total aerial cover varied from 37 to 40 percent. Soils were probably a Torriorthent. The disturbed area is 19.5 acres.

A third vegetation type disturbed by mining activities is the riparian area along Deer Creek. This is a perennial stream that flows in a northeast direction. Dominant woody plants were narrowleaf cottonwood, white fir, Douglas fir, Rocky Mountain maple, redosier dogwood and Saskatoon serviceberry (Table 6). Aerial plant cover varied around 70 percent. Soils were probably a Haploboroll. The disturbed area is 1.5 acres.

Reference Sites

Three reference sites were established to represent the vegetational types disturbed by mining activities (Table 7, 8 and 9; Map 2-15).

The reference site for the mixed-conifer vegetation type has a northwestern exposure and is located at 7,800 feet elevation. Slope varies from 33-36°. Important plants include white fir, Douglas fir, Saskatoon serviceberry, elderberry, mountain snowberry, corymbed eriogonum, galium, hoary aster, bluebunch wheatgrass and salina wildrye (Table 10). Total aerial cover is 46% with the woody plants contributing the most cover (Table 11). Shrub density is 3,290 plants per acre (Table 12). Wild buckwheat has the greatest density while Rocky Mountain maple and myrtle pachistima are the least dense. There are 30 trees/acre in referenced area

(Table 13). Douglas fir is the most common tree. Also, the majority of trees occur within the smallest size class. The species diversity index is 2.46. The soils belong to the Beenom-Comodore complex. The Beenom series is a loamy mixed Lithic Agriboroll, while the Comodore series is a loamy-skeletal Lithic Cryoboroll. The reference site is 5,155 m^2 (see 2-112).

The reference site (5,422 m^2) for the pinyon-juniper vegetation has a southeastern exposure and is located at 7,800 feet elevation. Slope varies around 35°. Dominant plants include Utah juniper, pinyon pine, Saskatoon serviceberry, Morman tea, corymbed eriogonum, bluebunch wheatgrass and salina wildrye (Table 14). Total aerial plant cover is 37% with trees and grasses providing most of the cover (Table 15). Shrub density is 554 plants per acre (Table 16). Cutler ephedra has the greatest density while mountain snowberry and curlleaf mountain mahogany are the least. Tree density is 30 plants per acre with Utah juniper being the most common (Table 17). The majority of trees occur within the largest size class. The species diversity index is 2.03. The soils belong to the Sunup series of the loamy-skeletal mixed mesic Lithic Ustic Torriorthent.

The reference site (4,500 m^2) for the riparian vegetation type is located along Deer Creek with an elevation of 7,100 feet. This vegetation type is located on the steep banks of Deer Creek. Important plants include narrowleaf cottonwood, white fir, Douglas fir, redosier dogwood, Rocky Mountain maple and mountain snowberry (Table 18). Aerial plant cover is 73 % with trees being the dominant life form (Table 19). Shrub density is 1,166 plants per acre (Table 20). Rocky Mountain maple has the greatest density while skunk bush is least. Tree density is 2,246 plants per acre (Table 21). Douglas fir has the greatest density while Rocky Mountain juniper is the least. The majority of trees occur in the smallest size class. The species diversity index is 1.87. The soils of the Riparian reference site are a complex of a fine loamy Cumulic Haploboroll and a loamy skeletal Cumulic Haploboroll.

Wildlife and Livestock

The mining permit area is located within the Ferron Ranger District of the Manti-LaSal National Forest managed by the United States Forest Service. Both wildlife and livestock utilize the permit area for grazing. However, wildlife and livestock grazing is limited to the higher elevations. Very little wildlife and livestock grazing occurs on the steep slopes where the mine is located.

Deer, elk and moose utilize the area for grazing (Table 22). Deer have a greater impact on the vegetation than elk or moose because of their high numbers.

Besides wildlife use, the area provides summer grazing for cattle (Table 23). Cattle grazing occurs on the East Mountain allotment of the Ferron Ranger District. For the past several years, there has been a 10 percent non-use of the available AUM's. In 1980, all AUM's were utilized. Overall range condition is fair.

Endangered or Threatened Plants

During the vegetation sampling, no endangered or threatened plant species were identified.

The current range condition of the mine and reference areas is judged as fair when correlated with USFS' assessment of the East Allotments (Land Use Section 783.22). The opportunity for improvement is very limited because of the inherent characteristic of the pinyon-juniper overstory to inhibit understory development. Also these steep sites are limited by the lack of soil and numerous rock masses.

PINYON-JUNIPER PRODUCTIVITY[1]

1. Soil Conservation Service, Soil Survey Carbon-Emery Area 1979
   Kenilworth very stony sandy loam, Wood Hill Range Site, Price, excellent condition (understory intact).
   900-1250 lbs./acre (dry weight)

2. U. S. Forest Service, Ferron Ranger District
   John Healy, Range Conservationist

   a. East Mtn. Allotment, two pinyon-juniper bench sites rated in 1982 fair condition
      150-160 lbs./acre (dry weight).

   b. Two mixed conifer sites (Deer Creek drainage) rated in 1982, fair condition
      167-290 lbs./acre (dry weight)

3. Bureau of Land Management, San Rafael Planning Unit
   Wilberg and West Huntington Allotments, fair condition
   Current stocking rates 60-100 lbs./acre (dry weight)[2]

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[1] Fifty percent of the total forage production is the annual growth of the pinyon and juniper trees.

[2] Based on 800 lbs. forage = 1 AUM.

The productivity for the pinyon-juniper reference site on the steep slopes is estimated at 25-100 lbs/acre (dry weight). This is inferred from the data on the benches and comparisons of the sites.

Riparian Productivity

1. Soil Conservation Service, Soil Survey Carbon-Emery Area 1979
   Wet stream bottom range site, Huntington Creek, mixed alluvial lands between stream bank and steep side hills. (1500-2500 lbs./acre (dry weight).

The mixed conifer reference site is located in an area that is most representative of the disturbed area, i.e., 50% trees and 50% understory.

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

350 North 4th East
Price, Utah 84501

October 19,1989

Mr. Val Payne
Utah Power & Light
P.O. Box 310
Huntington, Utah 84528

Dear Mr. Payne:

Here is the summary of the sites that Mr. Davis and I visited. Below is the information that is needed.

Veg.Type	Ecolog Cond.	Present Prod.	Potential Prod.
DES-BEE-DOVE MINE			
Pinyon-Jun.	Fair	800	1,000
Saltbush	Fair	150	200
DEER CREEK MINE			
Mixed Conifer	Good	2,000	2,500
Pinyon-Jun.	Good	800	900
Riparian	Fair	1,800	3,000
COTTONWOOD WILBERG			
Pinyon-Jun. (Fan Portal)	Good	1,800	1,800
Pinyon-Jun. (Wasterock Storage)	Fair	700	1,200
Pinyon-Jun. (Wasterock Storage)	Fair	400	1,200
Pinyon-Jun.	Good	600	900
Black Sage (Wasterock Storage)	Fair	250	500
Saltbush (Wasterock Storage)	Good	125	150

The production for the sites above are based on an average year.

George S. Cook
Range Conservationist
Price, Utah

Table 1. Sample adequacy for aerial plant cover and shrub density (tree density for riparian) for the mixed-conifer, pinyon-juniper, and riparian reference areas at the Deer Creek Mine.

Reference Site	Parameter	$N_{min.}$[1]	$\bar{x}$	S.D.	$N_{obs.}$
Mixed-conifer	Aerial cover	9	50.5	11.65	20
	Shrub density	21	1.29[2]	0.46	25
Pinyon-juniper	Aerial cover	9	33.0	7.52	20
	Shrub density	37	7.59[2]	3.11	45
Riparian	Aerial cover	7	68.50	13.55	18
	Shrub density	117	2.75[2]	2.32	40
	Tree density	15	1.81[2]	0.54	20

[1]Determined after 10 and 20 samples for aerial cover and density, respectively.
[2]Sample mean of mean area per plant (m^2).

Table 2. Vegetation types and size of each that are found within the permit area and adjacent land.

Vegetation Type	Total Acres	% of Permit Area
Mixed Conifer	9,037.1	50.2
Pinyon-juniper	4,524.4	25.1
Sagebrush	4,053.0	22.5
Grass	301.5	1.7
Riparian	84.0	0.5
TOTAL	18,000.0	100.0
Salt Desert Shrub[1]	281.71	0

[1]The salt desert type is located on land adjacent to the permit area. It is influenced by the Des-Bee-Dove Pond (see vegetational map).

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Table 3. Vegetation types, number of acres and percent of vegetation type disturbed by mining at the Deer Creek Mine.

Vegetation Type	Area Disturbed	% of Vegetation Type
Pinyon-juniper	19.5	0.4
Mixed-conifer	10	0.1
Riparian	5	6.0

Table 4. Plant species that are inferred to have grown within the disturbed portion of the mixed-conifer vegetation type at the Deer Creek Mine.

Scientific Name	Common Name
Trees	
Abies concolor	White fir
Juniperus scopulorum	Rocky Mountain juniper
Pinus edulis	Pinyon pine
P. flexilis	Limber pine
Populus tremuloides	Quaking aspen
Pseudotsuga menziesii	Douglas fir
Shrubs	
Artemisia tridentata	Big sagebrush
Amelanchier alnifolia	Saskatoon serviceberry
Berberis repens	Creeping barberry
Chrysothamnus nauseosus	Rubber rabbitbrush
C. viscidiflorus	Low rabbitbrush
Clematis sp.	Virginsbower
Eriogonum sp.	Wild buckwheat
Rhus trilobata	Skunkbush
Ribes aureum	Golden current
Sambucus cerulea	Elderberry
Symphoricarpos oreophilus	Mountain snowberry
Forbs	
Artemisia ludoviciana	Louisiana sage
Castilleja chromosa	Indian paintbrush
Eriogonum corymbosum	Corymbed eriogonum
Galium sp.	Galium
Heterotheca villosa	Hairy goldaster
Machaeranthera canescens	Hoary aster
Melilotus officinals	Yellow sweetclover
Senicio multilobatus	Lobeleaf groundsel
Trifolium sp.	Clover
Grasses	
Agropyron spicatum	Bluebunch wheatgrass
Elymus salinus	Salina wildrye
Festuca sp.	Fescue
Poa pratensis	Kentucky bluegrass

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Table 5. Plant species that are assumed to have grown within the disturbed portion of the pinyon-juniper vegetation type at the Deer Creek Mine.

Scientific Name	Common Name
Trees	
Abies concolor	White fir
Juniperus osteosperma	Utah juniper
Pinus edulis	Pinyon pine
Pseudotsuga menziesii	Douglas fir
Shrubs	
Amelanchier alnifolia	Saskatoon serviceberry
Artemisia tridentata	Big sagebrush
Chrysothamnus viscidiflorus	Low rabbitbrush
C. nauseosus	Rubber rabbitbrush
Ephedra cutleri	Morman tea
Symphoricarpos oreophilus	Mountain serviceberry
Xanthocephalum sarothrae	Snakeweed
Forbs	
Artemisia ludoviciana	Louisiana sage
Eriogonum corymbosum	Corymbed eriogonum
Cryptantha flavoculata	Cryptantha
Galium sp.	Galium
Hedysarum boreale	Utah sweetvetch
Machaeranthera canescens	Hoary aster
Petradoria pumila	Rock goldenrod
Grasses	
Agropyron spicatum	Bluebunch wheatgrass
Elymus salinus	Salina wildrye
Oryzopsis hymenoides	Indian ricegrass

Table 6. Plant species that are assumed to have grown within the disturbed portion of the riparian vegetation type at the Deer Creek Mine.

Scientific Name	Common Name
Trees	
Abies concolor	White fir
Juniperus scopulorum	Rocky Mountain juniper
Populus angustifolia	Narrowleaf cottonwood
P. tremuloides	Quaking aspen
Pseudotsuga menziesii	Douglas fir
Shrubs	
Acer glabrum	Rocky Mountain maple
Amelanchier alnifolia	Saskatoon serviceberry
Berbis repens	Creeping barberry
Cornus stolonifera	Redosier dogwood
Physcocarpus sp.	Ninebard
Rhus trilobata	Skunk bush
Rosa woodsii	Woods rose
Salix exigua	Coyote willow
Symphoricarpos oreophilus	Mountain snowberry
Forbs	
Artemisia ludoviciana	Louisiana sage
Cirsium vulgare	Bull thistle
Ipomopsis aggregata	Skyrocket gilia
Machaeranthera canescens	Hoary aster
Melilotus officinalis	Yellow sweetclover
Trifolium sp.	Clover
Grasses	
Bromus tectorum	Cheatgrass
Festcua sp.	Fescue
Poa pratensis	Kentucky bluegrass
Stipa commata	Needle-and-Thread grass

Table 7. Similarity between the mixed-conifer reference area and disturbed site at the Deer Creek Mine.

Parameter	Reference	Disturbed
Cover, %	46.5	44-48
Density, No/Acre		
Shrub	3,290	-
Tree	40	-
Species composition, s[1]	31	30
Aspect	Northwest	Northwest
Elevation, ft.	7,800	7,500-7,800
Slope, °	33-36	33-36
Soil	Argiboroll-Cryoboroll	Argiboroll-Cryoboroll
Geology	Colluvial	Colluvial
H'	2.46	-
H'_{max}	2.94	-
J	0.84	-
Index of similarity, %	72.2	

[1]total plant species.

Table 8. Similarity between the pinyon-juniper reference area and disturbed site at the Deer Creek Mine.

Parameter	Reference	Disturbed
Cover, %	37.0	36-40
Density, No/Acre		
Shrub	554	-
Tree	30	-
Species composition, s[1]	20	21
Aspect	Southeast	Southeast
Elevation, ft.	7,800	7,500-7,700
Slope, °	33-36	33-36
Soil	Torriorthent	Torriorthent
Geology	Colluvial	Colluvial
H'	2.03	-
H'_{max}	2.39	-
J	0.85	-
Index of similarity, %	73.9	

[1]total plant species.

Table 9. Similarity between the riparian reference area and disturbed site at the Deer Creek Mine.

Parameter	Reference	Disturbed
Cover, %	72.7	70-75
Density, No/Acre		
Shrub	1,166	-
Tree	2,246	-
Species composition, s[1]	25	24
Aspect	Northeast	Northeast
Elevation, ft.	7100	7100-7600
Slope, °	35-40	30-40
Soil	Haploboroll	Hapolboroll
Geology	Alluvium	Alluvium
H'	1.87	-
H'_{max}	2.63	-
J	0.71	-
Index of similarity, %	68.9	

[1]total plant species.

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Table 10. Plant species occurring within the mixed-conifer reference area at the Deer Creek Mine.

Scientific Name	Common Name
Trees	
Abies concolor	White fir
Pinus edulis	Pinyon pine
P. flexilis	Limber pine
Pseudotsuga menziesii	Douglas fir
Shrubs	
Acer glabrum	Rocky Mountain maple
Amelanchier alnifolia	Saskatoon serviceberry
Berberis repens	Creeping barberry
Chrysothamnus viscidiflorus	Low rabbitbrush
Clematis sp.	Virginsbower
Eriogonum sp.	Wild buckweat
Pachistima myrtinises	Myrtle pachistima
Ribes aureum	Golden current
Sambucus cerulea	Elderberry
Symphoricarpos oreophilus	Mountain snowberry
Xanthocephalum sarothrae	Snakeweed
Forbs	
Artemisia ludoviciana	Louisiana sage
Castilleja chromosa	Indian paintbrush
Cirsium vulgare	Bull thistle
Eriogonum corymbosum	Corymbed eriogonum
Floerkea proserpinacoides	False mermaid
Galium sp.	Galium
Heterotheca villosa	Hairy goldaster
Machaeranthera canescens	Hoary aster
Melilotus officinales	Yellow sweetclover
Petradoria pumila	Rock goldenrod
Senecio multilobatus	Lobeleaf groundsel
Trifolium sp.	Clover
Grasses	
Agropyron spicatum	Bluebunch wheatgrass
Elymus salinus	Salina wildrye
Festcua sp.	Fescue
Poa pratensis	Kentucky bluegrass

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Table 11. Ground cover by species for the mixed-conifer reference area at the Deer Creek Mine.

Item	Percent Cover	
Trees	12.0	
Douglas fir		9.5
White fir		1.5
Pinyon pine		1.0
Shrubs	12.3	
Saskatoon serviceberry		3.8
Mountain snowberry		2.8
Creeping barberry		1.5
Low rabbitbrush		1.3
Golden current		1.3
Snakeweed		1.3
Elderberry		0.3
Forbs	9.0	
Corymbed eriogonum		3.3
Galium		2.0
Rock goldenrod		1.5
Indian paintbrush		0.8
Louisiana sage		0.3
Bull thistle		0.8
Hoary aster		0.3
Grasses	14.3	
Bluebunch wheatgrass		7.3
Salina wildrye		7.0
Total plant cover	46.5	
Litter	10.0	
Rock	15.5	
Bare ground	28.0	

Table 12. Shrub density and composition for the mixed-conifer reference area at the Deer Creek Mine.

Species	Composition (%)	Density (No/Acre)[1]
Wild buckwheat	27	887
Saskatoon serviceberry	24	790
Mountain snowberry	24	790
Low rabbitbrush	12	395
Creeping barberry	9	296
Snakeweed	2	66
Myrtle pachistima	1	33
Rocky Mountain maple	1	33
	100	3290

[1]Based on 25 sample observations. The mean area per plant was $1.23m^2$

Table 13. Tree density and composition by size class within the mixed-conifer reference area at the Deer Creek Mine.

	Diameter at Breast Height (inches)				
Species	0-4	5-10	11-20	>20	Composition (%)
White fir	14	4	5	0	39.7
Douglas fir	16	4	4	4	48.3
Pinyon pine	1	1	0	0	3.4
Limber pine	2	3	0	0	8.6
% of Total	56.9	20.7	15.5	6.9	100

Table 14. Plant species occurring within the pinyon-juniper reference area at the Deer Creek Mine.

Scientific Name	Common Name
Trees	
Juniperus osteosperma	Utah juniper
Pinus edulis	Pinyon pine
Pseudotsuga menziessi	Douglas fir
Shrubs	
Amelanchier alnifolia	Saskatoon serviceberry
Artemisia tridentata	Big sagebrush
Cercocarpus ledifolius	Curlleaf mountain mahogany
Chrysothamnus viscidiflorus	Low rabbitbrush
Ephedra cutleri	Cutler ephedra
Symphoricarpos oreophilus	Mountain snowberry
Xanthocephalum sarothrae	Snakeweed
Forbs	
Artemisia ludoviciana	Louisiana sage
Cryptantha flavoculata	Cryptantha
Eriogonum corymbosum	Corymbed eriogonum
Galium sp.	Galium
Heterotheca villosa	Hairy goldaster
Petradoria pumila	Rock goldenrod
Senecio multilobatus	Lobeleaf groundsel
Grasses	
Agropyron spicatum	Bluebunch wheatgrass
Elymus salinus	Salina wildrye
Oryzopsis hymenoides	Indian ricegrass

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Table 15. Ground cover by species for the pinyon-juniper reference area at the Deer Creek Mine.

Item	Percent Cover	
Trees	11.1	
Utah juniper		6.3
Pinyon pine		4.5
Douglas fir		0.3
Shrubs	8.5	
Cutler ephedra		5.0
Saskatoon serviceberry		3.0
Low rabbitbrush		0.5
Forbs	2.3	
Corymbed eriogonum		2.0
Galium		0.3
Grasses	15.4	
Bluebunch wheatgrass		8.8
Salina wildrye		4.3
Indian ricegrass		2.3
Total plant cover	37.0	
Litter	7.8	
Rock	15.2	
Bare ground	40.0	

Table 16. Shrub density and composition for the pinyon-juniper reference area at the Deer Creek Mine.

Species	Composition (%)	Density (No/Acre)
Cutler ephedra	51	283
Saskatoon serviceberry	44	244
Low rabbitbrush	3	17
Mountain snowberry	1	5
Curlleaf mountain mahogany	1	5
	100	554

[1]Based on 45 observations. The mean area per plant is $7.31m^2$.

Table 17. Tree density and composition by size class within the pinyon-juniper reference area at the Deer Creek Mine.

	Diameter at Breast Height (inches)				
Species	0-4	5-10	11-20	>20	Composition (%)
Pinyon pine	5	3	1	6	37.5
Utah juniper	8	2	3	9	55.0
Douglas fir	0	2	1	0	7.5
% of Total	32.5	17.5	12.5	37.5	100

Table 18. Plant species occurring within the riparian reference area at the Deer Creek Mine.

