WUCNO: 35-4736 APPLICATION/CLAIM NO.: DIL 3009 CERT. NO.:
CHANGES: a11019 Terminated

OWNERSHIP

NAME: Upton Waterworks Company INTEREST: 100
ADDRESS:
CITY: Coalville STATE: UT ZIP CODE: 84017
LAND OWNED BY APPLICANT?

DATES, ETC.

Filing: 11/12/1974 Priority: 00/00/1899 Advertise Paper: Date: 00/00/0000 Protested? Approval: 00/00/0000
Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 00/00/0000
Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: DIL Source of Info: DIL Map: Date Verified: 00/00/0000 Initials:
PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT

FLOW: 0.045 cfs SOURCE: Springs (located in Randall Hollow)
TRIBUTARY 1: TRIBUTARY 2:
COUNTY: Summit COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINTS OF DIVERSION -- SURFACE:
(1) S 1320 ft. E 695 ft. from NW corner, Section 26, T 3N, R 6E, SLBM
Diverting Works: Pipe Line Source:
(2) S 1055 ft. E 381 ft. from NW corner, Section 26, T 3N, R 6E, SLBM
Diverting Works: Pipe Line Source:

USES OF WATER RIGHT

CLAIMS USED FOR PURPOSE DESCRIBED: 4736
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###STOCKWATERING: 84 Equivalent Livestock Units Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

###DOMESTIC: 4 Persons Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

OTHER COMMENTS

Maximum capacity of reservoir listed as 6000 gallons.

WUCNO: 35-9022 APPLICATION/CLAIM NO.: a12175 CERT. NO.: a1567

CHANGES: a12175 Cert. a1567, a13264 Cert. a1567

OWNERSHIP

NAME: Boyer, Lyle E. INTEREST:
ADDRESS: Box 71
CITY: Coalville STATE: UT ZIP CODE: 84017

LAND OWNED BY APPLICANT?

DATES, ETC.

Filing: 02/25/1982 Priority: 00/00/1875 Advertise Paper: Date: 00/00/0000 Protested? Approval: 09/15/1982
Proof Due: 07/31/1986 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 01/24/1985
Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: DEC Source of Info: CERT Map: Date Verified: 02/07/1985 Initials: JDO
PD REMARKS REFERENCE -- Name: 0 Interest: 0 Flow: 1 Type of Right: 2 Priority: 0 Source: 0

LOCATION OF WATER RIGHT

FLOW: 0.0126 cfs SOURCE: Chalk Creek
TRIBUTARY 1: TRIBUTARY 2:
COUNTY: Summit COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINT OF DIVERSION -- SURFACE:
(1) S 1208 ft. W 2238 ft. from NE corner, Section 36, T 3N, R 6E, SLBM
Diverting Works: Earthen dike with headgate Source:

REMARKS:

*The flow is Flood: 0.0398, High: 0.0223, Low: 0.0126.

**Right evidenced by award 775 Weber River Decree.

USES OF WATER RIGHT

CLAIMS USED FOR PURPOSE DESCRIBED: 9022,13.8 shares in Boyer Ditch Company.
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###IRRIGATION		*--NORTH EAST QUARTER--*				*--NORTH WEST QUARTER--*				*--SOUTH WEST QUARTER--*				*--SOUTH EAST QUARTER--*				Section
Tot Irr. Acrg.:	22.69*	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	Totals
Sec 25 T 3N R 6E SLBM	*											2.00	2.40					4.40
Sec 36 T 3N R 6E SLBM	*					10.00	8.00	0.29										18.29

or a Total of 22.69 acres. Sole Supply: 1.00 acres Diversion Limit: 1.00 PERIOD OF USE: 04/01 TO 10/31

WUCNO: 35-8775 APPLICATION/CLAIM NO.: CERT. NO.:

OWNERSHIP**

NAME: Boyer Ditch Co., MutualAssoc. INTEREST: 100
ADDRESS:
CITY: STATE: UT ZIP CODE:

LAND OWNED BY APPLICANT? Yes

DATES, ETC.**

Filing: 00/00/0000 Priority: 01/01/1875 Advertise Paper: Date: 00/00/0000 Protested? Approval: 00/00/0000
Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 00/00/0000
Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: DEC Source of Info: Map: Date Verified: 00/00/0000 Initials:
PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT**

FLOW: 0.41 cfs SOURCE: Chalk Creek
TRIBUTARY 1: Weber River TRIBUTARY 2:
COUNTY: Weber COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINT OF DIVERSION -- SURFACE:
(1) S 1255 ft. W 1660 ft. from NE corner, Section 36, T 3N, R 6E, SLBM
Diverting Works: Boyer No. 2 Ditch Source: Chalk Creek

PLACE OF USE OF WATER RIGHT**

NORTH-EAST4	NORTH-WEST4	SOUTH-WEST4	SOUTH-EAST4
NE NW SW SE	NE NW SW SE	NE NW SW SE	NE NW SW SE

USES OF WATER RIGHT**

CLAIMS USED FOR PURPOSE DESCRIBED: 775,765
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###IRRIGATION *---NORTH EAST QUARTER--*---NORTH WEST QUARTER--*---SOUTH WEST QUARTER--*---SOUTH EAST QUARTER--* Section
Tot Irr. Acrg.: 10.30* NE NW SW SE * NE NW SW SE * NE NW SW SE * NE NW SW SE * Totals
or a Total of .00 acres. Sole Supply: acres Diversion Limit: PERIOD OF USE: 03/01 TO 11/01

See Prop. Det. 197 b,c,d for acreage, owners, etc. Used to irrigate 10.3 ac, of land located in Secs. 25,26 and 36 T3N, R6E, SLB&M

###STOCKWATERING: 204 Equivalent Livestock Units Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

###DOMESTIC: 23 Persons Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

OTHER COMMENTS**

Weber River Decree No. 775
Not for official use
See Paragraph # 10 W.R. Decree
Proposed Determination No. 197 b,c,d. Pg. 60.

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WUCNO: 35-1002 APPLICATION/CLAIM NO.: A29674 CERT. NO.: a1476

CHANGES: a11370 Cert. a1476

OWNERSHIP**********

NAME: Boyer, Fern J. INTEREST:
ADDRESS: 5050 Ben Lomond Drive
CITY: Ogden STATE: UT ZIP CODE: 84403

NAME: Boyer, Dee F. INTEREST:
ADDRESS:
CITY: STATE: UT ZIP CODE:

NAME: Boyer, Gerald G. INTEREST:
ADDRESS:
CITY: STATE: UT ZIP CODE:

NAME: Boyer, Gregory J. INTEREST:
ADDRESS:
CITY: STATE: UT ZIP CODE:

NAME: Boyer, Stephen W. INTEREST:
ADDRESS:
CITY: STATE: UT ZIP CODE:

NAME: Boyer, Brent W. INTEREST:
ADDRESS:
CITY: STATE: UT ZIP CODE:

LAND OWNED BY APPLICANT?

DATES, ETC.**********

Filing: 01/28/1958 Priority: 01/28/1958 Advertise Paper: Date: 00/00/0000 Protested? Approval: 04/08/1958
Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: P Filed: 07/19/1983 Cert. or WUC Issued: 00/00/0000
Rej. Etc.: 00/00/0000

PD Book No. Status/Type of Right: CERT Source of Info: CERT Map: Date Verified: 12/29/1983 Initials: JDO
PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT**********

FLOW: 0.015 cfs SOURCE: Underground Water Well
TRIBUTARY 1: TRIBUTARY 2:
COUNTY: Summit COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINT OF DIVERSION -- UNDERGROUND:
(1) S 1407 ft. E 584 ft. from NW corner, Section 31, T 3N, R 7E, SLBM Diameter of Well: 6 ins. Depth: 170 to ' ft.

USES OF WATER RIGHT**********

CLAIMS USED FOR PURPOSE DESCRIBED: 1002
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###IRRIGATION	NORTH EAST QUARTER				NORTH WEST QUARTER				SOUTH WEST QUARTER				SOUTH EAST QUARTER				Section
Tot Irr. Acrg.: 0.25	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	Totals
Sec 31 T 3N R 7E SLBM							0.25										0.25
or a Total of .25 acres.	Sole Supply:				acres	Diversion Limit:				PERIOD OF USE: 04/01 TO 10/31							
###STOCKWATERING: 20 Equivalent Livestock Units	Diversion Limit:					PERIOD OF USE: 01/01 TO 12/31											
###DOMESTIC: 1 Family	Diversion Limit:					PERIOD OF USE: 01/01 TO 12/31											

WUCNO: 35-10773 APPLICATION/CLAIM NO.: CERT. NO.:

OWNERSHIP**

NAME: Staley, Elmer D. & Richard S. INTEREST: 100
ADDRESS:
CITY: STATE: UT ZIP CODE:

LAND OWNED BY APPLICANT? Yes

DATES, ETC.**

Filing: 00/00/0000 Priority: 01/01/1872 Advertise Paper: Date: 00/00/0000 Protested? Approval: 00/00/0000

Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 00/00/0000

Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: DEC Source of Info: Map: Date Verified: 00/00/0000 Initials:

PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT**

FLOW: 1.72 cfs SOURCE: Chalk Creek

TRIBUTARY 1: Weber River TRIBUTARY 2:

COUNTY: Weber COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINT OF DIVERSION -- SURFACE:
(1) N 01 ft. E 01 ft. from S4 corner, Section 31, T 3N, R 7E, SLBM
Diverting Works: Conrad Staley Ditch Source: Chalk Creek

PLACE OF USE OF WATER RIGHT**

NORTH-EAST4	NORTH-WEST4	SOUTH-WEST4	SOUTH-EAST4
NE NW SW SE	NE NW SW SE	NE NW SW SE	NE NW SW SE

USES OF WATER RIGHT**

CLAIMS USED FOR PURPOSE DESCRIBED: 773
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###IRRIGATION *---NORTH EAST QUARTER--*---NORTH WEST QUARTER--*---SOUTH WEST QUARTER--*---SOUTH EAST QUARTER--* Section
Tot Irr. Acrg.: 43.00* NE NW SW SE * NE NW SW SE * NE NW SW SE * NE NW SW SE * Totals
or a Total of .00 acres. Sole Supply: acres Diversion Limit: PERIOD OF USE: 03/01 TO 11/01

###STOCKWATERING: 1 Equivalent Livestock Units Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

###DOMESTIC: 1 Family Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

OTHER COMMENTS**

Weber River Decree No. 773
Not for official use
See Paragraph #10 W.R. Decree

@@

WUCNO: 35-529 APPLICATION/CLAIM NO.: A21430 CERT. NO.:

OWNERSHIP***

NAME: Jones, G. Allen INTEREST:
ADDRESS:
CITY: Coalville STATE: UT ZIP CODE: 84017

LAND OWNED BY APPLICANT?

DATES, ETC.***

Filing: 03/09/1950 Priority: 03/09/1950 Advertise Paper: Date: 00/00/0000 Protested? Approval: 09/29/1950

Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 00/00/0000

Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: NPR Source of Info: APPL Map: Date Verified: 00/00/0000 Initials:

PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT***

FLOW: 0.015 cfs SOURCE: Underground Water Well

TRIBUTARY 1: TRIBUTARY 2:

COUNTY: Summit COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINT OF DIVERSION -- UNDERGROUND:
(1) N 1161 ft. W 2590 ft. from SE corner, Section 31, T 3N, R 7E, SLBM Diameter of Well: 6 ins. Depth: 58 to ft.