Scientific Name	Common Name
Trees	
Abies concolor	White fir
Juniperus scopulorum	Rocky Mountain juniper
Populus angustifolia	Narrowleaf cottonwood
Pseudotsuga menziesii	Douglas fir
Shrubs	
Acer glabrum	Rocky Mountain maple
Amelanchier alnifolia	Saskatoon serviceberry
Berberis repens	Creeping barberry
Cornus stolonifera	Redosier dogwood
Physocarpus sp.	Ninebark
Rhus trilobata	Skunkbush
Rosa woodsii	Woods rose
Salix exigua	Coyote willow
Symphoricarpos oreophilus	Mountain snowberry
Xanthocephalum sarothrae	Snakeweed
Forbs	
Artemisia ludoviciana	Louisiana sage
Cirsium vulgare	Bull thistle
Ipomopsis aggregata	Skyrocket gilia
Machaeranthera canescens	Hoary aster
Melilotus officinalis	Yellow sweetclover
Penstemon sp.	Penstemon
Trifolium sp.	Clover
Grasses	
Agropyron sp.	Wheatgrass
Bromus tectorum	Cheatgrass
Oryzopsis hymenoides	Indian ricegrass
Stipa commata	Needle-and-Thread grass

Table 19. Ground cover by species for the riparian reference area at the Deer Creek Mine.

Item	Percent Cover	
Trees	41.1	
Narrowleaf cottonwood		23.6
Douglas fir		10.8
Rocky Mountain juniper		6.4
White fir		0.3
Shrubs	28.2	
Rocky Mountain maple		19.2
Redosier dogwood		5.6
Woods rose		1.7
Saskatoon serviceberry		1.1
Mountain snowberry		0.3
Skunkbush		0.3
Forbs	3.3	
Bull thistle		1.9
Hoary aster		1.1
Skyrocket gilia		0.3
Grasses	0.3	
Indian ricegrass		0.3
Total plant cover	72.7	
Litter	10.9	
Rock	4.2	
Bare ground	12.2	

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Table 20. Shrub density and composition for the riparian reference area at the Deer Creek Mine.

Species	Composition (%)	Density (No/Acre)[1]
Rocky Mountain maple	41	478
Woods rose	20	233
Redosier dogwood	16	187
Mountain snowberry	8	93
Creeping barberry	5	58
Saskatoon serviceberry	4	47
Coyote willow	4	47
Ninebark	1	12
Skunkbush	<1	<11
	100	1166

[1]Based on 40 observations. The mean area per plant is $3.47m^2$.

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Table 21. Tree density and composition by size class within the riparian reference area at the Deer Creek Mine.

	Diameter at Breast Height (inches)				
Species	0-4	5-10	11-20	>20	Composition (%)
Narrowleaf cottonwood	466	217	123	155	38.6
Douglas fir	923	94	0	66	43.8
White fir	217	94	0	0	12.6
Rocky Mountain juniper	94	32	0	0	5.0
% of Total	68.4	17.7	5.0	8.9	100

Table 22. Deer, elk and moose utilization on the Ferron Ranger District of the Manti-LaSal National Forest.

Wildlife	Unit	High Priority[1] Summer Range	Winter[2] Range	AUM[3]	No.[4]
Deer	34 N	6,500	-	274	289
	35 S	5,450		282	297
			3,055	73	65
Elk	Manti Range	12,685	-	365	126
			2,320	27	8
			Critical 1,040	120	35
Moose	Entire allotment (Year Long)		15,005	130	13

[1]Total acres
[2]Total acres
[3]Animal unit month
[4]Total animals

Table 23. Cattle utilization on the East Mountain allotment of the Ferron Ranger District, Manti-LaSal National Forest.

Total Acres	Land Ownership	AUM
1,959	Private[1]	845
19,328	USFS	1,710

[1]Private land but still managed by the USFS.

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SOILS INFORMATION (783.21)

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil." Soil tests on the disturbed and undisturbed areas and coal was show that the materials in the portal area should, with proper management, support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed.

Soils Report of the Deer Creek Mine (see Maps 2-16 and 2-17)

C - Cut Areas

These are areas disturbed in order to effectively gain sufficient work area to carry out mining operations. Sandstone and shale bedrock are exposed. In general, these areas have chemical and physical properties which will support plant growth. The major problems are steepness and aridity.

F - Fill Areas

These areas are nearly level (parking areas) and steep (more than 25%). The material derived from sandstone and shale with some coal waste is capable of supporting plant growth. The parking lots and storage areas may have places where undesirable conditions for plant growth have developed;

these areas will be covered with suitable growth media before revegetation is started.

Co-Be - Comodore-Beenom Complex, 40-60% Slopes

Comodore soils occur near drainageways, and support Douglas fir. They are shallow and well-drained (50%).

Beenom soils are shallow and well-drained. They occur in the areas which support mostly grass vegetation (40%).

Included in mapping are other soils and Rock Outcrop.

Pedon descriptions follow:

Comodore is a loamy-skeletal, mixed, Lithic Cryoboroll.

A11--0-8 cm; very dark grayish brown (10 YR 3/2) very stony, very fine sandy loam; very dark brown (10 YR 2/2) when moist; weak, fine, granular structure; soft, friable, slightly sticky, slightly plastic; common very fine, fine, medium, and coarse roots; few very fine and fine pores; 15% gravel, 45% cobbles and stones non-calcareous; mildly alkaline (pH 7.4); clear, smooth boundary.

A12--8-45 cm; very dark grayish brown (10 YR 3/2) very cobbly, very fine sandy loam; very dark brown (10 YR 2/2) when moist; weak, fine granular structure; soft, friable,slightly sticky, slightly plastic; common fine and medium, and coarse roots; few very fine pores; 15% gravel and 30% cobbles; non-calcareous; midly alkaline (pH 7.4); abrupt wavy boundary.

R--45 cm; sandstone bedrock.

Beenom is a loamy mixed Lithic Argiboroll

A1--0-10 cm; brown (10 YR 4/3) loam, dark brown (10 YR 3/3) when moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine, fine, and medium pores; midly alkaline (pH 7.6); abrupt smooth boundary.

B2t--10-35 cm; brown (10 YR 4/3) clay loam, dark brown (10 YR 3/3) when moist; strong, medium, subangular blocky structure; hard, firm, stocky, plastic; common very fine, fine, and medium roots; common very fine and fine poors; few thin clay films on faces of peds; mildly alkaline (pH 7.6).

R--35 cm; sandstone.

These soils were not sampled for laboratory analysis since they are outside of the disturbed area.

Samples from the cut-and-fill slopes and the undisturbed slopes near the mine portal were analyzed. The results are shown in Tables 1 and 2, in the Revegetation section. There is no indication that any of these materials will not support plant growth when the slopes are terraced and irrigated. The furnace slag used in the parking lot has a high pH, but it is presumed that this is from the fusion of calcium oxide and has no detrimental influence on plant growth when mixed with other suitable material.

Ro-R-S Rock Outcrop - Rubble Land - Sunup Gravelly Loam, 40-70% slopes

Rock Outcrop is dominantly from sandstone and shale. The boulders in the Rubble Land are from sandstone (75%).

Sunup soils are shallow and formed in material derived from sandstone. Permeability is moderately rapid in the soil material above the rock (25%).

Taxonomic classification is loamy-skeletal, mixed, mesic, Lithic Ustic Torriorthents. Pedon description follows:

A1--0-4 inches; pale brown (10 YR 6/3) very gravelly loam; olive brown (2.5 Y 5/4) when moist; weak, fine granular structure; friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; common fine and few medium pores; 55% gravel; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.3); abrupt wavy boundary.

C1--4-14 inches; light gray (2.5 Y 7/2) extremely flaggy, fine sandy loam, light yellowish brown (2.5 Y 6/4) when moist; massive; very friable; few fine, medium and coarse roots; 40% flagstones; 30% channers; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.8); abrupt smooth boundary.

R--14 inches; sandstone.

Included in mapping are areas of material which have sloughed and been deposited by gravity in small areas (less than 100 sq. ft.). The soil material is deeper than Sunup soils. These areas are of such limited extent that they are of no consequence as a local source of cover material for revegetation.

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Soil Survey of Parts of Carbon and Emery Counties, Utah. April 1979. Vol. I and II.

General Soil Map of the Permit Area (2-16)

$\frac{\text{I-E-R}}{\text{E}}$ Typic Cryochrepts-Lithic Cryorthents-Rock Outcrop loamy-skeletal, shallow association, 40-60% slopes.

These soils are mostly loamy-skeletal and lithic with areas of sandstone outcrops.

In this Map Unit, Typic Cryochrepts make up about 50%, Lithic Cryorthents about 25%, and Rock Outcrop and Rubble Land about 20%; included are small areas of Mollisols on north and east-facing slopes.

The Cryochrepts can be generally described as follows: pale brown gravelly loam or sandy loam surface layer, with 25% sandstone fragments, 35 cm thick, underlain by a pale brown gravelly or stony loam, with 35-50% sandstone fragments, 100 cm thick.

The Cryorthents are mostly shallow, underlain by rock within 50 cm of the surface.

Rubble Lands are those areas where the soils are covered by large boulders so close together that there is little area between the boulders for plants to grow.

Rock Outcrop is exposed areas of bedrock. These areas are often nearly vertical cliff walls in canyons.

$\frac{\text{Mp}}{\text{B}}$ Pachic Cryoborolls, loamy and loamy-skeletal, 10-25% slopes.

These are dark-colored soils in which the surface soils is more than 50 cm thick. Included in mapping are Typic Cryoborolls, Mollic Cryoboralfs, and Typic Cryochrepts. Pachic Cryoborolls can generally be described as follows: a very dark grayish brown loamy surface layer 60 cm thick, overlying a grayish brown loamy subsoil 30 cm thick, and underlain by a pale brown gravelly sandy loam substratum containing 50% sandstone fragments.

$\frac{Mt}{c}$ Typic Cryoborolls, loamy and loamy-skeletal, 25-40% slopes.

These are dark-colored soils under mixed conifer, sagebrush, and grass.

Included are areas of Pachic Cryoborolls and Mollic Cryoboralfs. Cryochrepts are on windswept ridges.

The Typic Cryoborolls can be generally described as follows: a dark grayish brown loamy surface layer about 40 cm thick, underlain by a pale brown clayey subsoil 40 cm thick, over a light gray calcareous substratum with up to 50% sandstone fragments.

References

1. Soils maps of Utah Power and Light mine sites: Deer Creek, Deseret, and Wilberg.
2. General Soils Map of Utah.
3. Soils map of a test area in T14S, R5E through 9E.
4. Soils Map of Northwest Carbon, Inc., Rilda Canyon and Trail Creek Mine sites.

The Soils at The Mine Site (2-17)

Soil	Range Site	Favorable	Unfavorable
Chipeta	Desert Shallow Shale	200	100
Beenom	Mountainy Stony Loam	2000	1200
Sunup	Semi-Desert Shallow Loam (Pinyon-Juniper)	600	275
Comodore	Woodland (Douglas Fir)	No Data Available	

The Soils in the General Soils Map For The Permit Area (2-16)

Would fall into

High Mountain Loam	Shrub or Aspen	2700	1250
High Mountain Loam		3000	1400
Woodland		Not assigned a range site - no data available.	

* Pounds of air dry production per acre per year.

Reference

Wilson, L., et al, 1975. Soils of Utah. Utah. Agricultural Experiment Station Bulletin 492. Pages 80-94. Utah State University, Logan, Utah 84322

FISH AND WILDLIFE RESOURCES INFORMATION (783.20)

As required by the regulations the application has consulted with the D.O.G.M., the D.O.W.R. and U. S. Fish & Wildlife Service. An on-site field investigation of each mine site was conducted. In addition, the applicant felt to properly mitigate wildlife concerns a consultant (Jarvis) was retained to provide both wildlife baseline information and, in consultation with the U. S. Fish & Wildlife Service, initiate any necessary studies and identify any possible conflicts between wildlife and mining operations. This report is included in this section. Notwithstanding Judge Flannery's decision, applicant feels that without baseline data a proper wildlife mitigation plan cannot be developed.

As the Jarvis report and the D.O.W.R. baseline data are for the most part redundant, applicant has chosen to include only the consultant's report in this application but has included the mitigation and impact avoidance procedures as recommended by the D.O.W.R. in the Fish & Wildlife Protection Plan. The applicant has the D.O.W.R. complete baseline studies on file and copies have been sent to all concerned state and federal management agencies.

Mine Plan Area

The UP&L lease area covers the south half of East Mountain in the Wasatch Plateau. Life zones range from Upper Sonoran below the mines to Canadian on top. The three mines are located in steep rocky canyons on the south and east slopes of the mountain.

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Methods

The mine plan was submitted to D.O.G.M. who, in turn, consulted the respected wildlife agencies for recommendations. Based on the Board's guidelines most of the wildlife information was obtained from existing records and publications. A field survey was conducted in 1981 to assess the occurrence of raptors and migratory birds nesting at the Cottonwood fan portal construction site. This survey is included in the Wilberg application.

Wildlife habitats were coordinated with the designations used in the vegetative survey. With the vegetative map and the species list for the Wasatch Plateau a list of species likely to occur in the mine area was developed (Table 1).

Wildlife Habitats

The habitats within the mine plan area are rated as 1 and 2 by Bob Scott and others for coal lands of Utah (Scott, 1977). Around the mines the cliffs are considered raptor nesting habitat with the slopes below and the flat lands above the cliffs as raptor feeding areas. The lower slopes and alluvial fans below the mines are rated as deer winter range. All elk range is above the mines on the top of East Mountain (Table 2) (see Maps 2-18 and 2-19).

The habitats at the Wilberg Mine and Des-Bee-Dove Mines are designated as pinyon-juniper with many open rock and cliff areas. At the Deer Creek Mine some riparian habitat exists along Deer Creek below the mine. The south facing slopes of this steep canyon are covered with pinyon-juniper and the north facing slopes are covered with a mixed conifer stand.

The habitat designations are listed below:

S - Sagebrush
G - Grassland
SD - Salt Desert Shrubs
R - Riparian
P-J - Pinyon-Juniper
MC - Mixed Conifer (includes Aspen Groves)

a. Sagebrush - All the sagebrush communities are situated between 8,000 and 10,000 foot elevations along the top of the East Mountain plateau. They exist as short sage communities generally on ridge tops and flats. Aspen groves are scattered through the sagebrush communities on the flats and along the edges. A few areas around springs still harbor small wet meadows.

b. Grassland - Two small areas on ridges in tributaries of Cottonwood Creek.

c. Salt Desert Shrub - This plant community is located on the lower slopes adjacent to the access road to the Des-Bee-Dove Mines.

d. Riparian - The streams are small and flow through steep narrow canyons. Consequently the riparian zone is very narrow often less than 30 yards wide. The vegetative composition varies from the broad-leafed trees and shrub plant community normally depicted as characteristic of riparian areas to many areas where there is only an increased density of conifers and/or aspen.

e. Pinyon-Juniper - This pygmy forest is located on steep slopes and talus slides that are crowned by near vertical to vertical rock escarpments. In many areas especially on the south face of East Mountain the forest consists of scattered trees growing amidst huge rocky cliffs and rough rock piles. Where steep canyons occur the pinyon-juniper forest is only found on south facing slopes or on rocky exposed ridges. In many areas where the pinyon-juniper grades into the mixed conifer stands a mountain brush plant community exists as an ecotone between the two tree dominated plant communities. These areas are generally confined to a single slope of less than 200 acres.

f. Mixed Conifer - The mixed community is spread all over East Mountain, on the top, the slopes, and in the steep side canyons. Below 8,000 feet elevation conifers are found only on north facing slopes in steep canyons. Fir species generally dominate the stands along with spruce and a scattering of aspens at the sagebrush interface.

Wildlife List (See Table 1)

Species of Special Significance

The species listed here and their habitat requirements are discussed in the following paragraphs. This list was derived from Utah Division of Oil, Gas and Mining's guidelines and from Utah Division of Wildlife Resources' status list (DOGM, 1980 and UDWR, 1979).

Species	Status	Habitat	Comments
Western Bluebird (Sialia mexicana)	Federal Migratory	MC,P-J	Probably occurs within disturbed area
American Peregrine Falcon (Falco peregrinus)	T & E	All	Does not occur, no sightings
Bald Eagle (Haliaeetus leucocephalus)	T & E	All	Winter visitor
Snowshoe Hare (Lepus americanus)	DWR limited	MC	Probably occurs on permit area but not in disturbed area
Northern Flying Squirrel (Glaucomys sabrinus)	DWR limited	MC	" "
Red Bat (Lasiurus cinereus)	DWR limited	MC	" "
Utah Mountain Kingsnake (Lampropeltis pyromelana)	DWR limited	R,P-J,MC	Possibly occurs in disturbed area
Utah Milksnake (Lampropeltis triangulum)	DWR limited	MC	Probably occurs on permit area but not in disturbed area
Tiger Salamander (Ambystoma tigrinum)	DWR questioned	R	" "

Threatened and Endangered

A letter from U. S. Fish and Wildlife Service dated November 6, 1980. "To the best of our knowledge, no endangered or threatened plant species or critical habitat for threatened or endangered wildlife species occur in the disturbed areas of the subject mining operations." The Bald Eagle is a known winter resident of the permit area but only in very low densities (see Table I).

Effects of Mining Operations on Fish and Wildlife

The Deer Creek, Des-Bee-Dove and the Wilberg Mines are currently operating. Their effects on wildlife are now historical and the species affected have either emigrated from the disturbed sites, adjusted to the disturbances or expired due to loss of habitat. The primary losses were probably raptor nesting sites around the mines and deer winter range from road construction. At the Deer Creek Mine some riparian habitat was destroyed at the mine site.

The lower open slopes are used by raptors on the escarpment face for hunting activities where an abundance of rodents and small birds provide a prey base. Wintering migrants also utilize these same habitats for hunting. The vehicle traffic and human presence continue to disturb the natural hunting patterns. Data from the period prior to mining is lacking to evaluate the present situation (Land Use Map 2-18).

The traffic on the mine access roads kills an unknown number of deer each year. The percent loss to the wintering deer herds is unknown. Some raptor disturbance continues at the mines and along the access roads which transect some of their hunting territory.

Following is a summary of certain reptile and amphibian species referred to in Utah Division of Oil, Gas and Mining letter to Utah Power and Light dated December 5, 1980.

a. Utah Mountain Kingsnake - These snakes are widely distributed throughout the mountains of Utah in specific localized drainages. The habitat requirements are drainages with wet meadows, brushy riparian areas and perennial streams. They use rocky south facing slopes adjacent to riparian habitat for denning.

   The drainages around East Mountain lack these components for a preferred environment because many of the streams are eroded and lack meadows. Thus it is doubtful these snakes inhabit any of the disturbed areas.

b. Utah Milksnake - This snake could occur in the riparian areas and in the mixed conifer habitat. Most likely place would be in that portion of the drainages with mixed conifer vegetation. This habitat type is far removed from any disturbed areas.

c. Tiger Salamander - These salamanders prefer quiet pools, ponds, or springholes. Since most of these water types occur on top of East Mountain it is doubtful any tiger salamanders would be disturbed by proposed construction.

Game Species

- Mule Deer (*Odocoileus hemionus*) - Mule deer range throughout all habitats on the mine property. Pinyon-juniper on the slopes of East Mountain are used as winter range. During other seasons deer concentrations are greater at high elevations. Although deer populations have declined over the past several years, the deer herd and habitat in the mine vicinity are in good condition (Dolton, 1977).
- Elk (*Cervus canadensis*) - Elk inhabit the sagebrush, and forest areas at the upper elevations on East Mountain, but do not ordinarily range into pinyon-juniper habitat. The seven year average of elk censused on East Mountain (1970-1976) was 76 antlerless and two antlered individuals seen per year (Dolton, 1977). This census included larger groups only and does not reflect a total population estimate (Dolton, 1977).
- Mountain Lion (*Felis concolor*) - This species inhabits rugged mountains and forest areas in the region and may occasionally occur on East Mountain (Dolton, 1977).

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- Snowshoe Hare (*Lepus americanus*) - This species occurs in forested portions of mountainous areas in the region. It inhabits higher elevations on East Mountain (Dolton, 1977).
- Mountain Cottontail (*Sylvilagus nuttalli*) - Mountain cottontails inhabit brushy areas and forests, particularly on rocky slopes throughout the mine region (USDI Bureau of Land Management, 1976).
- Blue Grouse (*Dendragapus obscurus*) - Open conifer stands with brushy understory at higher elevations provide suitable habitat for this species. Blue grouse occur on East Mountain. The greatest density of the species in Utah is in the northern Wasatch Range (Rawley and Bailey, 1972).
- Ruffed Grouse (*Bonasa umbellus*) - Brushy woodlands (aspens, willows, and conifers) near streams and springs are suitable habitat. This species occurs at higher elevations on East Mountain, but good populations are generally limited to the Wasatch Range northwest of the mine property (Rawley and Bailey, 1972)..
- Chukar Partridge (*Alectoris graeca*) - This species prefers steep, rock, semiarid slopes with low shrubs and rock outcrops. This species was introduced in Utah from 1951 to 1968. During this period 185,911 individuals were released at 191 different locations

(Rawley and Bailey, 1972). The species is now widely distributed throughout Utah and other western states.

- Mourning Dove (Zenaidura macroura) - This is an important game bird in many parts of North America. Mourning doves prefer open field and forest edge habitat, but occur over a broad range of vegetation types throughout the 48 conterminous United States. The species occurs in pinyon-juniper and forest edge habitat on East Mountain.

Special Status Species

No federally listed endangered or threatened species are known to occur on the site property (USDI, Fish and Wildlife Service, 1976). The black-footed ferret (Mustela nigripes), a federally endangered species, has recently been reported near Ferron, several miles south of the site (Dolton, 1977). This species is not likely to occur on mine property because preferred habitat (a prairie dog town) (USDI Bureau of Land Management, 1972a) is not present. American peregrine falcon (Falco peregrinus anatum) has been observed with 25 miles of the site in the winter of each of the past three years (Dolton, 1977). It is probably a winter visitor in the area (USDI Bureau of Land Management, 1972b), although, historically peregrine falcon aeries existed in the San Rafael swell area 30 miles southeast of the site.

The State of Utah has defined the status of selected animal species (Utah Division of Wildlife Resources 1976), some of which are likely to occur on or near the Wilberg Mine property as:

DECLINING: Any species of animal which, although still occurring in numbers adequate for survival, has been greatly depleted and continues to decline. A management program included protection or habitat manipulation, is needed to stop or reverse the decline.

LIMITED: Any species of animal occurring in limited numbers due to restricted or specialized habitat or at the perimeter of its historic range.

STATUS QUESTIONED: Insufficient data area available to permit a reliable assessment of the status of the species.

Special status species in Utah that might be found near the mine property are:

- Bobcat (*Lynx rufus*) Declining. Fur prices in recent years have resulted in high harvests. The species is presently under consideration for total protection until the current population trend is reversed. Bobcats probably occasionally use the habitats present on the mine property.
- Whitetail Jackrabbit (*Lepus townsendi*) Status questioned. Inhabits sagebrush flats in the region and may occur on site.

- <u>Sandhill Crane</u> (<u>Grus canadensis</u>) Limited. A few individual migrate through the region (Robbins et al, 1966).
- <u>Fox Sparrow</u> (<u>Passerella iliaca</u>) Status questioned. Suitable habitat for the species occurs at upper elevations on East Mountain on the mine property.
- <u>Utah Mountain Kingsnake</u> (<u>Lampropeltis pyromelana infralabialis</u>) Limited. Suitable habitat occurs on site. The species is in the region and may inhabit the mine area (Stebbins, 1966).

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TABLE I

VERTEBRATE SPECIES OF THE WASATCH PLATEAU

Fishes:

Species	Status	Habitat	Probable Occurence on UP & L Leases
Cutthroat trout	C	lakes, streams	
Rainbow trout	C	"	
Brown trout	C	"	
Brook trout	L	"	
Carp	C	"	
Utah chub	C	"	
Leatherside chub	C	streams	
Longnose dace	U	"	
Speckled dace	C	"	
Redside shiner	C	lakes, streams	
Bluehead sucker	C	"	
Mountain sucker	L	streams	
Mottled sculpin	C	"	
Largemouth bass	C	lakes	

Amphibians:			
Tiger salamander	C	R, MC	X
Great Basin Spadefoot toad	C	S	X
Western toad	K	R	X
Woodhouse's toad	C	G,S	
Chorus frog	C	S	X
Leapord frog	C	R	X

Reptiles:

Species	Status	Habitat	Probable Occurence on UP & L Leases
Collared Lizard	C	SD	X
Leopard Lizard	C	SD	
Eastern Fence Lizard	C	SD,P-J	X
Sagebrush Lizard	C	SD,P-J	X
Tree Lizard	C	P-J	X
Side-blotched Lizard	C	SD	X
Short-horned Lizard	C	SD,P-J,S,MC	X
Western Whiptail	C	SD	
Rubber Boa	C	MC	X
Striped Whipsnake	C	SD,P-J	X
Racer	C	S,MC	X
Ringneck Snake	K	R,MC	X
Gopher Snake	C	SD,P-J,S	X
Milk Snake	K	MC	X
Sonora Mountain Kingsnake	K	R,P-J,MC	X
Western Terrestrial Garter Snake	C	R,P-J,MC	X
Common Garter Snake	K	R	X
Night Snake	C	SD	
Midget Faded Rattlesnake	C	P-J	X

Birds:

Common Loon	U	Lakes
Horned Grebe	R	"
Eared Grebe	C	"
Western Grebe	C	"
Pied-billed Grebe	C	"

Birds con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Double-crested Cormorant	U	"	
Snowy Egret	C	Marshes	
Great Blue Heron	C	"	X
Black-crowned Night Heron	C	"	
American Bittern	U	"	
White-faced Ibis	C	"	
Whistling Swan	O	"	
Canada Goose	C	"	
White-fronted Goose	R	Marshes	
Snow Goose	U	"	
Ross's Goose	O	"	
Mallard	C	"	X
Gadwall	C	"	
Pintail	C	"	
Green-winged Teal	C	"	X
Blue-winged Teal	C	"	
Cinnamon Teal	C	"	
American Widgeon	C	"	
Northern Shoveler	C	"	
Wood Duck	R	"	
Redhead	C	Lakes	
Ring-necked Duck	U	"	
Canvasback	C	"	
Greater Scaup	U	"	
Lesser Scaup	C	"	

Birds cont.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Common Goldeneye	U	Lakes	
Bufflehead	U	"	
Ruddy Duck	C	"	
Hooded Merganser	R	Streams	
Common Merganser	C	Streams	
Red-breasted Merganser	C	"	
Turkey Vulture	C	All	X
Goshawk	C	MC	X
Sharp-shinned Hawk	U	MC,S	X
Cooper's Hawk	C	R,MC,P-J	X
Red-tailed Hawk	C	All	X
Swainson's Hawk	U	S,P-J	X
Rough-legged Hawk	C	SD	X
Ferruginous Hawk	U	SD	X
Golden Eagle	C	All	X
Bald Eagle	E	All	X
Marsh Hawk	C	SD	
Osprey	U	Lakes	
Praire Falcon	C	P-J	X
Peregrine Falcon	E	All	
Merlin	C	P-J	X
American Kestrel	C	R,SD,P-J	X
Blue Grouse	C	MC	X
Ruffed Grouse	C	MC	X
Sage Grouse	C	S	
California Quail	C	R	

Birds con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Chukar	C	SD	
Ring-necked Pheasant	C	Fields	
Sandhill Crane	R	Marshes	
Virginia Rail	C	"	
Sora Rail	U	"	
Common Gallinule	R	"	
American Coot	C	"	
Semipalmated Plover	U	"	
Snowy Plover	U	"	
Killdeer	C	S	X
Mountain Plover	R	Marshes	
American Golden Plover	U	"	
Black-bellied Plover	C	"	
Common Snipe	C	S	X
Long-billed Curlew	U	Marshes	
Willet	U	"	
Spotted Sandpiper	C	S	X
Solitary Sandpiper	U	Marshes	
Greater Yellowlegs	U	"	
Lesser Yellowlegs	C	"	
Pectoral Sandpiper	U	"	
Baird's Sandpiper	U	"	
Least Sandpiper	C	"	
Western Sandpiper	C	"	
Sanderling	U	"	
Short-billed Dowitcher	U	"	
Long-billed Dowitcher	C	"	

Birds Con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Marbled Godwit	C	Marshes	
American Avocet	C	"	
Black-necked Stilt	C	"	
Wilson's Phalarope	C	"	
Northern Phalarope	C	Lakes	
Herring Gull	U	"	
California Gull	C	"	
Ring-billed Gull	C	"	
Franklin's Gull	C	"	
Bonaparte's Gull	U	"	
Forsters Tern	C	"	
Common Tern	U	"	
Black Tern	C	"	
Caspian Tern	U	"	
Band-tailed pigeon	U	MC	
Rock Dove	C	P-J	
Mourning Dove	C	All	X
Yellow-billed Cuckoo	K	R	
Barn Owl	K	P-J	
Screech Owl	U	R	X
Flammulated Owl	K	MC	X
Great Horned Owl	C	All	X
Pygmy Owl	K	R,P-J	X
Burrowing Owl	L	SD	

Birds Con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Long-eared Owl	C	P-J	X
Short-eared Owl	C	Marshes	
Saw-whet Owl	K	MC	X
Common Nighthawk	C	SD	X
Poor-will	C	P-J	X
Black Swift	U	MC	X
White-throated Swift	C	P-J	X
Black-chinned Hummingbird	C	R	X
Broad-tailed Hummingbird	C	All	X
Rufous Hummingbird	C	MC	X
Calliope Hummingbird	C	MC	X
Belted Kingfisher	U	R	
Common Flicker	C	MC	X
Yellow-bellied Sapsucker	C	MC	X
Hairy Woodpecker	C	MC	X
Downy Woodpecker	C	R	X
Northern Three-toed Woodpecker	U	MC	X
Western Kingbird	C	SD	
Cassin's Kingbird	U	P-J	X
Eastern Kingbird	C	R	
Ash-throated Flycatcher	C	SD	
Says Phoebe	C	SD,P-J	
Willow (Traill's) Flycatcher	C	S	X
Hammond's Flycatcher	U	MC	X

Birds con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Dusky Flycatcher	C	MC	X
Gray Flycatcher	K	S,P-J	X
Western Flycatcher	C	MC	X
Western Wood Peewee	C	MC	X
Olive-sided Flycatcher	U	MC	X
Horned Lark	C	SD	X
Violet-green Swallow	C	All	X
Tree Swallow	C	S	X
Bank Swallow	C	R	
Rough-winged Swallow	C	R	
Barn Swallow	C	P-J	X
Cliff Swallow	C	P-J	X
Purple Martin	U	MC	X
Steller's Jay	C	MC	X
Gray Jay	R	MC	X
Scrub Jay	C	R,P-J	X
Black-billed Magpie	C	R,P-J	X
Common Raven	C	All	X
Common Crow	O	R	
Pinion Jay	C	S,P-J	X
Clark's Nutcracker	C	MC	X
Black-capped Chickadee	C	MC	X
Mountain Chickadee	C	MC	X
Plain Titmouse	C	P-J	X
Bushtit	C	MC	X
White-breasted Nuthatch	C	MC	X
Red-breasted Nuthatch	C	MC	X

Birds con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Pygmy Nuthatch	C	MC	X
Brown Creeper	C	MC	X
Dipper	C	R	
House Wren	C	MC	X
Rock Wren	C	SD,P-J	X
Canyon Wren	C	P-J	X
Bewick's Wren	C	P-J	X
Long-billed Marsh Wren	L	marshes	
Mockingbird	U	R	
Gray Catbird	U	R	
Sage Thrasher	C	S	X
American Robin	C	R,MC	X
Hermit Thrush	C	MC	X
Swainson's Thrush	C	MC	X
Veery	U	R	
Western Bluebird	U	MC,P-J	X
Mountain Bluebird	C	S,MC	X
Townsend's Solitaire	C	MC,P-J	X
Blue-gray Gnatcatcher	C	R	X
Golden-crowned Kinglet	U	MC,P-J	X
Ruby-crowned Kinglet	C	MC	X
Water Pipet	C	plains	
Bohemian Waxwing	U	R,MC	X
Cedar Waxwing	C	woodlands	
Northern Shrike	U	SD	
Loggerhead Shrike	C	SD	
Starling	C	All	X

Birds con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Solitary Vireo	U	R,P-J	X
Warbling Vireo	C	R	X
Orange-crowned Warbler	C	MC	X
Nashville Warbler	U	MC	X
Virginia's Warbler	C	P-J	X
Yellow Warbler	C	R	
Magnolia Warbler	U	MC	X
Yellow-rumped Warbler	C	MC	X
Black-throated Gray Warbler	C	P-J	X
Townsend's Warbler	U	MC	X
MacGillivray's Warbler	C	R	X
Yellowthroat	L	R	
Yellow-breasted Chat	C	R	
Wilson's Warbler	C	R	X
American Redstart	U	R	
House Sparrow	C	cities	
Western Meadowlark	C	SD	
Yellow-headed Blackbird	C	marshes	
Red-winged Blackbird	C	"	
Northern Oriole	C	R	
Rusty Blackbird	O	R	
Brewer's Blackbird	C	R	
Common Grackle	A	R	
Brown-headed Cowbird	C	R	X
Western Tanager	C	MC	X
Black-headed Grosbeak	C	R	X
Lapland Longspur	R	G	

Birds con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Indigo Bunting	R	R	
Lazuli Bunting	C	R,S	X
Green-tailed Towhee	C	S, P-J	X
Rufous-sided Towhee	C	S	X
Lark Bunting	O	SD	
Savannah Sparrow	C	G	
Grasshopper Sparrow	R	G	
Vesper Sparrow	C	S, SD	X
Lark Sparrow	C	S, SD	X
Sage Sparrow	U	S, SD	X
Dark-eyed Junco	C	MC	X
Gray-headed Junco	C	MC	X
Tree Sparrow	U	R	X
Chipping Sparrow	C	MC,P-J	X
Brewer's Sparrow	C	S,SD	X
Harris Sparrow	U	P-J	
White-crowned Sparrow	C	P-J	X
Fox Sparrow	K	R	X
Lincoln's Sparrow	U	R	
Song Sparrow	C	G	X
Black-throated Sparrow	U	S,P-J	X
Evening Grosbeak	C	MC	X
Cassin's Finch	C	MC	X
House Finch	C	All	X
Pine Grosbeak	U	MC	X
Rosy Finch	C	S	
Pine Siskin	C	MC	X

Birds con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
American Goldfinch	C	R,P-J	X
Lesser Goldfinch	C	P-J	X
Red Crossbill	U	MC	X

Mammals:			
North Water Shrew	C	R	
Merriam Shrew	U	S,MC	X
Vagrant Shrew	C	R	
Masked Shrew	C	R	
Dusky Shrew	C	MC	X
Little Brown Myotis	C	P-J	X
Fringed Myotis	U	SD, P-J	X
Long-Eared Myotis	C	MC	X
Long-legged Myotis	C	P-J	X
Yuma Myotis	U	P-J	X
California Myotis	C	"	X
Small-footed Myotis	U	"	X
Silver-haired Bat	C	MC	X
Western Pipistrelle	C	P-J	X
Big Brown Bat	C	"	X
Red Bat	U	MC	X
Hoary Bat	U	"	X
Western Big-eared Bat	C	P-J	X
Pallid Bat	C	SD	
Mexican Free-tailed Bat	C	SD	X
Pika	C	MC,P-J	X
White-tailed Jackrabbit	C	S	X

Mammals con't.

Species	Status	Habitat	Probable Occurence on UP & L Leases
Snowshoe Hare	C	MC	X
Black-tailed Jackrabbit	C	SD,P-J	X
Mountain Cottontail	C	S,G	X
Desert Cottontail	C	SD,P-J	X
White-tailed Prairie Dog	C	SD	
Red Squirrel	C	MC	X
Rock Squirrel	C	SD,P-J	X
Uintah Ground Squirrel	C	G, S	X
Golden-mantled Ground Squirrel	C	S,MC	X
Whitetail Antelope Squirrel	C	SD	X
Yellow-bellied Marmot	C	S,MC	X
Northern Flying Squirrel	C	MC	X
Least Chipmunk	C	S,SD,P-J	X
Uintah Chipmunk	C	MC	X
Cliff Chipmunk	U	P-J	X
Northern Pocket Gopher	C	G, S	X
Valley or Botta Pocket Gopher	C	G,S, P-J	X
Ord Kangaroo Rat	C	SD, P-J	X
Great Basin Pocket Mouse	C	SD	X
Beaver	C	R	X
Western Harvest Mouse	C	G, R	X
Canyon Mouse	C	P-J	X
Deer Mouse	C	All	X
Brush Mouse	C	P-J	X
Pinion Mouse	C	P-J	X
Desert Wood Rat	C	SD, P-J	X
Bushy-tailed Wood Rat	C	MC, P-J	X

Mammals con't

Species	Status	Habitat	Probable Occurence on UP & L Leases
Meadow Vole	C	S	X
Mountain Vole	C	S	X
Richardson's Vole	C	R	X
Longtail Vole	C	S, R	X
Black Rat	C	Mines	X
Norway Rat	C	"	X
House Mouse	C	"	X
Western Jumping Mouse	C	R	
Porcupine	C	MC	X
Coyote	C	All	X
Red Fox	C	MC	X
Kit Fox	U	SD	
Gray Fox	C	P-J	X
Black Bear	C	MC	X
Ring-tailed Cat	C	P-J	X
Raccoon	O	R	X
Short-tailed Weasel	R	P-J	X
Long-tailed Weasel	C	R	X
Mink	L	streams	
Black-footed Ferret	E	SD	
Marten	R	MC	X
Badger	C	S,MC,P-J	X
Striped Skunk	C	P-J	X
Spotted Skunk	C	R	X
River Otter	R	streams	

Mammals con't

Species	Status	Habitat	Probable Occurence on UP & L Leases
Bobcat	C	MC,P-J	X
Cougar	C	Mc,P-J	X
Mule Deer	C	All	X
Moose	L	R	
Rocky Mountain Elk	C	MC	X

TABLE I
KEY

Status	-	Population
C	-	Common, Widespread and Abundant
U	-	Uncommon, Widespread but not Abundant
R	-	Rare, Seldom Seen.
E	-	Endangered, Candidate for Extinction
T	-	Threatened, Candidate for Endangered
L	-	Limited, Restricted to a Specific Habitat
K	-	Status Unknown
Habitat		
S	-	Sagebrush
G	-	Grassland
SD	-	Salt Desert Shrub
R	-	Riparian
P-J	-	Pinyon-Juniper Forest
MC	-	Mixed Conifer (Includes Aspen Groves)

TABLE II

Wildlife Rankings of Habitat within Mine Portal Areas

Mine	Section	Ranking[a]	Principal Use
Deer Creek	T 17 S R 7 E Sec. 10	2	DWR
Des-Bee-Dove	T 17 S R 7 E Sec. 26	2	DWR
Wilberg	T 17 S R 7 E Sec. 27	2	DWR
Cottonwood Fan Portal Zone	T 17 S R 7 E Sec. 30	1	EWR DWR
	T 17 S R 6 E Sec. 25 Sec. 36	 1 2	EWR DWR DWR

[a] (Scott, 1977)

1 - Critical
2 - High Priority

LAND USE INFORMATION (783.22)

Geographically, the permit encompasses, for the most part, a relatively large plateau named East Mountain situated between two major drainages, Cottonwood and Huntington. Two separate and distinct environs are characterized within the upper and lower limits of the plateau. Plateau elevations reach 10,000 feet accounting for the 20 inches plus of annual precipitation.

Forested communities dominate the higher regions with abundant shrub cover for smaller animal habitat. Large game animals such as deer and elk are present during all seasons.

By contrast, the lower drainage area is much dryer where south-facing slopes support the arid plant communities of pinyon juniper and sagebrush. Plant cover shrubs and grasses are sparse by comparison.

The affected area, or portal area, lies within a steep narrow canyon (Deer Creek) in the transitional zone from valley to plateau crest at the outcrop of the Blind Canyon coal seam. Historically, this canyon's first organized land use was grazing by early ranching settlements in Emery County.

Both federal land agencies, Bureau of Land Management and the U. S. Forest Service, have active grazing units within the permit area.

Currently on the BLM lands in the permit area the livestock use is spring grazing with cattle on the benches

(April 1 - June 10). The Wilberg and West Huntington allotments are stocked at 27.0 acres/AUM and 16 acres/AUM for a total of 190 and 1,074 AUM's respectively. These allotments are judged in poor condition with a downward trend (BLM files).

Poor condition of the range is a characteristic of pinyon-juniper woodland types because of past grazing abuse. The desirable forage plants were eliminated or removed allowing the tree overstory to increase. This increased overstory shades the understory and also increases the competition for soil moisture. In these allotments with annual spring grazing the desirable forage is cropped each year forestalling recovery and maintaining the depleted range condition.

Very little grazing by cattle occurs on the steep slopes above the benches because of the difficult access and scarcity of forage.

The grazing of the USFS lands is confined to East Mountain under an approved rest rotation system (USFS, 1979). Nine permittees graze 486 cattle from June 21 to September 10 for a total of 1,296 AUM's. The range condition is judged good with a static to upward trend. The stocking rate is 11 acres/AUM. All of the cattle use is restricted to the upper slopes and top of East Mountain.