PLACE OF USE OF WATER RIGHT***

	NORTH-EAST4	NORTH-WEST4	SOUTH-WEST4	SOUTH-EAST4
	NE NW SW SE	NE NW SW SE	NE NW SW SE	NE NW SW SE
Sec 31 T 3N R 7E SLBM	* X: X: X: X*	* X: X: X: X*	* X: X: X: X*	* X: X: X: X*

USES OF WATER RIGHT***

CLAIMS USED FOR PURPOSE DESCRIBED: 529
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###DOMESTIC: 1 Family Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

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WUCNO: 35-8765 APPLICATION/CLAIM NO.: CERT. NO.:

OWNERSHIP**********

NAME: Boyer Ditch Co., Mutual Association INTEREST: 1000
ADDRESS:
CITY: STATE: UT ZIP CODE:

LAND OWNED BY APPLICANT? Yes

DATES, ETC.**********

Filing: 00/00/0000 Priority: 01/01/1866 Advertise Paper: Date: 00/00/0000 Protested? Approval: 00/00/0000
Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 00/00/0000
Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: DEC Source of Info: Map: Date Verified: 00/00/0000 Initials:
PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT**********

FLOW: 5.14 cfs SOURCE: Chalk Creek
TRIBUTARY 1: Weber River TRIBUTARY 2:
COUNTY: Weber COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINT OF DIVERSION -- SURFACE:
(1) S 1650 ft. E 825 ft. from NW corner, Section 31, T 3N, R 7E, SLBM
Diverting Works: Boyer #1 Ditch Source: Chalk Creek

PLACE OF USE OF WATER RIGHT**********

	NORTH-EAST4	NORTH-WEST4	SOUTH-WEST4	SOUTH-EAST4
	NE NW SW SE	NE NW SW SE	NE NW SW SE	NE NW SW SE

USES OF WATER RIGHT**********

CLAIMS USED FOR PURPOSE DESCRIBED: 765,775,763,769,
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###IRRIGATION	*---NORTH EAST QUARTER---*				*---NORTH WEST QUARTER---*				*---SOUTH WEST QUARTER---*				*---SOUTH EAST QUARTER---*				Section
Tot Irr. Acrg.: 128.40*	NE	NW	SW	SE *	NE	NW	SW	SE *	NE	NW	SW	SE *	NE	NW	SW	SE *	Totals
Sec 25 T 3N R 6E SLBM *	X:	X:	X:	X*	X:	X:	X:	X*	X:	X:	X:	X*	X:	X:	X:	X*	0.00
Sec 26 T 3N R 6E SLBM *	X:	X:	X:	X*	X:	X:	X:	X*	X:	X:	X:	X*	X:	X:	X:	X*	0.00
Sec 36 T 3N R 6E SLBM *	X:	X:	X:	X*	X:	X:	X:	X*	X:	X:	X:	X*	X:	X:	X:	X*	0.00

or a Total of .00 acres. Sole Supply: acres Diversion Limit: PERIOD OF USE: 03/01 TO 11/01

###STOCKWATERING: 204 Equivalent Livestock Units Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

###DOMESTIC: 23 Persons Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

OTHER COMMENTS**********

Weber River Decree No. 765
Not for official use
See Right 775 for balance of 138.7 acres,
Boyer Ditch Co., Mutual Assoc: Mary J. Boyer 68.1 ac; Wm. H. Staley 23.1 ac;
Walter Clark 19.5 ac; Peter Jacobson 28 ac; Total acreage 138.7 ac.
See Paragraph 10 W.R. Decree
Proposed Determination No. 197 #.c.d Pg.60

WUCNO: 35-3811 APPLICATION/CLAIM NO.: U20958 CERT. NO.:

CHANGES: a11125 Unapproved

OWNERSHIP***

NAME: Potter, G.W. INTEREST:
ADDRESS:
CITY: Coalville STATE: UT ZIP CODE: 84017

LAND OWNED BY APPLICANT?

DATES, ETC.***

Filing: 03/20/1960 Priority: 06/08/1899 Advertise Paper: Date: 00/00/0000 Protested? Approval: 00/00/0000

Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 00/00/0000

Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: UGWC Source of Info: UGWC Map: Date Verified: 00/00/0000 Initials:

PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT***

FLOW: 0.012 cfs SOURCE: Underground Water Well

TRIBUTARY 1: TRIBUTARY 2:

COUNTY: Summit COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINT OF DIVERSION -- UNDERGROUND:
(1) S 258 ft. W 103 ft. from NE corner, Section 6, T 2N, R 7E, SLBM Diameter of Well: 48 ins. Depth: 52 to ft.

USES OF WATER RIGHT***

CLAIMS USED FOR PURPOSE DESCRIBED: 3811
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###STOCKWATERING: 18 Equivalent Livestock Units Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

###DOMESTIC: 9 Persons Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

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WUCNO: 35-8773 APPLICATION/CLAIM NO.: CERT. NO.:

OWNERSHIP**********

NAME: Staley, Elmer D. & Richard S. INTEREST: 100
ADDRESS:
CITY: STATE: UT ZIP CODE:

LAND OWNED BY APPLICANT? Yes

DATES, ETC.**********

Filing: 00/00/0000 Priority: 01/01/1872 Advertise Paper: Date: 00/00/0000 Protested? Approval: 00/00/0000
Proof Due: 00/00/0000 Ext Filed: 00/00/0000 Elec/Proof: Filed: 00/00/0000 Cert. or WUC Issued: 00/00/0000
Rej, Etc.: 00/00/0000

PD Book No. Status/Type of Right: DEC Source of Info: Map: Date Verified: 00/00/0000 Initials:
PD REMARKS REFERENCE -- Name: Interest: Flow: Type of Right: Priority: Source:

LOCATION OF WATER RIGHT**********

FLOW: 1.72 cfs SOURCE: Chalk Creek
TRIBUTARY 1: Weber River TRIBUTARY 2:
COUNTY: Weber COMMON DESCRIPTION: DRAINAGE AREA: Weber River

POINT OF DIVERSION -- SURFACE:
(1) S 265 ft. W 1585 ft. from NE corner, Section 6, T 2N, R 7E, SLBM
Diverting Works: Conrad Staley Ditch Source: Chalk Creek

PLACE OF USE OF WATER RIGHT**********

NORTH-EAST4				NORTH-WEST4				SOUTH-WEST4				SOUTH-EAST4			
NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE

USES OF WATER RIGHT**********

CLAIMS USED FOR PURPOSE DESCRIBED: 773
Referenced To: Claims Groups: Type of Reference -- Claims: Purpose: Remarks:

###IRRIGATION

	NORTH EAST QUARTER				NORTH WEST QUARTER				SOUTH WEST QUARTER				SOUTH EAST QUARTER				Section
Tot Irr. Acrg.: 43.00	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	Totals
Sec 31 T 3N R 7E SLBM	X	X	X	X					X	X	X	X					0.00

or a Total of .00 acres, Sole Supply: acres Diversion Limit: PERIOD OF USE: 03/01 TO 11/01

###STOCKWATERING: 80 Equivalent Livestock Units Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

###DOMESTIC: 7 Persons Diversion Limit: PERIOD OF USE: 01/01 TO 12/31

OTHER COMMENTS**********

Weber River Decree No. 773
Not for official use

UMC 783.16 SURFACE WATER INFORMATION

UMC 783.16(a) - GENERAL DESCRIPTION OF SURFACE WATER HYDROLOGY

The Weber River Basin drains a 2080 square mile area and ranges in elevation from 4210 to 11708 feet. Several major reservoirs increase the total usable capacity of the river, most of which is used for irrigation and some recreation. The primary consumptive water usage in the basin is irrigation (Thompson, 1983).

The reclamation area is located adjacent to Chalk Creek, a major tributary to the Weber River. Chalk Creek contributes some 60 to 65 percent of the total flow in the Weber River at their confluence near Coalville (Table 783.16-1). The quality of the creek generally diminishes the quality of the Weber River in nearly every aspect (Table 783.16-2, Table 783.16-3).

Chalk Creek, a perennial stream draining some 132 square miles upstream from the site, is the only surface water body present in the proposed reclamation area. Drawing number 783.16-1 shows several ephemeral drainages in the vicinity of the disturbed area, but none of which traverse the area. Reclamation activities are not expected to affect these drainages.

Chalk Creek appears to be a gaining stream in the vicinity of its confluence with the Weber River. Approximately three miles east of Coalville however, Chalk Creek is apparantly above the water table and from that point upstream is probably recharging the alluvium (Gates, et al, 1984).

The reclamation area is located adjacent to Chalk Creek approximately twelve miles upstream from its confluence with the Weber River. Chalk Creek is the only surface water body which is located in or crosses the area. Drawing numbers 783.16-1 and 783.15-2 (page 783.15- of this document) show the area topography and ephemeral drainages tributary to Chalk Creek. During site reconnaissance no ephemeral streambeds were noted to traverse the reclamation area.

UMC 783.16(b)(1) - Discharge Conditions

Table 783.16-1 provides a discharge range for locations both upstream and downstream from the reclamation area. Table 783.16-4 shows the seasonal flow variation recorded at the gaging station near Coalville (10131000). Peak flow periods occur in

the spring and primarily result from melting snowpack within the drainage area.

UMC 783.16(b)(2) - Surface Water Quality

Available water quality data is included in Tables 783.16-1, 783.16-3 and Table 783.16-5 for sample stations located both upstream and downstream from the reclamation site. The upstream sample location referred to in Tables 783.16-1 and 783.16-3 is several miles upstream from the reclamation site. Surface water monitoring for baseline data is available from the SOAP program being conducted at the adjacent Boyer Mine. Available data from the Earth Fax draft report is included as Table 783.16-6a through 783.16-7b in this section. Sampling locations are shown on drawing number 783.16-1, page 783.16-6 of this section.

TABLE 783.16-1

SUMMARY OF HYDROLOGIC DATA SHOWN IN TABLES 783.16-2 AND 783.16-3

Parameters	Chalk Creek at USGS Gaging Sta. 10131000	Chalk Creek Above Permit Area	Weber River at USGS Gaging Sta. 10130500
Number of Chemical Analyses	6	2	5
Discharge Range (cfs)	114.5-319	12-230	134-790
Dissolved Solids Range (mg/l)	237-446	202-234	163-256
Specific Conductance Range (umhos)	390-775	375-380	290-435
Hardness Range	Very Hard	Very Hard	Hard-Very Hard
Dominant Cation(s) During High Flow	Ca	Ca	Ca
Dominant Cation(s) During Low Flow	Ca,Mg	Ca,Mg	Ca
Dominant Anion(s) During High Flow	HCO3	HCO3	HCO3
Dominant Anion(s) During Low Flow	HCO3	HCO3	HCO3
Salinity Hazard to Irrigation Supply	Medium-High	Medium	Medium
Sodium Hazard to Irrigation Supply	Low	Low	Low
Boron Hazard to Irrigation Supply	None	None	None
Dissolved Solids Hazard to Irrigation Supply	None	None	None
Significant Upstream Diversions	Yes	No	Yes
Significant Upstream Irrigation	Yes	No	Yes