Elk use East Mountain for summer range but winter on the western slopes in the Cottonwood Creek drainage. Mule deer also summer on the mountain and winter on the benches and slopes of the southern and eastern portion of East Mountain from the mouth of Cottonwood Creek around to Rilda Canyon in the Huntington Creek drainage. These ranges are rated as deer winter range by Utah Division of Wildlife Resources. Current herd management levels are one deer/20 acres of winter range (UDWR, 1982) (see Maps 2-18 and 2-19).

The total forage productivity of the pinyon-juniper range on the benches is 100-324 lbs/acre, dry weight. The pinyon-juniper range on the rockland soils of the steep slopes is lower, estimated at 25-100 lbs/acre, dry weight. The mixed conifer range productivity is 167-290 lbs/acre, dry weight. See Vegetation section for productivity details.

The BLM also recognizes the sand and gravel resources on these benches and has designated specific areas for excavation and processing to aid in community expansion. The BLM visual resource management system rates the benches as Class IV and the cliff faces as Class III. both of these classifications allow for modification of the land through man's activities. The USFS also rates the south end of East Mountain as modification or partial retention, a scenic value similar to BLM's Class IV and III respectively.

The Land Use Plan for the Wasatch Plateau designates no recreation development, or timber sales on East Mountain but does specify the improvement of big game range, protection of watersheds and reconstruction of the Cottonwood Creek road for coal hauling. The south end of the mountain is not in a known oil or gas field and the reserve potential is judged low.

Premining use of the land was for livestock grazing and wildlife habitat with some occasional timber cutting on top of East Mountain. Land use capability is limited by the steep topography, rocky soils and an intermittent water supply. Other than mining, the highest and best use would remain as grazing and wildlife habitat.

During the early forties, coal was mined within the same small drainage (Deer Creek). Old workings of the American Fuel mine cover about 75 acres and was mined in the Blind Canyon coal seam using room-and-pillar mining methods. About 394,000 tons were removed.

REFERENCES

Bureau of Land Management June 1979, San Rafael Unit Resource Analysis and Management Framework Plan. Price, Utah.

Emery County Zoning Plat Books. Castledale, Utah.

U. S. Forest Service May 1979, Land Management Plan Ferron-Price Planning Unit. Manti-LaSal National Forest. Price, Utah.

Utah Division of Wildlife Resources, May 1982, Utah Big Game Investigations and Management Recommendations 1981-1982. Publication #82-3.

EMERY COUNTY ZONING

A-1 Agricultural Zone, contains the primary farming areas of the county.

RA-1 Residential-Agricultural Zone, this is the area with the communities and the adjacent of intermixed agricultural lands.

Revised 11/21/83

M&G-1 Mining and Grazing Zone, all of the country lands outside of the communities, farming areas and forest service boundary.

I-1 Industrial Zone, specific areas near communities and highways reserved for industrial development.

Ce-1 Critical Environmental Zone, general designation for all private lands within the forest boundary.

Ce-2 Critical Environmental Zone, specific designation for certain land parcels especially those adjacent to recreation sites in the forest.

PRIME FARMLAND INVESTIGATION (783.27)

After investigating all the lands within the permit boundaries of the Deer Creek Coal Mine it is determined that these lands do not qualify as "Prime farmlands" for the following reasons:

1. Historically the lands prior to construction were not used as crop land.
2. The slopes of and surrounding the portal area exceed 10 percent.
3. There is no developed water supply qualifying as an irrigation source.

Following is a negative determination from the U. S. Soil Conservation Service.

Revised 11/21/83

United States Department of Agriculture

Soil Conservation Service

P. O. Box 11350
Salt Lake City, UT 84147

Nobember 10, 1983

RECEIVED
NOV 1 1983
MINING AND EXPLORATION

C. E. Shingleton
Director of Permitting,
Compliance and Services
Mining and Exploration
Utah Power & Light Company
P. O. Box 899
Salt Lake City, Utah 84110

Dear Mr. Shingleton:

Keith E. Beardall, District Conservationist, Price, Utah, has handled the field investigation concerning the area described in your letter of November 1, 1983.

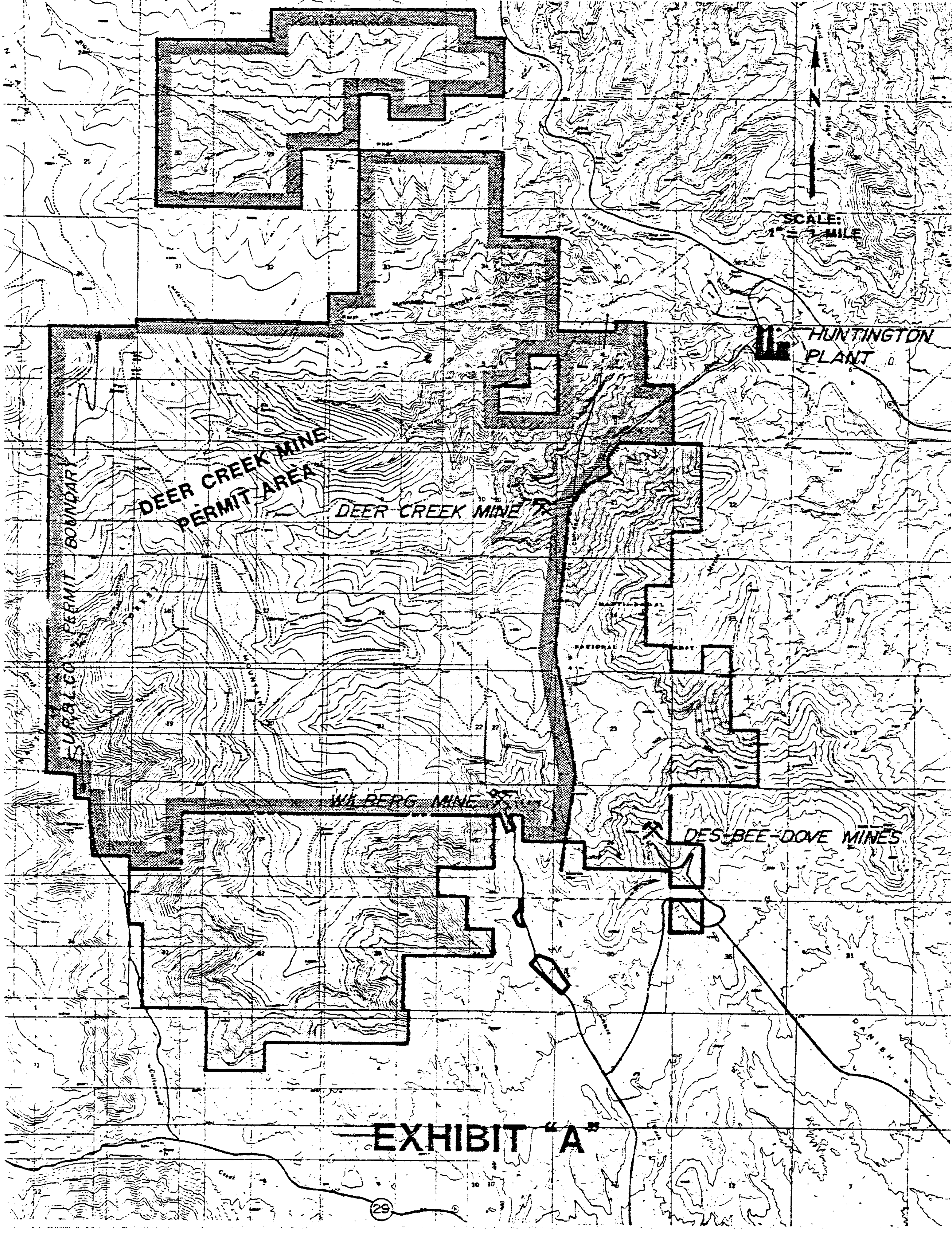
According to observations and data collected, there are no prime farmland soils in the sites A, B, and C (designated on the map you furnished). Soils in these sites are too steep or above established irrigation systems which eliminate the soils from the Prime Farmland category.

We are retaining the map and your correspondence in this office for future reference. Should you need additional information please call us.

Sincerely,

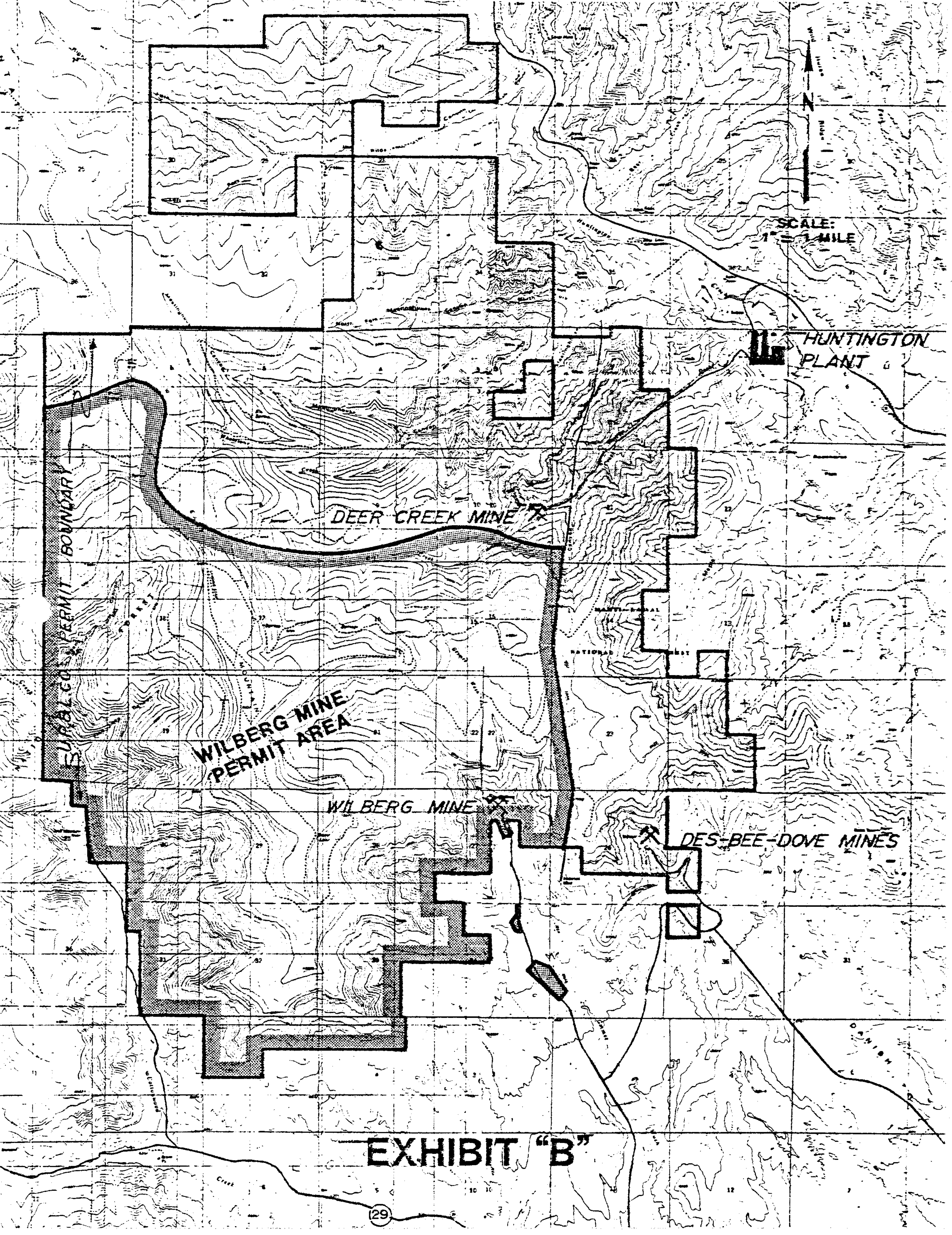
Ferris Allgood

FERRIS P. ALLGOOD
State Soil Scientist



N
SCALE:
1" = 1 MILE
HUNTINGTON
PLANT
DEER CREEK MINE
PERMIT AREA
DEER CREEK MINE
UP&L CO. PERMIT BOUNDARY
WILBERG MINE
DES-BEE-DOVE MINES

EXHIBIT "A"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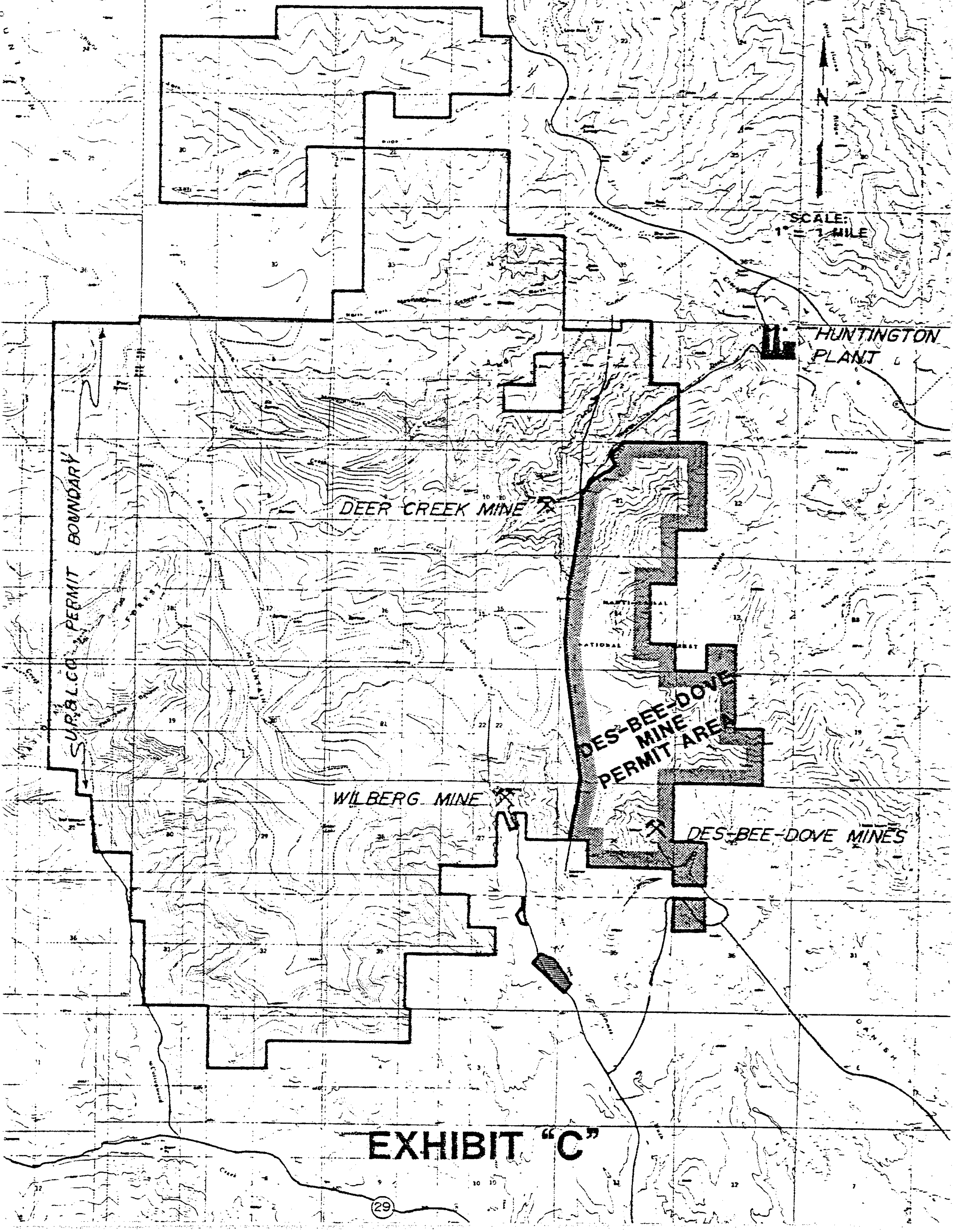
WILBERG MINE
PERMIT AREA
WILBERG MINE
DES-BEE-DOVE MINES

EXHIBIT "B"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DEER CREEK MINE
U.P.&L.CO. PERMIT BOUNDARY
DES-BEE-DOVE
MINE
PERMIT AREA
WILBERG MINE
DES-BEE-DOVE MINES
29

EXHIBIT "C"

ALLUVIAL VALLEY FLOORS (785.19)

The statutory definition of alluvial valley floors is as follows: "'alluvial valley floor' means the unconsolidated stream laid deposits holding the streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass movement accumulation and windblown deposits." The surface facilities located at the Deer Creek, Wilberg, and Church underground mines are situated in relatively narrow canyons which slope up directly from the draining stream. The canyons lack any soil development and do not contain irrigatable land which could be used for agricultural purposes. The canyons in which the surface facilities are located contain deposits of mass movements, slope wash, debris erosion and sheet runoff. The area is classified as an upland and nonirrigation area and, therefore, cannot be considered as an alluvial valley floor. Furthermore, 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 through one system or another.

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JUN 29 1988
DIVISION OF
OIL, GAS & MINING

DEER CREEK MINE OPERATION

Deer Creek Mine is named for the canyon in which it is located. Private coal mining operations were conducted on fee land in Deer Creek Canyon prior to 1946 when the first federal coal lease was issued in this area. No information is available on tonnage removed.

Peabody Coal Company acquired leases on the Deer Creek property and began operations in 1969. In 1977, Utah Power and Light Company purchased the Peabody operation and leases.

Two minable coal seams exist in the Deer Creek Mine area. Blind Canyon (upper seam is mined mainly from Deer Creek Mine). Hiawatha (lower seam is mined mainly from Cottonwood/Wilberg Mine; however, portions of this seam will be mined by Deer Creek. Both Cottonwood/Wilberg and Deer Creek Mines are owned by Utah Power and Light Company.

Relative locations of these two mines are shown on Figure 1.

Deer Creek portal is located in Deer Creek Canyon on the northern end of East Mountain in Emery County, Utah. Mine personnel and coal handling facilities are located there.

Approximately 8823 acres of minable coal are accessible in the Blind Canyon seam from the Deer Creek Mine. Future mining plans include ramping down from the north end of the Deer Creek Mine to the Hiawatha Seam to mine approximately 2269 acres. The anticipated Deer Creek life-of-mine low-ash production is near 90 MM tons. An additional 35 MM tons of high-ash reserves may be recovered when economic conditions warrant establishment of a coal transfer and preparation facility. This anticipated production will be obtained by

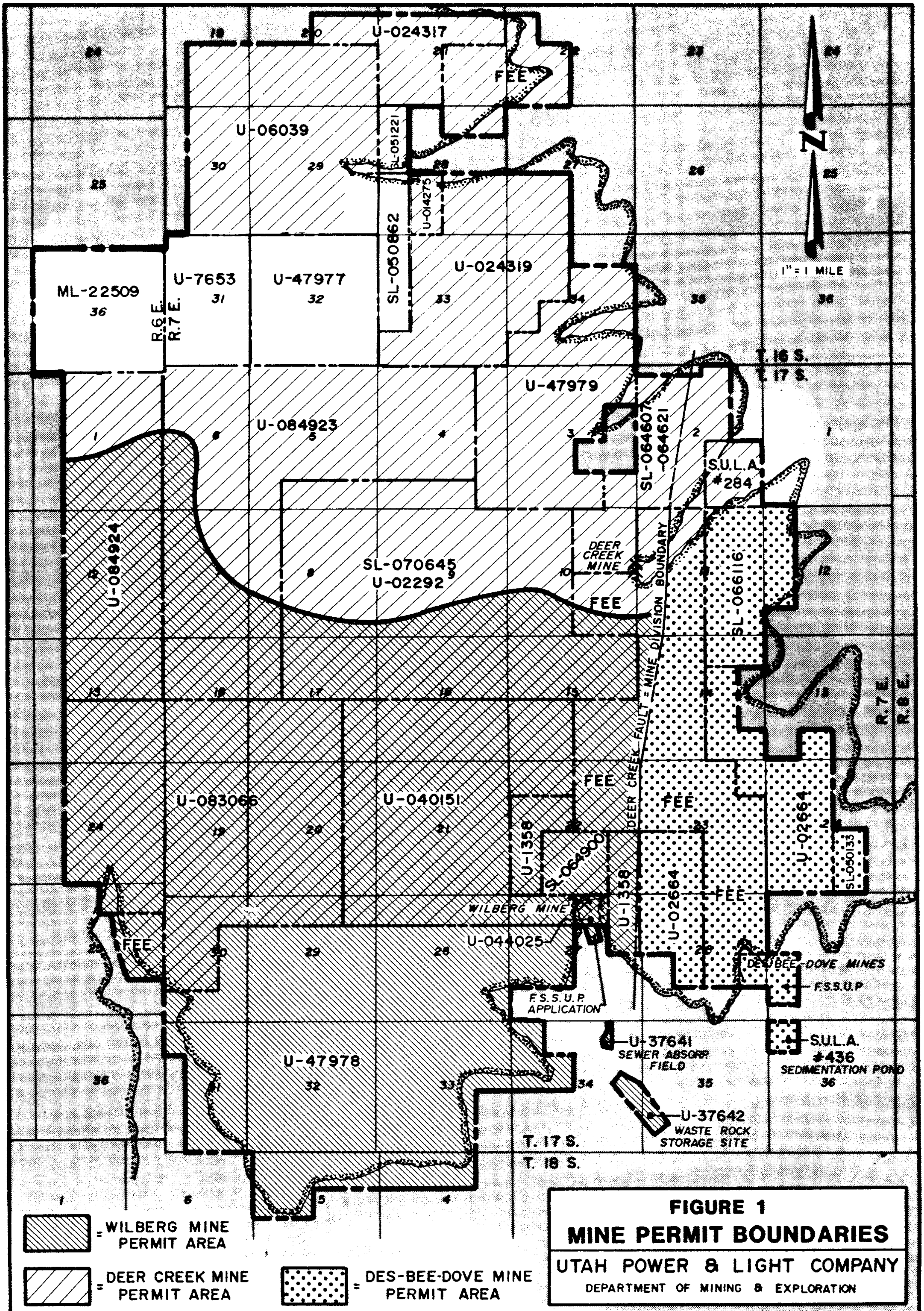


FIGURE 1
MINE PERMIT BOUNDARIES

utilizing two to three continuous mining units and one to two longwall mining systems. Deer Creek presently operates three continuous mining units and one longwall mining system.

The Deer Creek mining plan has progressively changed with the introduction of more efficient mining methods. The Deer Creek mine is developed with mains and sub-mains which support a series of longwall mining panels. This system is very effective in extracting and maximizing coal recovery. Approximately 70% of the Deer Creek minable coal reserve will be extracted by longwall mining systems, 30% will be extracted by continuous miner development and limited pillar extraction.

The extracted coal is sized in the Deer Creek coal handling facility and conveyed to the Utah Power and Light - Huntington Power Plant, approximately two miles. A portion of the coal is also transferred to the Cottonwood Mine loading facilities via underground conveyor belts and transfer shafts.

<u>MINING PLAN</u> (784.11)

The Deer Creek mining plan is based on the geologic information outlined in <u>Geology Description</u>. Good knowledge of the entire property is available from the outcrop and drilling. Detailed knowledge of a smaller part of the property is known from mining operations.

The mining areas are bounded by natural and imposed limits with varying degrees of confidence as to location and extent:

> Lease boundaries - definitely located and invariable in the short term.
> Faults - may vary somewhat from currently assumed locations.
>
> Stratigraphic thinning (pinchout)- mining limits may vary hundreds of

feet as information becomes available and as mining recovery economics and practicality are studied further.

Faults - may vary somewhat from currently assumed locations.

Underground burned areas - from a practical point of view are indeterminate prior to mining.

Permit boundary and approximate locations of faults affecting the Deer Creek Mine plan are illustrated in Figure 1. Faults influencing the mining plan are the Pleasant Valley Fault, Deer Creek Fault, and Roan's Canyon Fault.

Mining limits in the Blind Canyon and Hiawatha Seam include the 5 foot seam thickness. The underground mining machines now employed in the Deer Creek Mine are, by design, limited to a 5 foot coal seam. The Blind Canyon 5 foot thickness limit is present in the southern area of the Deer Creek Mine and the western area of the north reserves accessed through the Roan's Canyon Fault.

The interburden in the minable area where the two seams overlap averages about 80 feet. Mining will commence in interburden thickness of 30 feet or greater when extracting both seams.

Since part of the area of the Cottonwood/Wilberg Mine is overlain by areas of the Deer Creek Mine, detailed mine scheduling has been undertaken to ensure that the upper seam is mined prior to the mining of the lower seam while still following good mining practices in generating the mine layout. In addition, the mining plans are designed with a system of barriers for protection of the 345 KV line and perennial stream drainage.

The mine layout, as illustrated in Maps 3-1 thru 3-5 is an arrangement of longwall panels and development sections interconnected by systems of main and sub-main entries. This arrangement is predicated on geographical dedication of reserves, available coal quality and geologic information. Better knowledge of the geology and quality parameters of the coal reserve through additional drilling, mine development work, and continued operating experience at Huntington Power Plant will influence future mining techniques and mine plans.

The planned mine development sequence accommodates longwall panels as the primary means of efficiently extracting the reserves. Longwall mining systems are far superior to other mining methods in terms of overall coal recovery, safety, consistent coal quality, and operational efficiency. In areas of the mine where overburden, coal quality, or ground conditions are a concern, only longwall systems will be employed to extract the reserves. This will ensure the best possible means of maximizing reserve recovery while maintaining consistent coal quality and ground control.

The sequence of mining at Deer Creek is shown on Maps 3-1 thru 3-5.

Plans for roof control, ventilation system, and methane and dust control have been submitted to MSHA and are filed in the MSHA district office; Mine Safety and Health Administration, P. O. Box. 25367, Denver, Colorado 80225.

In order to accommodate the future needs of the Deer Creek Mine, three breakout locations have been identified. These breakouts will be located in the North and South forks of Meetinghouse Canyon and in Rilda Canyon.

Revised 11/21/83
Revised 6/6/88

The breakouts in the South Fork of Meetinghouse Canyon will be used for ventilation portals. This proposed breakout would be done from within the mine and there will be no disposal of coal, rock or waste materials on the surface. These portals will not be designated as emergency escapeways and will not require any access route in the canyon. If, in the case of an emergency which would cut off all other routes of escape and these portals were used, the personnel could make their way to the canyon floor on foot.

Each of the three portals will be approximately eight feet high and twenty feet wide with horizontal separation of one hundred feet between centers. Each portal will be fenced to prevent entry and posted with warning signs.

The coal seams at this location strike in a north-south direction and dip to the west at 1.3 degrees. Because of this fact, any water produced near the portal would flow downdip into the mine rather than flowing out of the mine.

The breakout in the North Fork of Meetinghouse Canyon will be used for mine ventilation airways. As was the case with the South Fork breakout, this breakout will be developed from within the mine and there will be no disposal of coal, rock or waste materials on the surface. These portals will not be designated as emergency escapeways and will not require any access routes in the canyon. If, in the case of an emergency which would cut off all other routes of escape and these portals were used, the personnel could make their way to the canyon floor on foot.

Each of the two portals will be approximately eight feet high and twenty feet wide with horizontal separation of one hundred feet between centers. Each portal will be fenced to prevent entry and posted with warning signs.

All necessary studies of the North Fork Meetinghouse Canyon breakouts have been completed and approvals received in order to complete construction of the two portals.

The coal seams at this location strike in a north-south direction and dip to the west at 1.3 degrees. Because of this fact, any water produced near the portal would flow downdip into the mine rather than flowing out of the mine.

The breakout locations in Rilda Canyon are not planned to be developed during the period that this permit covers. Therefore, only brief detail will be given.

Men, supplies, and materials will access these reserves from new portal facilities to be constructed in Rilda Canyon, adjacent to our lease area. However, it is not anticipated that any construction will take place on this project until the early 1990's. When this concept has been further developed, applicant will submit detailed plans for Division, Forest Service, and other required approvals.

MINING METHOD

Continuous Mining Units

The principle purpose for continuous mining units in Deer Creek Mine is development; i.e., driving main entries, opening headgates, tailgates, bleeder and setup entries for the longwall panels.

Figure 2 illustrates the basic configuration of the main entries. A six-entry system is planned for the main headings with openings driven 20 feet wide on 100 foot centers. The pillars created thereby measure 80 feet by 80 feet, a size which, in the past, has proven sufficient to support the overlying strata.

Development work for the longwall panels is illustrated in Figure 3. Headgates and tailgates are being driven with three entry systems on 105 foot by 50 feet centers. The two-entry system development layout will be reinstated pending awaited approvals from MSHA. Bleeder entries are driven on 100 foot by 100 foot centers. With retreating longwall mining systems, all development work is done by continuous mining units prior to longwall equipment installation.

In those areas where longwall mining is not practicable and economic conditions are favorable, room-and-pillar sections may be developed as production sections for continuous mining units. For development of room-and-pillar sections at Deer Creek Mine, three entries will be opened on advance with two or more developed on retreat in conjunction with pillar extracting. Openings are 20 feet wide on 100 foot by 100 foot centers. The sequence of pillar recovery is shown in Figure 4 (near the end of advance and beginning of retreat and pillaring).

However, the predominant mining method will be the longwall mining system which achieves much higher recovery percentages.

Longwall Mining Systems

Longwall coal mining as it is practiced in Utah Power and Light Company's mines presents the safest and most efficient mining method that is available.

The longwall method used is the retreating type. After development entries are driven to the extent of the panel length on both sides of the longwall face, setup entries are driven to connect the development entries. A face 500 to 1000 feet long (depending on circumstances) is developed, and the longwall equipment is set up. Mining proceeds back towards the main entries. A barrier of approximately 400 to 500 feet is left between the mined out longwall panel and the main entries.

Panels are designed with two or three-entry development systems on 50 foot by 105 foot centers. Entries are developed on 100 foot centers for two pillars before they are decreased to the 50 foot by 105 foot centers. The 50 foot by 105 foot centers on the development entries are designed on the yielding pillar principle. This means they will gradually crush out at the second panel mines by them. The purpose of this feature is to prevent the buildup of unrelieved stresses in the pillar which, in the past, has resulted in sudden and violent failure of pillars with its accompanying danger to personnel and property.

The longwall panels are designed to be as long as possible within the property boundaries. Geologic features are the principal limiting factors.

Due to the time involved in moving a longwall mining system, the minimum panel length considered is 1500 feet.

Coal Recovery

The maximum amount of economically recoverable coal will be extracted from this mine with the exception of protective coal, which

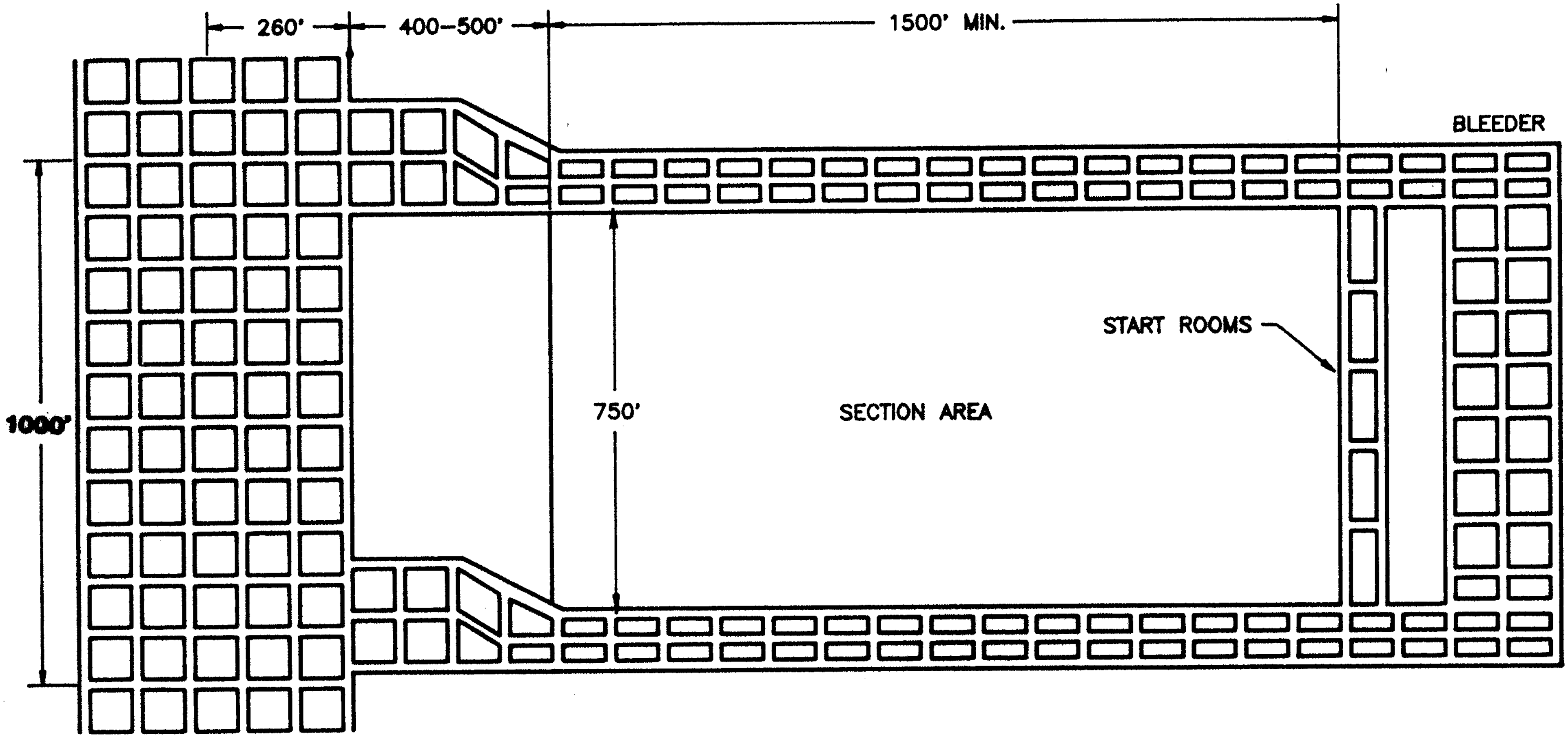


FIGURE 2

CONFIGURATION OF EXTRACTION PLAN FOR LONGWALL SECTIONS AT DEER CREEK MINE

SCALE: 1"=300'

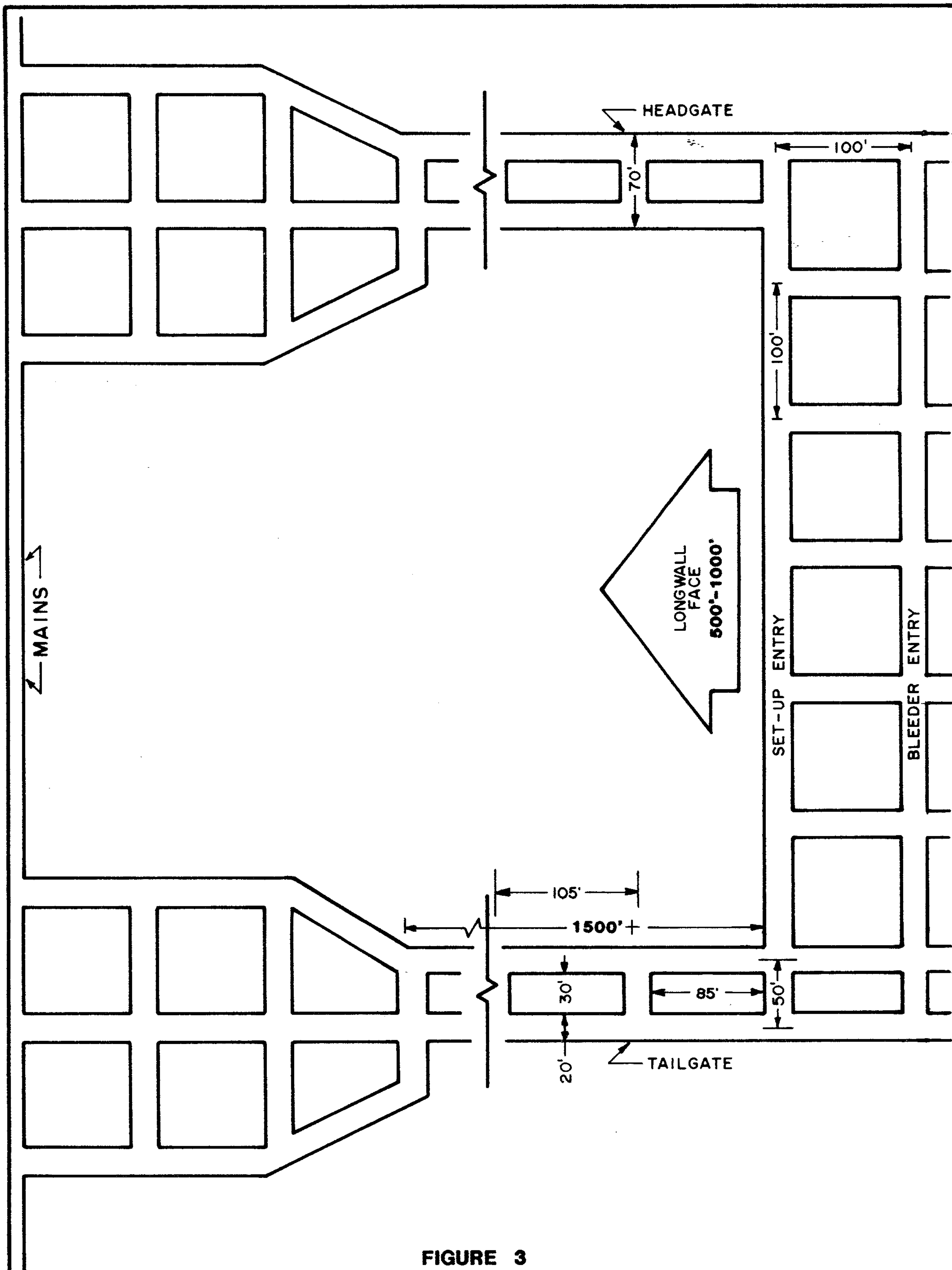
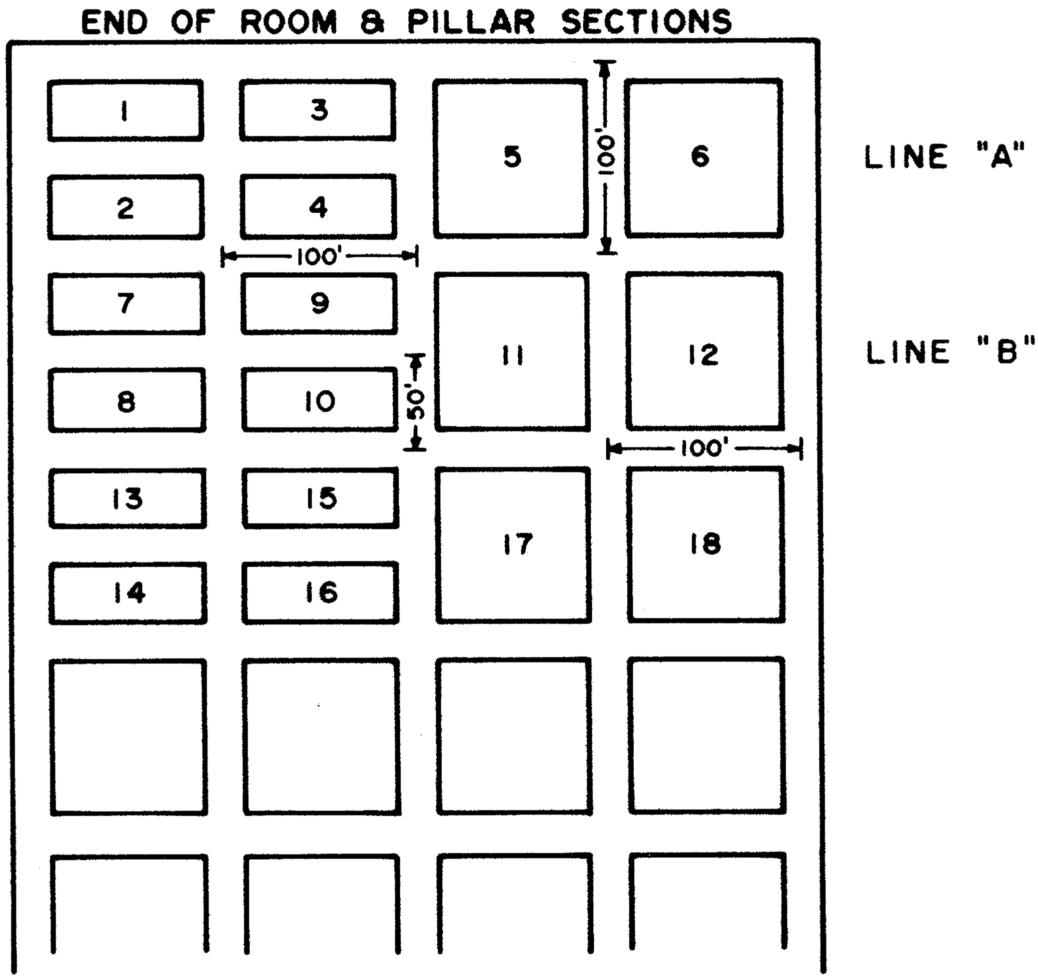


FIGURE 3

LONGWALL PANEL AS USED IN DEER CREEK MINE

Scale: 1" = 100'



Pillars in Line A will be recovered first, starting at pillar #1 going to #6. Then the pillars in Line B will be recovered.