TABLE 783.16-2

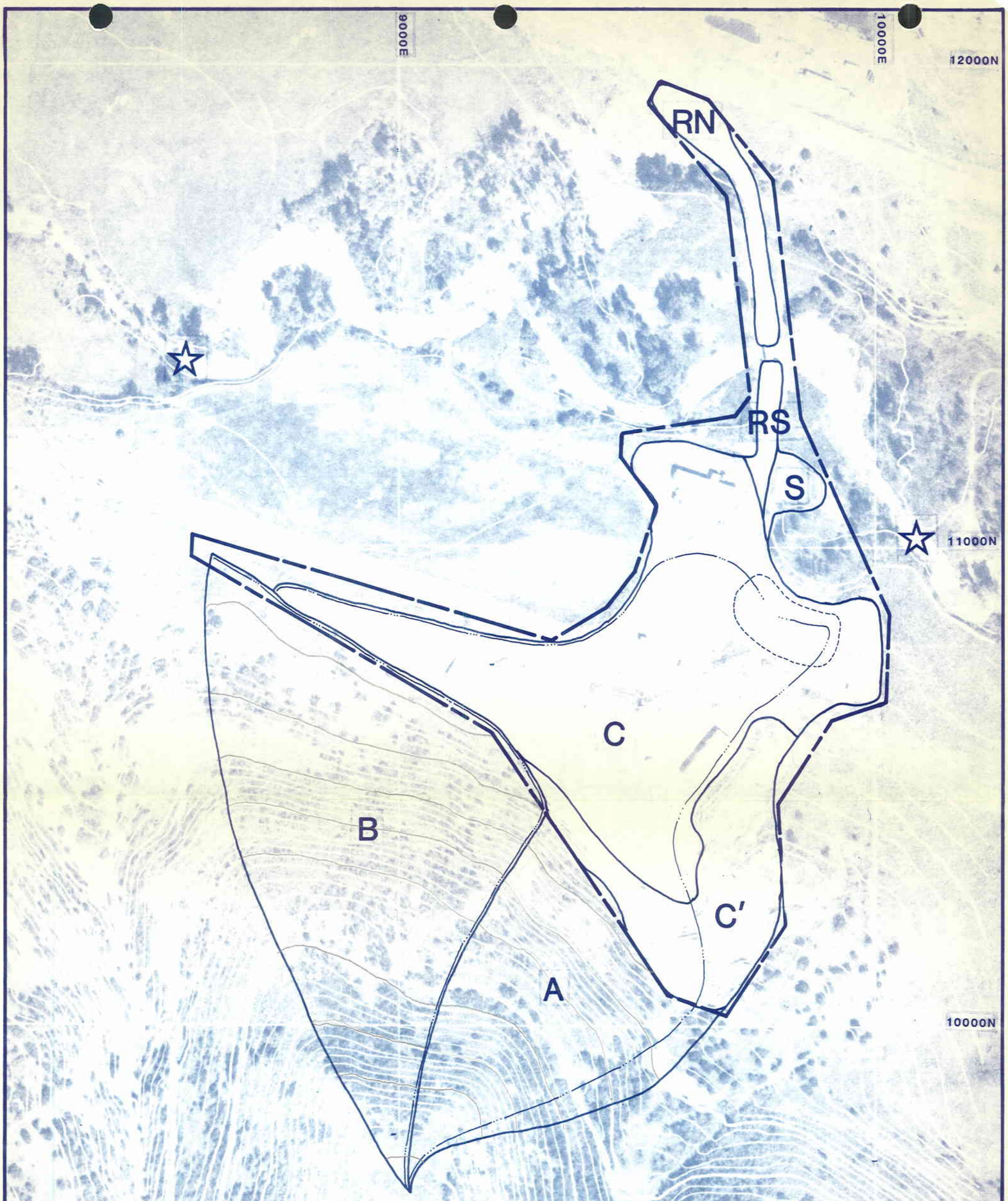
CHEMICAL ANALYSES OF WATER SAMPLES FROM THE WEBER RIVER NEAR COALVILLE

Parameters	At USGS Gaging Station 10130500				
	08/02/79	02/27/80	04/02/80	05/12/80	08/12/80
Discharge (cfs)	174	205	187	790	134
Temperature (degree C)	14.5	5.0	6.0	8.0	16.5
Specific Conductance (umhos)	380	425	435	320	290
pH	8.4	8.5	8.4	7.9	8.2
Dissolved Solids (mg/l)	205	253	256	196	163
Dissolved Silica as SiO2 (mg/l)	0.1	8.4	9.8	11	8.6
Dissolved Calcium as Ca (mg/l)	52	62	62	48	40
Dissolved Magnesium as Mg (mg/l)	12	15	15	12	8.9
Dissolved Sodium as Na (mg/l)	7.8	11	11	8.1	5.8
Dissolved Potassium as K (mg/l)	2.1	2.6	2.8	2.4	1.4
Alkalinity total as CaCO3 (mg/l)	170	190	190	140	130
Dissolved Sulfate as SO4 (mg/l)	18	24	26	19	11
Dissolved Chloride as Cl (mg/l)	10	15	14	1.0	8.2
Dissolved Fluoride as F (mg/l)	0.1	0.2	0.1	0.1	0.2
Dissolved Nitrate plus Nitrite as N (mg/l)	0.13	0.23	0.23	0.25	0.24
Dis. Phosphorus, Orthophosphate as P (mg/l)	0.05	0.00	0.00	0.01	0.01
Dissolved Phosphate, Ortho as PO4 (mg/l)	0.15	0.00	0.00	0.03	0.03
Total Hardness as CaCO3 (mg/l)	180	220	220	170	140
Non-carbonate Hardness as CaCO3 (mg/l)	9	27	27	29	7
Sodium Adsorption Ratio	0.3	0.3	0.3	0.3	0.2
Dissolved Boron as B (mg/l)	60	40	30	30	70
Potassium-40 (pCi/l)	1.6	1.9	2.1	1.8	1.0
Dissolved Oxygen (mg/l)	---	11.0	11.0	9.2	8.1