FIGURE 4

DEER CREEK MINE
SEQUENCE OF PILLAR RECOVERY

must be left in place to ensure the integrity of the mine. This protective coal can be broken into two separate categories of barrier coal and strata control coal.

One hundred (100) foot wide barrier pillars are left between room-and-pillar panels to prevent abutment pressures from adjacent sections from carrying over to the active section. These barrier pillars also act as fire isolation barriers, should a combustible incident arise in any particular panel.

Barriers either 300 feet or 400 feet wide are left between major room-and-pillar panels. Barriers from 400 to 500 feet are left between longwall extracting panels and the main entries in the mine. These major pillars protect the main entries, which contain the intake and return airways, and transportation systems, during mining in the particular area of the mine that these entries serve.

Strata control coal is left in areas where the floor or roof rock is unstable and subject to failure. This coal will be left as a safety measure, during the development of the section, and will be extracted during the retreat of the section if safely possible.

As is the case with both our standard systems of mining for Deer Creek Mine, it is our intention to maximize the amount of coal recovered from our lease areas, subject only to feasible economic constraints, coal quality and mine safety considerations.

It is anticipated that occasions will arise when resource recovery cannot be fully accomplished, as outlined by the mine plan, due to difficult mining conditions, unforeseen geologic conditions, or degradation of the minable coal quality. However, before any modification is made, it will first be discussed with the appropriate BLM officials for approval.

Abandonment of the coal mine will be accomplished by a series of systematic sealings of worked out areas within the mine. As each section of the mine is extracted, the gob area left behind ill be sealed off from the mine atmosphere by constructing seals. These seals will be constructed in accordance with MSHA regulations.

Within the area of the Wasatch Plateau, coal seams are known to be present in two formations, the Blackhawk and the Ferron Sandstone member of the Mancos Shale. Coal seams within the Ferron Sandstone outcrop to the southeast and are of economic importance in that region (Emery Coal Field). However, the presence of these seams at depth below East Mountain can only be speculated because no data is available to prove their existence. If coal seams do exist in the Ferron Sandstone they would be at presently unminable depths of 4,000 to 4,500 feet below the Deer Creek Mine workings. The future recovery of these speculative coal reserves will, in no way, be influenced by the present or proposed workings of the Deer Creek.

Table 3 identifies the number of acres affected by mining for each five year period. In areas of seam overlap, only the first mining in the area is considered in calculation of acreages. Subsequent mining in the other seam is not considered since the area has previously been affected.

TABLE 3

Acres Affected by Mining

Period	Low-Ash # Acres
1988 - 1992	1131
1993 - 1997	1080
1998 - 2002	1173
2003 - 2007	830
2008 - 2012	489
2013 - 2017	201
2018 - 2022	446
TOTAL LOW-ASH ACRES	5350
ADDITIONAL HIGH-ASH ACRES	3473
TOTAL	8823

MINE PRODUCTION

It is expected that the increasing emphasis on production sections as opposed to development sections, an average production rate of 600 tons/machine shift for continuous miners and 5000 tons/machine shift for longwalls is deemed attainable in the future. Table 4 lists the anticipated annual and total production of coal at Deer Creek Mine.

A year's production of the longwall can change from year-to-year because of the long length of time required to move the longwall equipment when a panel is completed. A longwall move can take up to a month's time to complete. Several moves may occur during the same calendar year depending on longwall panel length.

It is expected that recovery rates of 80% or better can be obtained within the longwall panels and that pillars will be recovered as much as possible as the mains are retreated towards the end of the mine life. The estimated overall minable reserve recovery for Deer Creek Mine is 60%.

TABLE 4

DEER CREEK MINE

ANTICIPATED ANNUAL AND TOTAL PRODUCTION

YEAR	TONS	YEAR	TONS
1988	2,998,000	2005	2,582,000
1989	2,942,000	2006	2,772,000
1990	2,955,000	2007	2,762,000
1991	2,855,000	2008	2,762,000
1992	2,969,000	2009	2,782,000
1993	3,055,000	2010	2,772,000
1994	2,952,000	2011	2,672,000
1995	2,754,000	2012	2,682,000
1996	2,869,000	2013	2,662,000
1997	2,797,000	2014	2,672,000
1998	2,777,000	2015	2,682,000
1999	2,777,000	2016	2,672,000
2000	2,662,000	2017	2,682,000
2001	2,672,000	2018	2,572,000
2002	2,772,000	2019	2,256,000
2003	2,682,000	2020	1,380,000
2004	2,762,000	2021	1,380,000

TOTAL LOW-ASH TONS 91,084,000

The sequence of developing panels is dependent upon production requirements, mining efficiency, and geologic parameters of the coal deposit. Coal requirements are based on a planned annual production rate of 2.5 to 3.0 MM tons for the mine. Total recoverable reserves within the Deer Creek Mine's boundaries are 125 MM tons (this includes 35 MM high-ash tons in the Blind Canyon and Hiawatha Seam). As noted previously, a mining productivity of 600 tons/continuous miner shift and 5000 tons/longwall shift is eventually attainable. This translates into three miner sections and one longwall section operation 2 shifts/day, 235 days/year in order to achieve the required coal output at full production. Deer Creek Mine will eventually transfer up to 1,000,000 tons per year via a coal transfer raise to the Wilberg coal handling system.

All in-mine coal haulage is by belt conveyor. Of the total entries in the main entry systems, at least one entry is dedicated specifically to the belt conveyor. All men and materials are transported underground by diesel equipment.

Table 5 lists the major ancillary equipment used in Deer Creek Mine.

TABLE 5

DEER CREEK MINE - MAJOR UNDERGROUND ANCILLARY EQUIPMENT

Continuous Mining Units	Longwall Mining Systems	General Mine
6 - Continuous Miners	2 - Face conveyors	2 - Locomotives
11 - Shuttle Cars	2 - Double Ended Shearers	10 - Compressors
5 - Scoops	262 - Shield Type Supports	23 - Transformers
11 - Roof Bolters	2 - Stageloaders	2,400 - 42" Conveyors
32 - Rock Dusters	2 - Lump Breakers	41,620 - 48" Conveyors
4 - Power Centers	4 - Scoops	20 - Conveyor Drives
7 - Feeder Breakers	2 - Transformers	12 - Welders
	1 - Petito Mule	9 - Battery Chargers
		3 - Man Carriers
		2 - Mechanic's Jeeps
		2 - Material and Equipment Trailers
		7 - Diesel Scoops
		27 - Isuzu Pickups
		1 - Road Grader
		1 - Dozer

Revised 11/21/83
Revised 6/6/88

ENGINEERING PRINCIPLES AND TECHNIQUES

A variety of engineering principles and techniques are applied in the Deer Creek Mine operation. Principles of engineering employed are those associated with standard prudent mine engineering practice. Employment of knowledgeable, experienced personnel makes application of such principles possible. Engineering design techniques for Deer Creek Mine include computer simulation of coal extraction, ventilation, and pumping systems, along with reserve and testing in rock mechanics and subsidence.

Long-range mine planning by computer simulation plays an important role in design. Computer simulation of coal extraction assists the engineers in projecting annual tonnages and sequencing extraction in panels and sections. Computer based long-range planning helps to maximize annual production and better utilize continuous mining units and longwall mining systems. The two seam nature of the property and consequent need to extract upper seam panels and sections increases the value of these simulations.

Ventilation and dust suppression are essential in underground mining operations. Delivering air and water from their respective sources to fulfill these needs can become complicated in a large operation. Simulations of ventilation and hydraulic networks play a significant role in planning for future needs and installing systems for delivery. Deer Creek Mine planning includes these ventilation and hydraulics simulations.

Rock mechanics studies are a necessary part of mine planning. The long-term stability of the entries directly affects mine integrity as well as a protection of property and mine production. Because of the areal extent of the Deer Creek property, mine integrity must be maintained for extended periods up to 50 years. Rock mechanics studies have been extensive, with Utah Power and Light conducting several in-house and outside evaluations and participating in ongoing cooperative projects with the U.S. Bureau of Mines.

The determination of rock strength, entry stress distribution, abutment loads, and roof support design have been consistently studied. Holes are drilled downward or upward from existing Deer Creek entries within the mine to determine coal quality and interburden characteristics. This data is continually processed to aid in efficient design of the Deer Creek mining layouts.

utah power & LIGHT COMPANY
MINING DIVISION
P.O. Box 310
Huntington, Utah 84528

June 21, 1988

Mr. Brent Northrup
Bureau of Land Management
Moab District Office
P. O. Box 970
Moab, Utah 84532

SUBJECT: Deer Creek Mine Plan Update and R2P2 Modification

Dear Sir;

Changes have occurred in the Deer Creek life-of-mine plan which warrant modification of the existing resource recovery and protection plan.

Updated mine plan sequencing and longwall panel orientation changes are necessary to utilize new geologic data, new Mine Safety and Health Administration (MSHA) regulation interpretation, and mining system improvements.

The Roan's Canyon fault crossing will now be located at the northern-most end of the 3rd North mains. This will enable the layout of longwall panels in the northern leases to be more compatible with the overburden joint orientations. The 3rd North crossing location also allows selective mining of low-ash and high-ash longwall blocks. This will ensure consistent coal quality while maximizing recovery of reserves designated for additional preparation.

MSHA regulations regarding longwall bleeder systems have made it necessary to design and incorporate "dedicated" bleeder systems in the mine plan whenever possible. These bleeder systems must be maintained open for extended periods of time, requiring that barriers be used to protect the bleeder entries from mining abutment loads. The protection barriers will vary in width depending on overburden depth and accumulated design experience.

The reorientation of longwall panels in the life-of-mine plan fully utilizes the longwall mining units as the primary source of reserve extraction. Extension of longwall panel lengths are projected to reduce the amount of entry development and increase reserves mined by the longwall units. The high percentage of coal recovered from the longwalls will increase overall Deer Creek Mine reserve recovery percentages.

Areas reflecting modification in the R2P2 include an updated life-of-mine plan map showing mining by year for 5 years, thereafter in 5 year increments for the Deer Creek Mine. All other areas pursuant to 43 CFR 3482.1 (c) remain unchanged in the approved resource recovery and protection plan.

If you require more information please call.

Thank you,

Bart Hyita
Director of Operational Engineering

BH/jd

Enclosure

cc: Morgan Moon
Dave Smaldone

MINE FACILITIES

Introduction

Deer Creek Mine facility is located on a 20 acre site at the junction of Deer Creek Canyon and Elk Canyon as shown on Figure 1. The site is characterized by moderate vegetation and rugged, steep terrain. Surface Facilities include the following: sediment pond, embankment fills, coal surge bin, transfer tower, breaker station, crusher station, coal weigh bin, truck load-out, facility conveyors, overland conveyor, parking lot, office-bathhouse, warehouse-shop, materials storage area, access and service roads, mine ventilation fan, power supply and substation, water treatment system, sewer treatment system and drainage system. Access to the surface facilities is controlled by an automated security system. The system consists of automated traffic gates, electronic surveillance equipment and card readers. See Drawing DS202E, Packet 3-9 for location of the system.

Specific locations of mine facilities are shown on Drawings 3-8 and 3-9.

All facility plans are on file at Utah Power and Light Company - Fuel Resources, 324 South State, Salt Lake City, Utah. They are available for public inspection.

With the exception of roads, conveyors, and mine yard track, a narrative follows explaining the construction, use, maintenance, and removal of the forenamed facilities.

AMENDMENT TO
APPROVED Mining & Reclamation Plan
Approved, Division of Oil, Gas & Mining
by PGL date 1/23/96

DAMS, EMBANKMENTS, AND OTHER IMPOUNDMENTS

Sediment Pond -- A pond has been designed and constructed for sediment control at Deer Creek Mine. The pond design capacity is 14.0 acre-feet, 2.5 acre-feet for sediment, 11.3 acre-feet for runoff, and 0.2 acre-feet free board. The pond design will impound runoff from the 10 yr.-24 hr. precipitation event of 2.25 inches. All runoff from 20 acres of disturbed area is collected and routed through the sediment pond. Runoff is detained for the theoretical 24 hr. detention period and discharged. A grouted rip-rap spillway is installed in the dam to provide controlled release of runoff from a 100 yr./24 hr. precipitation event.

Construction and design of the ponds were under the direction of a registered professional engineer. Details of pond construction are included in Existing Structures.

The pond excavation is located mainly in the hard rock strata of the steep Deer Creek Canyon walls. The excavated rock was used in extending the fill for additional materials storage and personnel parking.

Pond slopes vary depending on the material in which they are constructed. Those constructed in rock have a 1 horizontal to 4 vertical slope. Fill slopes are 2.5 horizontal to 1 vertical. The rip-rapped upstream dam slope is constructed at 2.5 horizontal to 1 vertical. The down-stream dam slope is 2 horizontal to 1 vertical.

The outlet works for the sediment pond are constructed of 24" CSP, screened to prevent clogging and capped with a skimmer ring.

The sediment pond embankments are riprapped to minimize erosion.

Maintenance of the sediment pond includes quarterly inspections and discharge monitoring. Copies of inspection reports by a registered professional engineer will be kept on file in the Utah Power & Light Company-Mining Division Office in Huntington, Utah. Deer Creek sediment pond has not discharged since its installation. The pond will be dredged of sediment when sediment volume is 60% of design capacity.

Reclamation of the pond will complete the proposed Deer Creek reclamation process. The pond will be allowed to dry followed by backfilling and grading. Graded contours will be compatible with the natural surroundings. Revegetation will be performed as outlined in Reclamation Plan.

Mine Facilities Pad -- An earthen fill structure is utilized for material storage and personnel facilities. The fill occupies approximately 8½ acres. Construction material for the fill was obtained from the south slope of the Deer Creek drainage and from the sediment pond excavation.

Approximately 30% of the fill structure is asphalt surfaced providing access and personnel parking. The remaining 70% is utilized for material storage, office-bathhouse, warehouse-shop, and electric substation.

AMENDMENT TO
APPROVED Mining & Reclamation Plan
Approved, Division of Oil, Gas & Mining

by [signature] date 8/3/88

RECEIVED
JUN 05 1989
DIVISION OF
OIL, GAS & MINING

DEER CREEK MINE
SEDIMENT POND CLEANING

The sediment pond at the Deer Creek Mine site has accumulated sediment to the extent that cleaning it has become necessary. To accomplish the cleaning, the Mining Division will adopt the Division of Oil, Gas and Mining "Sedimentation Pond Cleanout Procedural Guidelines" as closely as possible during the cleaning process.

The pond will be drained of water to a workable level prior to the cleaning of the sediment accumulation. In order to stay within the NPDES permit, a sample of the pond discharge was sampled on May 11, 1989 to determine the maximum flow while still remaining under the 2000 lbs/day TDS discharge limit. When the results are known, the valve will be opened to a level safely below this calculated amount. During the draining process, three (3) additional discharge samples will be analyzed for the NPDES monthly discharge parameters to guide us in the correct discharge rate and length. If this method can not lower the water level to that desired, while staying in compliance, pumping and hauling of water will be used.

Because of the tight quarters in the pond area, a few temporary procedures and structures are necessary to successfully clean the pond. To control the water level in the pond, a temporary sediment basin will be constructed at the access road turn-off. (See Map DS1139E) This basin will catch and hold runoff from the tipple area during cleaning via a small dam, placed at the Weigh Bin building, and a 12" diversion line. During a significant precipitation event, the water is diverted back to the sediment pond. The basin, which has no spillway (Map DS1127D), will be pumped and the water hauled to the Waste Rock Site Facility as needed. The basin water level will be monitored periodically, 24 hrs/day. Upon completion of the project the temporary structures will be removed. The areas will be reclaimed to the pre-cleaning state, i.e. sediment in the basin will be cleaned out and hauled to the Waste Rock Site and the basin filled in, the rip-rap channel will be reestablished.

To clean the sediment from the pond, an access road will be constructed over the dam and into the pond. The road will be reclaimed after the cleaning project is complete.

Sludge from the sedimentation pond will be disposed of in a small basin constructed at the Waste Rock Site. At the time of initial removal of the sediment from the pond, a Division inspector will be invited to witness the sediment transportation process to assure that adequate measures are being taken.

AMENDMENT TO
APPROVED Mining & Reclamation Plan
Approved, Division of Oil, Gas & Mining

by I. Munson date 6/5/89

The west side of the fill nearest the mine portals supports a rail spur for men and materials transport to the mine. All runoff from the fill area is collected by catch basins and slot drains in the disturbed drainage system.

A proposal is being considered to utilize a portion of the fill to support a rail extension into the materials storage area on the east end of the fill.

Maintenance of the fill is minimal. Periodic inspections are made to observe changes in the stable condition of the fill. Resurfacing of parking areas, regrading of graveled surfaces will be done as needed. In order to maintain the surface grade and stability of the fill, yard drains and catch basins will be inspected and cleaned annually for proper drainage.

Reclamation of the fill will involve removal of drainage structures, grading, and revegetating.

Once the drainage structures are removed, the fill will be graded to contours compatible with the natural surroundings. Regraded slopes will be no greater than 2h:1v. The graded slopes will be revegetated and contoured as discussed in Reclamation Plan.

Ventilation Fan Pad -- Deer Creek Mine is ventilated through a 150' vertical shaft. The fan is mounted on an earth fill structure behind the mine offices. The 150' x 50' structure is a cut-and-fill in the north slope of Deer Creek drainage.

Fresh water storage and diesel fuel storage (for the ventilation fan back-up motor) are located on a similar structure adjacent to the ventilation fan pad -- at a slightly higher elevation. This cut and fill structure is approximately 200' x 50'.

All runoff from these structures is collected in the disturbed drainage system. The outslopes of the fills have been revegetated to minimize erosion.

Maintenance of this structure involves periodic inspections to monitor stability. Grading will be carried out as needed to maintain proper drainage.

Removal of this structure is discussed in <u>Reclamation Plan</u>.

<u>Overburden And Topsoil Handling And Storage</u>

At present, no structures or facilities exist specifically for overburden and topsoil handling and storage at Deer Creek Mine. All overburden removed in the mine area has been utilized as construction material for earthen fill structures.

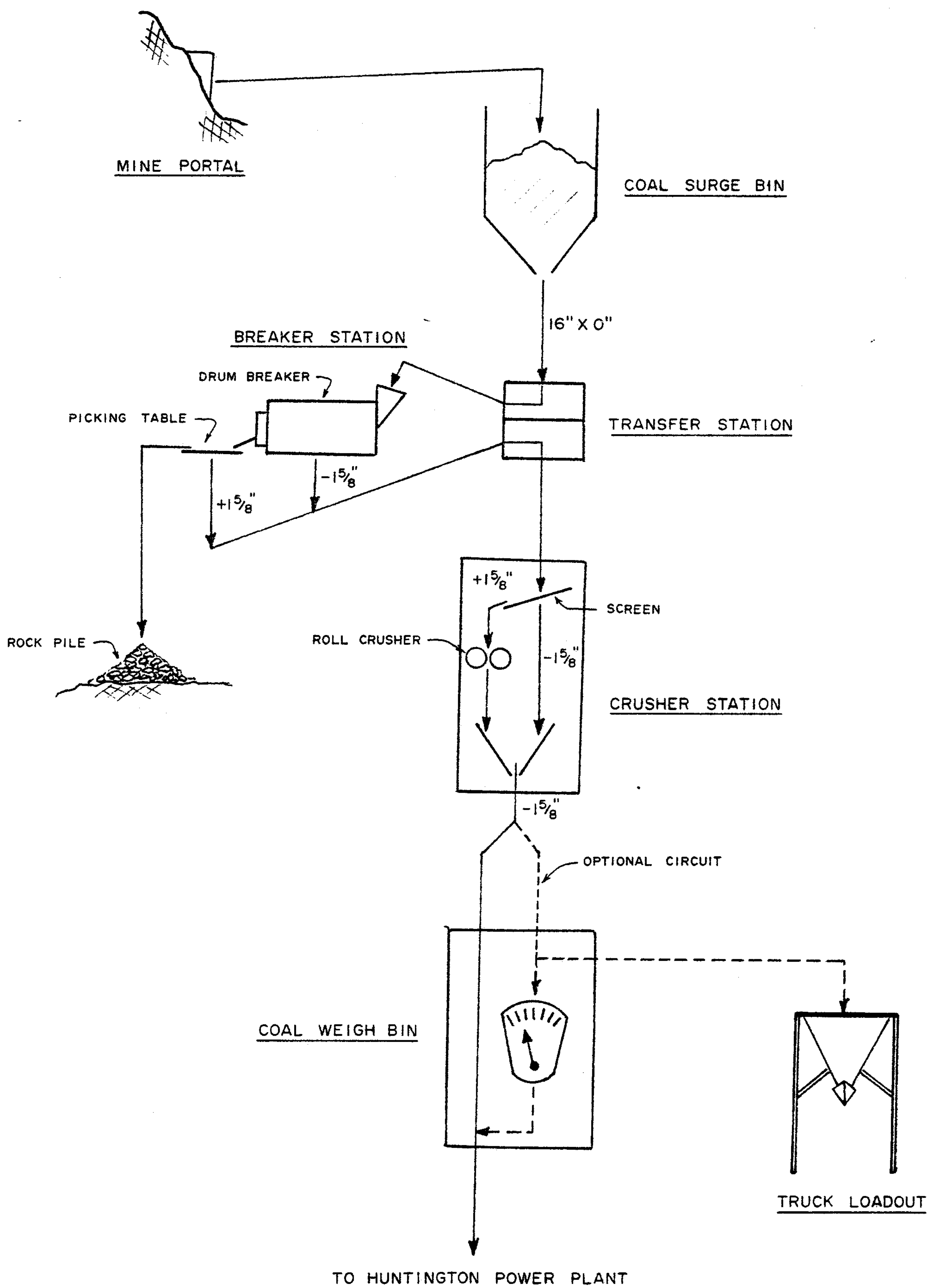
<u>Coal Handling Facilities</u>

The coal handling system at Deer Creek Mine is designed to prepare a -1 5/8" product for the Huntington Power Plant. Figure 8 is a simplified flowsheet to clarify the following facility description.