TABLE 783.16-3

CHEMICAL ANALYSES OF WATER SAMPLES FROM CHALK CREEK

Parameters	At USGS Gaging Station 10131000						Above Permit Area	
	08/02/79	10/25/79	02/27/80	04/02/80	05/12/80	08/12/80	08/02/79	05/12/80
Discharge (cfs)	21	14.5	36	15	319	23.1	12	230
Temperature (degree C)	15.5	11.0	3.0	6.5	5.5	16.0	19.5	5.0
Specific Conductance (umhos)	775	720	590	690	390	650	375	380
pH	7.5	7.6	8.2	8.2	8.1	7.7	8.4	8.0
Dissolved Solids (mg/l)	423	412	361	446	237	408	202	234
Dissolved Silica as SiO2 (mg/l)	2.1	11	7.5	11	7.8	12	0.8	7.0
Dissolved Calcium as Ca (mg/l)	90	84	78	74	60	88	49	57
Dissolved Magnesium as Mg (mg/l)	28	27	24	25	15	27	16	17
Dissolved Sodium as Na (mg/l)	28	30	27	30	9.8	25	7.5	8.9
Dissolved Potassium as K (mg/l)	3.4	3.8	3.0	2.5	1.6	3.5	1.0	1.3
Alkalinity total as CaCO3 (mg/l)	320	290	250	250	190	300	180	190
Dissolved Sulfate as SO4 (mg/l)	35	35	26	33	14	25	8.1	15
Dissolved Chloride as Cl (mg/l)	40	44	44	58	13	43	11	12
Dissolved Fluoride as F (mg/l)	0.4	0.2	0.2	0.2	0.3	0.3	0.1	0.2
Dissolved Nitrate plus Nitrite as N (mg/l)	0.83	0.66	0.31	0.30	0.41	0.93	0.02	0.38
Dis. Phosphorus, Orthophosphate as P (mg/l)	0.03	0.01	0.00	0.01	0.02	0.02	0.01	0.01
Dissolved Phosphate, Ortho as PO4 (mg/l)	0.09	0.03	0.00	0.03	0.06	0.06	0.03	0.03
Total Hardness as CaCO3 (mg/l)	340	320	290	430	210	330	190	210
Non-carbonate Hardness as CaCO3 (mg/l)	20	31	44	180	22	31	8	22
Sodium Adsorption Ratio	0.7	0.7	0.7	1.1	0.3	0.6	0.2	0.3
Dissolved Boron as B (mg/l)	120	90	50	60	40	110	20	30
Potassium-40 (pCi/l)	2.5	2.8	2.2	3.1	1.2	2.6	0.7	1.0
Dissolved Oxygen (mg/l)	---	9.3	10.9	11.0	11.0	6.6	---	---



LEGEND

- PERMIT AREA BOUNDARY
- DRAINAGE AREA BOUNDARY
- HYDRAULIC LENGTH
- SEDIMENTATION POND
- SURFACE WATER MONITORING LOCATION

ACREAGES

A	5.42	S	0.29
B	10.73	RS	0.32
C	9.77	RN	0.93
C′	3.10		

LENGTHS (feet)

A	725	C′	325
B	1726	A-C-C′	1764
C	1305		

NOTE: Disturbed area includes C, C′, S, RS, and RN for a total of 14.41 acres.

THIS DRAWING WAS PREPARED UNDER MY SUPERVISION:

BARBARA A. FILAS — DATE

REGISTERED PROFESSIONAL ENGINEER, UTAH NO. 7007

SUMMIT MINERALS, INC.

STORM RUNOFF AND DRAINAGE AREAS

BAF 10/16/86
Scale: 1" : 200'
Ref. Dwgs.:

783.16-1

783.16-6

TABLE 783.16-4

STATION 10131000 CHALK CREEK AT COALVILLE UTAH

DISCHARGE (CUBIC FEET/SECOND)
NORMAL MONTHLY MAXIMUMS (ALL DAYS)