SIMPLIFIED COAL HANDLING SYSTEM DIAGRAM

DEER CREEK MINE

FIGURE 8



Coal Bin -- The 16" x 0" ROM product is delivered approximately 1,350 feet from the mine portal to a coal surge bin. The coal bin is constructed in the rock strata of the west slope of Elk Canyon. Bin capacity is approximately 14,000 tons. The recovery cone at the base of the bin was excavated from the rock and shotcreted. A vibratory feeder delivers coal to a belt in the reclaim tunnel at the base of the bin.

Maintenance of the bin is limited to standard mechanical maintenance on the machinery at the base of the bin in the reclaim tunnel.

Reclamation of the coal bin will include backfilling and revegetation. The reclaim tunnel and bin will be backfilled with non-toxic fill. The fill will be contoured and revegetated to be compatible with the natural surroundings.

Transfer Tower -- The transfer tower is a steel frame structure supporting twc coal transfer chutes. Coal collected from the bin in the reclaim tunnel passes through the transfer tower to the breaker station. Coal is also received from the breaker station and passed through the transfer to the crusher station.

The transfer tower requires only standard structural and mechanical maintenance. Mechanical parts are greased, repaired, and replaced as needed. The steel framing will be painted periodically to maintain its appearance and structural integrity.

At the end of its useful life, the transfer tower will be dismantled and sold for scrap. The concrete foundations will be broken up and used for coarse backfill.

Breaker Station -- The breaker station is a steel frame structure supporting, in general, a tramp iron magnet, 9' x 21' rotary breaker, and picking table. The 16" x 0" ROM coal is carried past the tramp iron magnet into the rotary breaker where it is broken and screened to -1 5/8" or rejected to the picking table. Unbroken coal is returned to the circuit for further crushing. Rock and trash are rejected for disposal.

The breaker station requires standard mechanical and structural maintenance. Mechanical parts are greased, repaired, and replaced as needed. The steel framing and housing will be painted periodically to maintain their appearance.

The breaker station will be dismantled and sold for scrap at the end of its useful life. Foundations for the breaker station will be broken up and used for coarse backfill.

Crusher Station -- The crusher station is a steel frame structure supporting, in general, a tramp iron magnet, vibrating screen, roll crusher, and tipple control building. The coal received from the breaker station through the transfer tower passes by a tramp iron magnet to a screen where the -1 5/8" product is removed. The oversize passes through the roll crusher where it is crushed to -1 5/8". The - 1 5/8" product collected at the base of the crusher station is the final facility product. The tipple control building is approximately 15' x 15' square with concrete floor and corrugated galvanized steel sheet siding. The building interior is lined with styrofoam for insulation against climate and noise. Tipple controls for belts, breaker, screen, and crusher are housed in this building.

As with other coal handling facilities, standard mechanical maintenance is practiced on the crusher station. Mechanical parts are greased, repaired, and replaced as needed.

Steel framing will be painted as needed to preserve structural appearance.

In accordance with the reclamation plan, the crusher station will be dismantled and sold for scrap. Structure foundations will be broken up and used for coarse backfill.

Weigh Bin -- Generally, crushed coal from the crusher station is conveyed directly to Huntington Power Plant.

Two other options in the handling process are available: 1) coal may be weighed before conveying or 2) coal may be diverted to the truck loadout for truck transport.

The weigh bin building is a steel frame structure with corrugated galvanized steel sheet for roof and siding. The cone-shaped bin is welded steel sheet with a maximum capacity of 200 tons.

The weigh bin requires no maintenance. The weigh bin building may require painting to maintain its appearance.

During reclamation the weigh bin structure will be dismantled and sold for scrap. Building foundations will be broken up and used for coarse backfill.

Truck Loadout -- The truck loadout is maintained to provide haulage when the overland conveyor is undergoing major repair. The steel frame structure supports a surge bin with clamshell loadout gates.

Standard mechanical maintenance is performed on the truck loadout when needed.

The truck loadout will be dismantled and sold for scrap during reclamation. Concrete foundations will be broken up and used for coarse backfill.

Facility Conveyors -- All facility conveyors are identical and discussed in Transportation Facilities.

Waste Rock And Non-Coal Waste Disposal

Underground development waste rock will be generated throughout the life of Deer Creek Mine. Typical sources of waste rock are rock slope construction, scours, and entry rehabilitation. Rock that cannot be gobbed underground will be transported from the mine and placed in a controlled manner within the permit area. Details of underground development waste rock disposal plans are included in Underground Development Waste.

Deer Creek run-of-mine product includes rock from roof, floor, or in-seam rock splits. Standard coal mining practice cannot fully eliminate extraneous rock in the run-of-mine product. Therefore, coal handling and sizing processes at Deer Creek Mine are designed to screen and remove the +6" pieces of rock.

Analysis of samples taken from roof and floor of the Deer Creek Mine area have shown the rock to be non-toxic and non-acid forming. Non-toxic waste rock is disposed of in a controlled manner with underground development waste. Disposal plan details are included in Underground Development Waste.

Non-coal waste is removed from the mine by rail to a concrete trash storage bin in the mine yard. A photo of the trash bin is shown in Existing Structures. Trash is collected periodically from the bin and trucked to a State approved disposal area.

The trash bin requires no maintenance.

During reclamation, the trash bin will be demolished and concrete will be used for coarse backfill.

Other Mine Facilities

Office-Bathhouse -- Mine offices and bathhouse facilities are housed in a 170' x 70' two story, pre-fab concrete building in Deer Creek Canyon. The concrete foundation is anchored to steel "H"-beam pilings. Interior construction is standard with concrete floors, aluminum siding, and sheet-rock walls.

Offices for administrative, clerical, safety and engineering personnel are included in this building with conference rooms and bathroom facilities. Locker rooms, showers, bathrooms, and lamp room for 550 miners and supervisors occupy the bulk of the building.

Standard building maintenance procedures are followed to maintain the office-bathhouse.

Reclamation plans include demolition of the office-bathhouse following interior salvage and stripping. Concrete floors, walls, and foundation will be utilized for coarse backfill.

Warehouse-Shop -- The 140' x 80' Warehouse-Shop is a steel frame structure with concrete floors and aluminum siding and roofing.

Roughly, one third of the building is utilized for storage of small parts and machinery requiring cover and security. The remaining two thirds of the building is utilized as a shop for small machinery repair and minor overhauls to locomotives, belt drives, etc..

Standard building maintenance is applied to the warehouse-shop. The exterior will be painted periodically to maintain its appearance.

During reclamation, the warehouse-shop will be dismantled. Steel parts will be salvaged or sold for scrap. Concrete footings and floors will be broken up and used for coarse backfill.

Materials Storage Area -- Mine support materials and equipment are stored in graveled surface areas on the embankment fill in Deer Creek Canyon. Primary material storage surrounds the warehouse-shop and includes a storage shed, oil storage, fuel facilities, and rock dust silo. A secondary storage area is located near the edge of the fill beyond the substation and parking lot.

Materials stored in open areas include crib blocks, roof bolts, conveyor hardware, belts, beams, etc..

Adjacent to the warehouse-shop is a 50' x 80' steel frame storage shed formerly utilized as a bathhouse. Storage shed construction is identical to the warehouse-shop. The storage shed provides shelter for bagged rock-dust and ready-mix concrete. No maintenance is needed on this building. Removal of the storage shed will be similar to the warehouse-shop.

Oil storage and fueling facilities are located northeast of the warehouse-shop. Cans of oil and lubricant are housed in a steel storage shed. Diesel fuel is stored in a 4,000 gallon buried tank and accessed with an electric pump.

A 140 ton capacity steel rock dust bin is located in the northwest section of the storage area, east of the shop and warehouse. The bin is mounted on a concrete foundation. Rock dust is pumped into specially equipped rail cars for distribution in the mine.

Material storage areas are cleared of snow and debris as needed to maintain accessibility. Drains are inspected and cleaned periodically to ensure proper drainage. Grading and resurfacing of graveled areas will be performed as needed.

Stockpiled materials, storage sheds, fueling facilities, and the rock dust bin will be removed from the area and scrapped or salvaged during reclamation. Specific reclamation procedures for the embankment fill supporting the materials storage areas are outlined in Reclamation Plan.

Parking Lots - Two general parking areas exist at Deer Creek Mine. Construction consists of an average 10" road base with 4" of asphalt surface. One small lot is located just outside the office-bathhouse with spaces designated for 18 vehicles. The main parking lot in the mine yard has 110 designated parking spaces.

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Revised 6/9/89

Parking lots are cleared of snow and debris and resurfaced as needed.

Drains are inspected and cleaned periodically to ensure proper drainage.

Asphalt will be broken up and used as coarse back-fill during reclamation.

Mine Ventilation Fans -- Deer Creek Mine is ventilated through a 150' long, 20' diameter, vertical shaft. A Joy Series 1000 Axivane Fan is anchored to a concrete foundation set in a cut-and-fill embankment. Mine exhaust is drawn through steel ducting and exhausted through an evase'. The fan motor is housed in a steel frame building.

Under normal operation, the fan is driven by a 1,000 hp electric motor as the prime mover. Through a clutch arrangement, a Model D346 Caterpillar diesel engine is installed to provide back up for the electric motor. The electric motor and the diesel engine are installed in a motor house, separated from the mine ventilation fan and duct by a long shaft-type coupling.

Fuel for the diesel engine is stored in a 1,000 gallon capacity horizontal fuel tank located on a cut-and-fill embankment behind the fan at a slightly higher elevation. A buried 3/4" line supplies fuel to the engine.

The mine fan is inspected daily and greased as needed. The fan motor house and evase' will be painted periodically to maintain their appearance.

At the end of mine life the fan installation will be dismantled and salvaged. The ventilation shaft will be sealed. Concrete foundations will be broken up and used for landfill.

An auxiliary back-up fan is available for use a Deer Creek Mine. A 600 hp Jeffrey axial flow fan was formerly utilized for main ventilation.

The auxiliary back-up fan is maintained for immediate service, otherwise remains idle.

During reclamation, the fan installation will be dismantled and salvaged. The fan portal will be sealed. Concrete foundations will be broken up and used for coarse backfill.

<u>Power Supply and Substations</u> - Power to the substation is supplied to Deer Creek Mine via a 12.5 KV utility service line which roughly parallels the northwest side of the access road up Deer Creek Canyon.

Power is transformed from the 12.5 KV utility service down to various voltages by means of 12 transformers which comprises the substation located east of the shop warehouse facility. Five feeder lines carry power to the mine; the remaining seven lines feed the surface facilities. Power is further transformed at small transformer station outside the office-bathhouse, mine ventilation fan, and ROM belt [illegible].

The substat[illegible] northwest of the shop and warehouse facility, s[illegible]70 volt lines to the mine and three 480 volt lines for shop and surface power.

Both substations will be used until 1992. At the time the substation east of the shop will be removed.

Deer Creek mine power supply system was installed and is maintained by Utah Power & Light Company - Southern Division.

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The power supply system will be removed by Utah Power & Light Company - Southern Division. Gravel and foundation material from the main substation will be used for backfill.

Water Pollution Control Facilities

Drainage Systems -- Two separate drainage systems are provided at the Deer Creek Mine site and are classified 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 past the disturbed area into the natural channel of Grimes Wash. These systems are illustrated in plan drawings 3-12 and 3-13.

Undisturbed runoff is collected by concrete inlet boxes in Elk Canyon and Deer Creek Canyon and conveyed through a corrugated steel pipe system past the sediment pond. Undisturbed runoff is discharged into the natural Deer Creek drainage. The system is designed to adequately pass peak flow from the 50 yr./24 hr. precipitation event.

The "disturbed" collection system collects runoff from roads, parking lots, storage areas and portal area and conveys it to the sedimentation pond. This system consists of concrete catch basins, small-diameter CSP culvert and open ditches designed to adequately collect and pass peak flow from a 10 yr./24 hr. precipitation event. (See Appendix IX last part for disturbed drainage calculations.)

Maintenance on the above drainage system consists of annual inspection and cleaning of all culverts, inlets and ditches. Trash and debris is removed and the system is checked for damage which might require repair to ensure proper operation of the system. J.E. 5/7/90

During mine-site reclamation, all diversion will be removed and the streambed re-established and rip-rapped to prevent erosion. Details are included in Reclamation Plan.

The construction, maintenance, and removal of the sediment pond is discussed previously in this description.

Mine Water Discharge -- Mine waste water is collected in an underground sump and discharged into a concrete weir adjacent to the main mine portal. Approximately 17,500 gallons of water per day are collected and treated for use as potable water. Excess mine water is conveyed through a 15" plastic (PVC) water line to the Huntington Power Plant water system and/or to the undisturbed drainage system through a buried 18" plastic (PVC) water line from the mine water discharge building to the undisturbed drainage culvert located 330' east of the office/bathhouse.

The water treatment system is installed in a concrete block building behind the office-bathhouse. Up to 35 gpm may be treated. The system is approved by Utah State Department of Social Services. Treated water is pumped to a 25,000 gallon redwood storage tank near the mine ventilation fan.

The water treatment system is maintained to be operational at all times and to adequately treat water within the Utah State water standards.

During reclamation, the mine waste water disposal and treatment system will be dismantled, extracted, and sold for salvage. Concrete block and floor from the treatment building will be broken up and used for backfill.

Sewage System - Office-Bathhouse and Warehouse-Shop sewage is collected in two (5,000 and 9,335 gal) precast concrete septic tanks located in the mine yard. The septic tanks are connected in series. Effluent from these tanks is carried by 6-inch diameter pipeline to an absorption field located adjacent to the overland conveyor approximately 5,800 feet northeast of the septic tanks.

The sewer treatment provided fulfills local, state and county health codes. Approval of the treatment process has been given by the Utah State Department of Social Services (see Map Packet 3-11 for details and approval.

The sewer treatment facilities will be left in place to dry out and the septic tanks will be crushed and backfilled.

Alternative Sediment Control Areas (UMC 817.42(3)) - Disturbed areas which cannot be reasonably treated by a siltation structure (i.e., sediment pond) due to remote geographic locations and small areas not justifying a sediment pond but which cannot meet effluent limitations without treatment, are considered Alternative Sediment Control Areas (ASCA). These areas are treated by the best control technology available which includes, but is not limited to: silt fences, berms, catch basins, strawbales, gravel filter dikes, check dams, sediment traps and mulches.

A list of the ASCA's within the permit area is found in Table 5.1 (See Page 3-32.2).

TABLE 5.1
DEER CREEK MINE
ALTERNATIVE SEDIMENT CONTROL AREA (ASCA)

SITE LOCATION	SEDIMENT CONTROL	ACREAGE	DRAWINGS
Meetinghouse Canyon	Berm	.02 Total (2) 20' x 21' Areas	Packet 1-3 CM-10367-DR
Sediment Pond & C1 Conveyor (#1)	Silt Fence	2.4	Packet 5-1 CM-10673-DR
Powder Magazine (#2)	Silt Fence	.10	Packet 5-1 CM-10673-DR
Road Shoulder (#3)	Silt Fence	.28	Packet 5-1 CM-10673-DR
Road Shoulder (#4)	Silt Fence	.43	Packet 5-1 CM-10673-DR
C1/C2 Transfer (#5)	Strawbales, Silt Fence, Sediment Trap	2.27	Packet 5-1 CM-10673-DR
C2 Conveyor Sites #6, 8, 9	Silt Fence, Strawbales, Berm	9.48 Total (1.54, 3.04, 4.90 Acres)	Packet 5-1 CM-10673-DR
Leach Field (#7)	Silt Fence	1.50	Packet 5-1 CM-10673-DR
Elk Canyon Coal Storage Pad Outslope	Silt Fence	.02	Packet 3-9 DS202E
	TOTAL	16.49 Acres	

DIVERSIONS (784.22)

Deer Creek Mine operation will not require further diversion of any stream channel in the permit area until reclamation. Specific procedures for diversion during reclamation are described in the Reclamation Section. Existing runoff and stream channel diversions are described in Operation Plan.

TRANSPORTATION FACILITIES (784.24)

Deer Creek Mine operation utilizes roads, conveyors, and a railway in association with facilities described in Operation Plan. All portal facilities are shown on drawings 3-8 and 3-9. A description of the construction, maintenance, and removal of each transportation facility at Deer Creek Portal follows.

Roads

Deer Creek Mine operation utilizies three facility roads as follows:

a. Mine Access Road

b. Coal Facilities Access Road

c. Mine Fan Access Road

The mine access road is asphalt surfaced. It extends approximately three miles from State Highway 31 in Huntington Canyon. Detailed plans of this road are unavailable due to its age. A general road plan is shown on drawing 3-18 and 3-19.

Road width averages 20'. Road gradient averages approximately 8% until it nears the facilities area. A 1,000' length of road from the truck loadout to the parking lot has a gradient of 18%. Steep narrow canyon terrain allows no leeway for a more gradual gradient. Sufficient evidence was provided to OSM and the Division to make a determination whether a variance should be granted. Correspondence regarding a determination seemed to concur with UP&L's findings that "major construction of complying roadways would increase environmental degradation". A determination of UP&L's submittal is still pending.

Asphalt and road base thicknesses are variable due again to road age and periodic resurfacing. Asphalt thicknesses are at least 4". The mine access road is crowned in the center, gradually sloping to the sides.

Runoff from the access road outside the portal area is collected in open ditches which drain into Deer Creek. Within the disturbed area, runoff is collected in open ditches, slot drains, and catch basins and routed through the sediment pond. Diversions are discussed in Operation Plan. Road drainages outside the portal area beyond the mine gate are maintained by Emery County Road Department.

The access road was constructed and is maintained by the County and will remain in place between the mine gate and State Highway 31 to provide access to the forest and fee lands.

The coal facilities access road is a 1,000' long winding gravel road up Elk Canyon which provides access to major components of the coal handling circuit. It has variable width and grade. It 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 1,500' long gravel road winding up Deer Creek Canyon behind the office-bathhouse to the mine ventilation fan. Road gradient averages approximately 20%. Travel on this road is limited to once a day at low speed. Road width averages 12'. Drainage from the mine fan access road is collected in an open ditch in the "disturbed" drainage system.

Maintenance of all facility roads includes snow and debris removal, grading, and resurfacing as needed.

Removal of all facility roads is discussed in Reclamation Plan.

Conveyors

Six facility conveyors are utilized at Deer Creek Mine. They are identified as follows:

a. Run-of-Mine Conveyor

b. Surge Bin Reclaim Conveyor

c. Breaker Feed Conveyor

d. Breaker Reclaim Conveyor

e. Crusher Feed Conveyor

f. Overland Conveyor

Two alternate conveyors are available for use if needed. They are Weigh Bin Conveyor and Truck Loadout Conveyor.

All facility conveyors are 48" wide. All conveyors are covered to prevent wind erosion except the truck loadout conveyor which is seldom used. All conveyors are steel frame idler supported conveyors except the overland conveyor which is steel frame cable supported conveyor.

The 1,350' run-of-mine conveyor delivers 16" x 0" size coal to the coal surge bin from the mine. This conveyor will deliver as much as 2,500 tph.