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL
1944	30.0	29.0	23.0	18.0	21.0	50.0	271.	655.	581.	92.0	25.0	29.0	655.
1945	21.0	25.0	22.0	18.0	32.0	152.	179.	289.	170.	44.0	151.	31.0	289.
1946	28.0	31.0	30.0	27.0	41.0	120.	485.	349.	161.	40.0	15.0	17.0	485.
1947	45.0	37.0	30.0	19.0	30.0	220.	123.	399.	210.	82.0	63.0	34.0	399.
1948	28.0	34.0	34.0	37.0	50.0	123.	499.	625.	207.	52.0	50.0	10.0	625.
1949	19.0	25.0	21.0	17.0	21.0	42.0	345.	387.	349.	82.0	24.0	24.0	387.
1950	43.0	27.0	21.0	32.0	37.0	46.0	500.	861.	764.	150.	49.0	51.0	861.
1951	38.0	52.0	40.0	32.0	82.0	74.0	249.	500.	335.	74.0	68.0	26.0	500.
1952	34.0	29.0	26.0	26.0	25.0	38.0	1200.	1200.	519.	150.	49.0	54.0	1200.
1953	20.0	26.0	24.0	38.0	27.0	64.0	110.	314.	349.	61.0	44.0	19.0	349.
1954	21.0	28.0	22.0	21.0	25.0	44.0	104.	145.	57.0	28.0	11.0	25.0	145.
1955	15.0	18.0	15.0	16.0	15.0	41.0	81.0	307.	110.	22.0	15.0	17.0	307.
1956	17.0	33.0	77.0	46.0	21.0	138.	237.	426.	260.	49.0	29.0	20.0	426.
1957	22.0	24.0	31.0	21.0	70.0	40.0	104.	610.	556.	130.	40.0	31.0	610.
1958	26.0	31.0	31.0	22.0	47.0	41.0	206.	274.	91.0	18.0	14.0	11.0	274.
1959	11.0	19.0	25.0	18.0	26.0	29.0	164.	172.	108.	71.0	16.0	44.0	172.
1960	28.0	19.0	15.0	16.0	27.0	216.	95.0	251.	75.0	16.0	8.60	9.80	251.
1961	15.0	21.0	20.0	11.0	15.0	131.	54.0	68.0	46.0	12.0	6.30	5.80	131.
1962	13.0	17.0	16.0	36.0	294.	134.	292.	352.	225.	52.0	19.0	19.0	352.
1963	28.0	20.0	20.0	56.0	160.	36.0	81.0	220.	122.	24.0	19.0	26.0	220.
1964	21.0	21.0	17.0	16.0	15.0	43.0	226.	652.	382.	130.	21.0	16.0	652.
1965	20.0	26.0	102.	47.0	36.0	47.0	347.	590.	503.	205.	96.0	73.0	590.
1966	54.0	47.0	85.0	34.0	27.0	144.	188.	482.	85.0	38.0	15.0	28.0	482.
1967	32.0	26.0	27.0	21.0	22.0	55.0	72.0	693.	506.	303.	36.0	45.0	693.
1968	37.0	30.0	27.0	26.0	44.0	57.0	119.	558.	541.	129.	108.	47.0	558.
1969	51.0	41.0	33.0	52.0	32.0	88.0	395.	545.	239.	157.	33.0	21.0	545.
1970	48.0	33.0	33.0	51.0	34.0	30.0	178.	510.	347.	92.0	45.0	51.0	510.
1971	39.0	58.0	45.0	59.0	48.0	340.	210.	563.	414.	148.	52.0	77.0	563.
1972	46.0	50.0	53.0	42.0	45.0	189.	425.	586.	415.	90.0	25.0	58.0	586.
1973	49.0	41.0	31.0	29.0	26.0	38.0	578.	752.	419.	82.0	34.0	58.0	752.
1974	43.0	48.0	42.0	41.0	39.0	123.	566.	1080.	389.	113.	33.0	23.0	1080.
1975	28.0	31.0	33.0	29.0	25.0	43.0	75.0	615.	798.	262.	41.0	57.0	798.
1976	52.0	39.0	39.0	30.0	65.0	69.0	175.	441.	140.	55.0	26.0	16.0	441.
1977	24.0	21.0	19.0	14.0	15.0	30.0	65.0	47.0	27.0	12.0	7.20	5.80	65.0
1978	9.60	20.0	21.0	17.0	20.0	73.0	155.	496.	333.	112.	40.0	65.0	496.
1979	29.0	32.0	32.0	23.0	37.0	42.0	115.	200.	117.	25.0	40.0	18.0	200.
1980	22.0	21.0	18.0	53.0	52.0	37.0	574.	563.	346.	160.	41.0	34.0	574.
1981	40.0	38.0	27.0	25.0	58.0	47.0	251.	352.	307.	53.0	23.0	40.0	352.
1982	37.0	30.0	42.0	26.0	55.0	66.0	453.	800.	334.	177.	60.0	135.	800.
1983	103.	73.0	55.0	44.0	55.0	163.	458.	1240.	1410.	386.	206.	177.	1410.
1984	71.0	74.0	78.0	64.0	65.0	83.0	399.	1240.	665.	230.	180.	100.	1240.
1985	88.2	81.0	65.0	50.4	48.0	140.	617.	793.	256.	104.	51.0	46.0	793.
PER	103.	81.0	102.	64.0	294.	340.	1200.	1240.	1410.	386.	206.	177.	1410.

* INDICATES A NO-VALUE MONTH

TABLE 783.16-5

WATER QUALITY DATA - USGS GAGING STATION 10131000, CHALK CREEK AT COALVILLE, UTAH

Parameter	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.
					1973-1974							
Flow (cfs)	36	38	37	35	----	39	110	610	252	81	19	21
Temp. (degree C)	8.0	1.5	2.0	0.5	----	2.0	4.0	8.0	14.0	17.0	15.0	16.0
Sp. Cond. (umhos)	650	500	530	540	----	700	730	410	380	585	750	700
					1974-1975							
Flow (cfs)	14	25	19	22	22	35	81	158	456	245	35	48
Temp. (degree C)	10.0	4.0	0.5	0.5	1.0	2.5	2.5	4.5	7.0	8.5	14.5	11.0
Sp. Cond. (umhos)	750	650	700	680	600	520	490	450	320	300	400	600
					1975-1976							
Flow (cfs)	38	31	----	28	29	23	141	344	----	26	23	15
Temp. (degree C)	5.0	3.5	----	1.0	1.0	1.5	7.0	9.0	----	14.0	11.0	13.5
Sp. Cond. (umhos)	500	520	----	600	510	610	480	350	----	600	700	700
					1976-1977							
Flow (cfs)	20	19	18	20	18	12	29	20	11	----	5.5	6.4
Temp. (degree C)	9.5	2.5	1.5	1.0	1.5	4.0	6.0	9.0	12.0	----	13.0	11.0
Sp. Cond. (umhos)	620	630	640	620	630	680	540	670	830	----	880	880
					1977-1978							
Flow (cfs)	5.1	13	20	17	16	72	----	165	415	19	----	19
Temp. (degree C)	10.0	8.5	2.0	2.0	4.5	9.5	----	8.0	12.0	14.0	----	14.0
Sp. Cond. (umhos)	830	790	720	670	580	580	----	495	380	740	----	690
					1978-1979							
Flow (cfs)	21	14	18	23	24	----	84	183	61	8.2	21	14
Temp. (degree C)	8.0	3.0	2.0	1.5	2.5	----	5.0	12.0	12.0	14.0	15.5	16.0
Sp. Cond. (umhos)	660	670	690	570	590	----	550	360	520	690	775	710
					1979-1980							
Flow (cfs)	5.1	15	12	43	----	----	32	423	295	59	18	19
Temp. (degree C)	20.0	4.0	0.0	2.5	----	----	3.0	7.5	8.0	14.0	13.0	12.0
Sp. Cond. (umhos)	790	620	690	500	----	----	600	405	320	540	800	740
					1980-1981							
Flow (cfs)	19	24	22	15	----	25	267	313	86	10	14	26
Temp. (degree C)	9.5	5.0	1.0	1.0	----	4.0	11.0	10.0	10.5	14.5	15.5	16.0
Sp. Cond. (umhos)	700	580	600	610	----	560	350	370	570	800	750	----
					1981-1982							
Flow (cfs)	26	----	13	----	29	28	371	480	254	67	34	55
Temp. (degree C)	9.0	----	2.5	----	2.0	6.0	8.0	9.0	11.0	17.0	17.0	14.0
Sp. Cond. (umhos)	----	----	640	----	600	640	480	----	500	590	680	560
					1982-1983							
Flow (cfs)	----	22	30	24	21	40	224	899	551	108	119	68
Temp. (degree C)	----	3.0	0.0	1.0	3.5	4.5	4.0	7.0	13.0	14.0	16.5	14.0
Sp. Cond. (umhos)	----	690	650	660	640	630	590	440	410	590	590	560
					1983-1984							
Flow (cfs)	72	67	----	53	46	----	107	847	362	148	173	----
Temp. (degree C)	11.0	7.5	----	1.0	0.0	----	5.0	15.0	17.0	14.0	16.0	----
Sp. Cond. (umhos)	445	640	----	660	680	----	720	405	----	600	600	----