The surge bin reclaim conveyor is approximately 150' long and delivers a maximum 1,500 tph to the transfer tower for passage to the breaker feed belt.

The 60' long breaker feed belt delivers a maximum 1,500 tph to the breaker station.

The 100' long breaker reclaim belt delivers a maximum 1,500 tph -1 5/8" and breaker reject size coal to the transfer tower for passage to the crusher feed conveyor.

The crusher feed conveyor is approximately 70' long and delivers up to 1,500 tph to the crusher station.

Final -1 5/8" coal product from the crusher station is generally delivered to the overland conveyor which carries it directly to Huntington Power Plant. The 1.8-mile long overland conveyor can deliver up to 1,200 tph. It is constructed in two long sections, one 3,000' and the other 6,400'.

If major repairs are necessary on the overland conveyor, coal may be routed to the weigh bin conveyor and onto the truck load-out conveyor to facilitate truck haulage to Huntington Power Plant.

If weighing of the plant product is desired, coal may be delivered to a 200 ton capacity coal weigh bin via the weigh bin conveyor.

Standard mechanical maintenance procedures are followed to ensure smooth operation and long life of the facility conveyors.

During reclamation, the conveyors will be dismantled and sold for salvage. Concrete foundations will be broken out and used for coarse backfill.

Material Transport System

The mine track has been extended outside the Deer Creek Portal to provide locomotive and mine car access to the warehouse-shop and storage yard. Within the mine, locomotives are electric motor driven, drawing power through a trolley system. The railroad electrification extends outside the portal for a distance of approximately 500 feet.

Rail trackage is 60-LB on wood ties at 42-inch gauge. Track grade is essentially level. Standard turnouts (switches) are utilized to provide spurs and sidings. Bumping posts are provided at track ends.

An extension of the existing track layout is proposed to provide access to additional material storage and underground development waste disposal. Drawing 3-14 shows the existing track layout and proposed track extension.

The mine yard track will be maintained to facilitate material transport, ensure safety, and prolong track life.

Track will be removed during reclamation. Rail will be sold for scrap or salvaged.

RETURN OF COAL PROCESSING WASTES TO UNDERGROUND (784.25)

No plans exist to return coal processing wastes to the underground at Deer Creek Mine.

BLASTING PLAN

Explosive storage and handling facilities are shown on Map 3-8. Blasting plan is included in the Appendix.

AIR POLLUTION CONTROL PLAN (784.26)

In accordance with UMC 817.95, air pollution control measures have been applied and will be applied throughout the life and subsequent reclamation of the Deer Creek Mine site.

The main service road and parking lots are asphalt surfaced. Service roads to the mine fan and coal handling facilities are gravel surfaced. 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 for 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.

All areas adjacent to roads or travelways have been planted for revegetation. Reseeding is repeated until vegetation is adequately established. Revegetation is applied on all disturbed surfaces and regraded areas as soon as season and weather permit.

Fugitive dust control procedures are implemented throughout the coal handling process. All commonly utilized 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 provides fugitive dust control throughout the coal handling process. Analysis of samples taken during processing show an average 9.4% inherent and surface moisture content in 248 samples. Table 6 is a copy of the sample analysis data. Coal dust generation is reduced throughout the handling process by the dampening effect of this moisture.

The captive nature of the Deer Creek Mine product eliminates the possibility of spontaneous combustion conditions developing. Long term stockpiling within the permit area is unlikely.

TABLE 6

STANDARD LABORATORIES INC.
UTAH POWER & LIGHT CO.

DATE 1/ 2/81

LOCATION NUMBER 1101 LOCATION DESCRIPTION DEER CREEK BELT

LONG PROXIMATE (AS RECEIVED)

	TIME PERIOD		NO. OF SAMPLES	MEAN	ST. DEV.	MINIMUM	MAXIMUM
%MOISTURE	12/15/80-12/20/80		8	9.39	2.70	7.10	16.26
	MONTH ENDING	12/20/80	19	9.26	2.89	6.13	17.85
	YEAR ENDING	12/20/80	248	7.54	1.69	4.63	17.85
%ASH	12/15/80-12/20/80		8	14.35	2.44	10.30	17.97
	MONTH ENDING	12/20/80	19	14.15	2.09	10.30	17.97
	YEAR ENDING	12/20/80	248	12.75	2.60	7.72	23.31
%VOL. MATTER	12/15/80-12/20/80		8	38.50	0.96	37.40	39.90
	MONTH ENDING	12/20/80	19	38.73	1.45	34.86	40.71
	YEAR ENDING	12/20/80	248	40.06	1.37	34.86	42.85
%FIX. CARBON	12/15/80-12/20/80		8	37.78	1.84	35.66	41.21
	MONTH ENDING	12/20/80	19	37.88	2.42	34.47	44.92
	YEAR ENDING	12/20/80	248	39.66	1.98	34.40	44.92
BTU/LB	12/15/80-12/20/80		8	11032.24	451.56	10482.00	11892.00
	MONTH ENDING	12/20/80	19	11109.98	486.79	10101.00	11926.00
	YEAR ENDING	12/20/80	248	11561.10	502.35	10101.00	12643.00
%SULFUR	12/15/80-12/20/80		8	0.43	0.02	0.40	0.48
	MONTH ENDING	12/20/80	19	0.43	0.02	0.40	0.50
	YEAR ENDING	12/20/80	248	0.43	0.04	0.34	0.55
% AIR DRY MOIS. LOSS	12/15/80-12/20/80		0	0.0	0.0	0.0	0.0
	MONTH ENDING	12/20/80	0	0.0	0.0	0.0	0.0
	YEAR ENDING	12/20/80	0	0.0	0.0	0.0	0.0

EXPERIMENTAL PRACTICES (785.13)

No experimental underground mine practices are being conducted at Deer Creek Mine.

OFFSITE SUPPORT FACILITIES (785.21)

There are no offsite facilities supporting the Deer Creek Mine.

IN-SITU PROCESSING (785.22)

There are no in-situ processing activities or plans for such activities associated with Deer Creek Mine.

OPERATION PLAN EXISTING STRUCTURES (784.12)

The definition of Existing Structures, as found in the Environmental Impact Statement for the Surface Mining Control and Reclamation Act of 1977, is as follows:

Existing Structures

The types of structures which may be affected by the regulations in the preferred alternative concerning existing structures are roads and associated structures, fills, berms, benches, waste banks, discharge structures, diversions, rail loops, rail sidings, rail spurs, refuse areas, shafts, spoil pipes, utility lines, terraces, drains, wells, exploration holes, boreholes, barricades, fences, bridges, culverts, storage areas, mine buildings, tipples, storage or repair facilities, surge ponds, processing plants, slurry pipelines, conveyors, and other man-made structures or areas disturbed by mining.

By definition everything constructed within the mine plan area (portal area) is an existing structure.

Under this subchapter applicant is required to evaluate "structures" condition, how it meets the performance standards of Subchapter "K" and provisions for monitoring.

It is obvious the regulations were not intended to monitor nor apply performance standards void of design criterion to structural facilities, building and conveyor systems.

We suggest that structures are not buildings themselves but rather the earthen structure that facilities are built on (John Hardaway).

We have, however, under this section, included each and every building, structural facility, conveyor system, and supporting appurtenance contained within the mining area (portal area) to meet the requirements of UMC-817.181 as it relates to erosion and surface water runoff characteristics.

Further, company has included in the appendix individual photographs of each facility as evidence of its condition and the condition of its supporting structure.

For the sake of organization and simplicity, we have decided to list the various structures by groupings of association. Group I (Hydrological Association) - This group will list those facilities such as underground diversions, surface drainage systems and sedimentaton ponds. Group II shall list and incorporate all surface structural facilities, buildings, conveyors, power lines, storage tanks, etc., and all facilities related with operations as they pertain to coal processing. Group III lists only earthen structures, i.e., fills, embankments, roads and earthen berms.

Monitoring of the pond for structural deterioration, settling or water seepage will be visually inspected quarterly. Sediment and water levels will be recorded and cleaned as necessary to maintain the 60 per cent sediment storage levels.

An annual inspection report of the pond's physical condition with recorded water and sediment levels shall be submitted to the Division as required.

Deer Creek Mine has been issued an NPDES Permit whose identification number is UT-0023604. The sediment pond is currently the only permitted outfall. Mine water discharges for Deer Creek and Meetinghouse Portals have been applied for and are pending approval.

Approval of the sedimentation ponds by the appropriate State and Federal agencies has been give for the Deer Creek sedimentation pond. Company states that the pond meets the performance standards of Subchapter "K" and requires no modification.

GROUP I (HYDROLOGICAL ASSOCIATION)

DIVERSION SYSTEM

Deer Creek Mine is located ~~in a narrow canyon drainage~~ - Deer Creek. The mine proper is situated at the junction of two small tributaries to the Deer Creek drainage, Right Fork and Elk Canyon. The Right Fork and Elk Canyon drainages are ephemeral in nature.

To meet the initial regulations (effective December 13, 1977) Company planned and constructed with approval from the regulatory authority, an underground diversion system (see Map 3-12). Each drainage was diverted using corrugated metal pipe sized to meet a 50 year/24 hour event. Hydrological and engineering calculations are included in the Appendix.

The principal drainage is Deer Creek and is carried by a nominal 8 foot diameter CMP culvert from a point about 800 feet southeast of the mine portal to discharge into the Deer Creek channel about 600 feet northeast of the weight bin structure; a distance of about 2800 feet with a vertical drop of about 420 feet.

An 18" buried pipeline is located from the mine portal to the Deer Creek undisturbed drainage culvert located 330' east of the office/bathhouse for the purpose of discharging excess mine water into Deer Creek drainage.

A secondary drainage, Deer Drainage, is diverted into a 36-inch diameter culvert in the drainage channel about 300 feet upstream from the parking lot. This culvert runs about 650 feet to the Deer Creek culvert and is connected to it about 400 feet east of the change-room building.

A 30-inch culvert lies in the drainage channel of Elk Canyon Creek and diverts runoff to the Deer Creek culvert at the tipple site. Two side drainages from the south side of Elk Canyon Creek are diverted into this feeder culvert.

All diversions are protected at the intake by substantial concrete retaining walls and catch basins with trash racks. The basins are designed to prevent entry of floating debris, damming or side-wash.

To help reduce diversion maintenance at the Deer Creek tipple area, two sediment traps were constructed at the locations indicated on the surface yard map (Plate 3-9). This will greatly reduce the amount of sediment from this area entering diversion ditches, culverts, and the sediment pond. The

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trap at the corner of the Weigh Bin will discharge into the grouted channel. The 36-inch culvert will discharge into the grouted channel without entering the trap. Flow into the second trap will be directed via a drop inlet and 12-inch culvert. Discharge flow from the second trap structure will enter the 36-inch culvert via a 12-inch culvert. Map DS1159C, Plate 3-9, is a detailed drawing of the sediment traps. The design of the traps will facilitate easy cleaning on a periodic basis. The traps will only be functional during the spring, summer and fall seasons, due to severe winter conditions. All winter runoff of these areas will still report to the sediment pond.

Additional drainage control in the tipple area includes a drop inlet structure and 12-inch diameter culvert located in the vicinity of the rotary breaker and crusher (see Plates 3-9 and 3-13).

In addition to the sediment trap structures, a small compressor building will be built in front of the recently completed binwall extension for weather and damage protection of the compressor. A trash bunker will be constructed adjacent to the rotary breaker station.

Modification - Underground Division

Subsequent to Public Law 95-87 the State of Utah, Division of Oil, Gas and Mining held meetings with active mining companies in the form of hearings to ascertain whether these companies could meet interim regulations.

Modifications to existing non-conforming structures were to be submitted to the Division for approval. In the case of the buried diversion pipes at the Deer Creek Mine specifications and plans were submitted. Approval of the engineering and diversion plan was given by the State.

Applicant understands the constructed diversion for Elk Canyon is undersized because a surface ditch to divert runoff from the disturbed area was, for some unknown reason, deleted. Company will install an additional 42 inch CMP parallel to the existing pipe to provide the hydrological protection in Elk Canyon. On hold per memo from DOGM 11-21-86

In the Right Fork of Deer Creek initial design of the pipe was based on a prorated value of the main drainage and its computed discharge. This method has been challenged by OSM reviewers.

Company agrees, and using a very conservative method, (SCS) has recalculated peak flows from this drainage. We have designed, and have included in permit application, an additional parallel pipe to accommodate the additional runoff waters.

However, we are reluctant to simply spend additional funds for increased piping based on conservative runoff figures. Moreover, we have over six years of experience with the single pipe without over-topping. It is our contention it would be in our best interest to request a variance concerning the diversion and leave the existing pipe as is.

See Vol 3, III

Sedimentation Pond

Approved and constructed in September 1979, this single-stage non self-dewatering containment facility was designed to meet the requirements of the initial regulations. Pond size is approximately 14 acre feet which accommodates a 10-year, 24-hour storm event plus 0.2 acre-feet of sediment volume per acre of disturbed mining area.

Site specific studies, including geotechnical, hydrological and soil analysis are enclosed in the appendix. Construction drawings with details are included in the map section of this application (see Maps 3-15 and 3-16).

The sedimentation pond meets the criteria of Subchapter "K" in all aspects with the exception of the requirement of combined slopes of the dam. Final regulations state combined dam slopes shall not be less than five horizontal to one vertical. Stability and slopes were based on recommendations from a geotechnical study. Applicant requests the general requirement of 1:5 be waived in favor of the submitted geotechnical report.

Surface Drainage Facilities

Runoff waters from the mining areas or disturbed areas will be collected and channeled to the sediment pond.

The parking area has been fitted with drop and slotted drains to collect storm water. Ditches and some buried culverts direct this water to a main buried storm drain located parallel to the access road which has spaced drop drains along its length.

Drainage system is sized to handle a 10-year, 24-hour storm event and provides best technology for sedimentation control in steep slopes such as the lower reaches of the Deer Creek access road.

For details of the surface drainage system, refer to Map 3-13.

Group II (Surface Facilities)

As previously described, Company has listed and provided individual photographs for each separate building, conveyor and structural facility used to mine, process or transport coal (photos are included in the appendix).

Surface facilities and structures are shown on the surface facilities Maps 3-9 (Topography) and 3-8 (Aerial Photograph). Maps are included in the map section.

All surface facilities are constructed within the permit area and are provided with hydrological protection by use of existing underground diversions, surface runoff collection system and sedimentation pond.

Company states that each surface facility was designed and constructed to meet both state and federal building codes. No existing structure requires modification to meet the performance standards of Subchapter "K".

Construction plans for each major structure (facility) are on file in applicant's office at 41 North Redwood Road, Salt Lake City, Utah, for review by the regulatory authority.

Group III (Earthen Structures)

This narrative refers to Maps 3-8 and 3-9. In 1969, the Peabody Coal Company purchased control of both fee and federal coal leases comprising the acreage of what is now known as Deer Creek Mine. Mine development was contracted to the Castle Valley Mining Company of Huntington, Utah.

<u>SURFACE FACILITIES</u>

	FACILITY	YEAR CONSTRUCTED
1	Office and Bathhouse	1978
2	Warehouse	1973-74
3	Warehouse and Shop	1973-74
4	Transfer Tower	1973-74
5	Breaker and Trommel Screen	1979-80
6	Crusher Building and Master Control Center	1973-74 & 1991
7	Weigh Structure and Loadout	1973-74
8	ROM Conveyor	1973-74
9	Overland Conveyor	1973-74
10	Water Treatment Plant	1979
11	Ventilation Fan	1979
12	Rock Dust Storage Tank	1975
13	Concrete Storage Bin	1980
14	Oil Storage Bins	1980
15	Fuel Storage Area	1976
16	Power Substation	1974
17	12.5 KV Line	1973-74
18	Tipple Trash Bunker	1990
19	Compressor Building	1990

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by PGL 91D date 12/3/91

In May 1972, mine development required extensive amounts of fill material to provide a parking lot and material storage area.

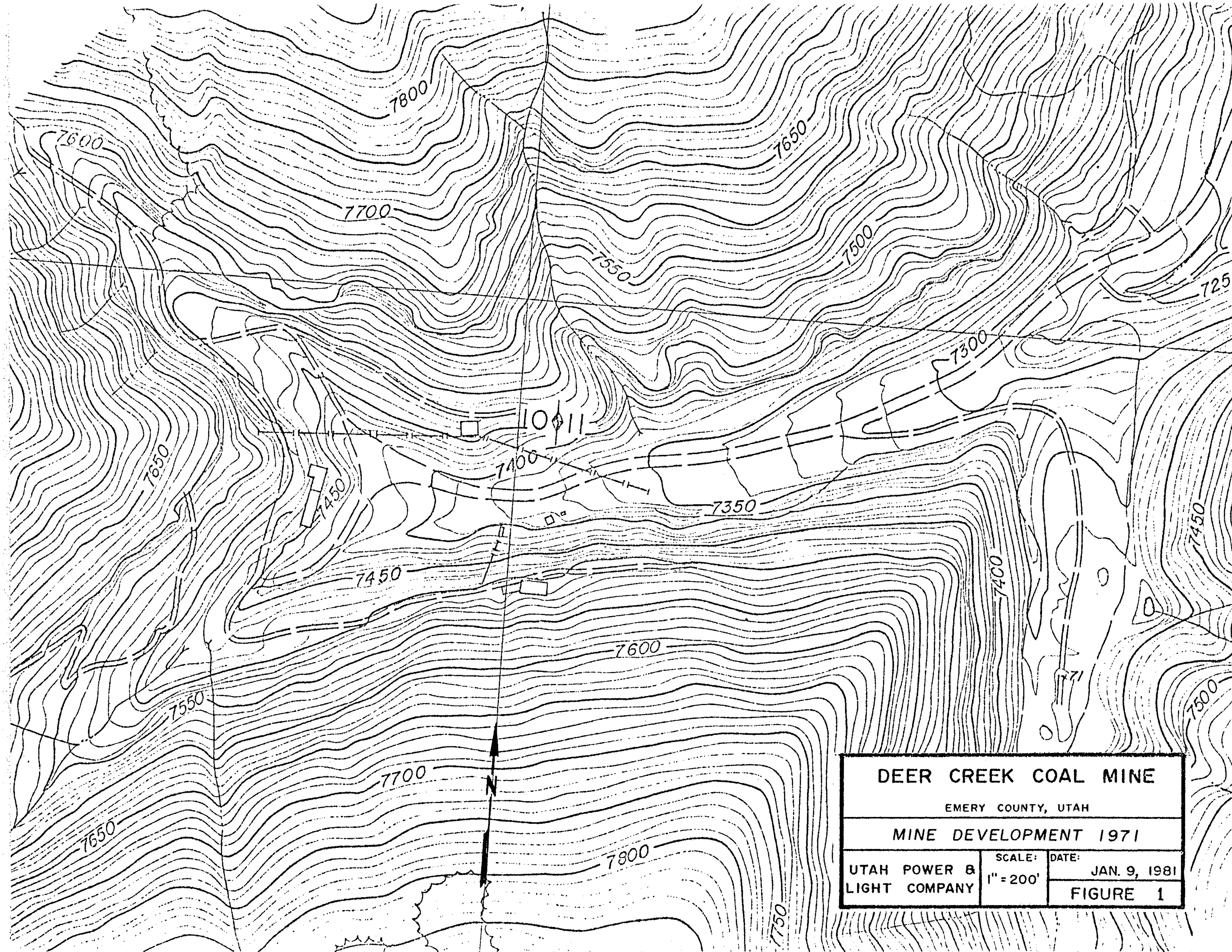
The mine area, as presently constructed, was largely made from material excavated from fee land immediately south of the mine site as shown on the aerial photograph depicted as parallel terraces. Approximately 450 M cubic yards was excavated.

The parking lot and storage area extends from the portal of the main entry at coordinates N 373, 450 E 2, 109,309 in an easterly direction for 1100 feet. It occupies an area of about 8½ acres at the confluence of Deer Creek and Deer Drainage (right fork of Deer Creek).

Applicant has no access to Peabody Coal Company's files to research engineering records or maps. Former employees working at Deer Creek at the time indicate cross-sections were taken (Pollack) and fill placement was constructed using standard accepted practices. Figure I shows the mine area prior to parking lot file. An ongoing stability report enclosed in the appendix reveals the structure to be stable.

Surface waters are diverted and collected for sediment control through the sediment pond.

The excavated portion of the sediment pond, built in 1979, forms the east face of the parking lot fill. Company plans to extend the fill (structure) with development waste rock generated from everyday mining and residual waste rock



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DEER CREEK COAL MINE
EMERY COUNTY, UTAH
MINE DEVELOPMENT 1971
UTAH POWER & LIGHT COMPANY
SCALE: 1" = 200'
DATE: JAN. 9, 1981
FIGURE 1