TABLE 783.16-6a

WATER QUALITY ANALYSES
CHALK CREEK - UPSTREAM

	06/03/85	08/31/85	11/25/85	02/25/86
Field Measurements				
Temperature (degrees C)	8.0	14.5	7.2	2.0
Flow (cfs)	171.3	25.0	21.4	89.9
pH	7.36	6.97	6.91	7.15
Specific Conductance (umhos/cm at 25 degrees C)	480	450	570	550
Laboratory Measurements				
Aluminum (mg/l)	<0.05	<0.002	0.26	0.04
Ammonia (mg/l)	0.06	0.10	0.24	0.25
Arsenic (mg/l)	0.002	0.025	0.018	0.005
Barium (mg/l)	0.09	0.11	0.14	0.17
Bicarbonate (mg/l)	203	182	197	180
Boron (mg/l)	<0.05	<0.05	<0.05	<0.05
Cadmium (mg/l)	<0.001	0.002	0.003	0.003
Carbonate (mg/l)	<1	0	0	0
Calcium (mg/l)	65	41	47	84
Chloride (mg/l)	26.0	28.2	37.7	67.2
Chromium (mg/l)	0.004	<0.005	<0.005	<0.005
Copper (mg/l)	0.001	0.006	0.006	0.013
Fluoride (mg/l)	0.11	0.10	0.29	0.27
Hardness (mg/l CaCO3)	243	232	305	244
Iron (mg/l)	0.25	<0.03	0.24	0.04
Lead (mg/l)	<0.010	0.023	0.031	0.015
Magnesium (mg/l)	16	19	25	30
Manganese (mg/l)	0.012	0.001	0.039	0.035
Mercury (mg/l)	0.0004	<0.0001	0.0007	<0.0001
Molybdenum (mg/l)	<0.001	<0.05	<0.05	<0.05
Nickel (mg/l)	0.012	0.010	0.005	0.009
Nitrate (mg/l as N)	<0.02	0.23	0.06	3.65
Nitrite (mg/l as N)	<0.02	0.03	<0.01	<0.01
Oil and Grease (mg/l)	<5	<5	<5	<5
Phosphate (mg/l)	0.09	0.28	0.36	<0.01
Potassium (mg/l)	2	3	2	5
Selenium (mg/l)	0.002	0.002	0.004	0.012
Sodium (mg/l)	11	15	7	30
Solids, Dissolved (mg/l)	295	310	400	390
Solids, Settleable (mg/l)	<1	<0.5	<1	<0.5
Solids, Suspended (mg/l)	24	2	13	104
Sulfate (mg/l)	15	11.2	36.1	57.6
Sulfide (mg/l)	0.025	<0.002	0.01	0.02
Zinc (mg/l)	0.013	0.006	0.002	0.022

TABLE 783.16-6b

CHARGE / TDS BALANCE
CHALK CREEK - UPSTREAM

	06/03/85		08/31/85		11/25/85		02/25/86	
	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l
Calcium	65	3.24	41	2.05	47	2.35	84	4.19
Magnesium	16	1.32	19	1.56	25	2.06	30	2.47
Potassium	2	0.05	3	0.08	2	0.05	5	0.13
Sodium	11	0.48	15	0.65	12	0.52	30	1.31
Sum of Cations		5.09		4.34		4.98		8.10
Bicarbonate	203	3.33	182	2.98	197	3.23	180	2.95
Carbonate	<1	0.00	0	0.00	0	0.00	0	0.00
Chloride	26	0.73	28.2	0.80	37.7	1.06	67.2	1.90
Sulfate	15	0.31	11.2	0.23	36.1	0.75	57.6	1.20
Sum of Anions		4.37		4.01		5.04		6.05
Charge Balance (%)		7.6		4.0		(0.6)		14.5

Laboratory TDS	295	310	400	390
Calculated TDS	236	208	258	362
TDS Balance (%)	11.1	19.7	21.6	3.7

$$\text{Charge Balance (\%)} = \left(\frac{\text{Cations} - \text{Anions}}{\text{Cations} + \text{Anions}}\right) 100$$

$$\text{TDS Balance (\%)} = \left(\frac{\text{Laboratory} - \text{Calculated}}{\text{Laboratory} + \text{Calculated}}\right) 100$$

TABLE 783.16-7a

WATER QUALITY ANALYSES
CHALK CREEK - DOWNSTREAM

	06/03/85	08/31/85	11/25/85	02/25/86
Field Measurements				
Temperature (degrees C)	8.0	18.0	6.0	4.8
Flow (cfs)	187.0	20.6	30.3	118.6
pH	7.30	7.05	7.10	7.08
Specific Conductance (umhos/cm at 25 degrees C)	540	420	570	580
Laboratory Measurements				
Aluminum (mg/l)	<0.05	<0.05	0.81	0.04
Ammonia (mg/l)	0.05	0.06	0.22	0.95
Arsenic (mg/l)	0.002	0.020	0.010	0.009
Barium (mg/l)	0.09	0.11	0.15	0.15
Bicarbonate (mg/l)	196	197	201	218
Boron (mg/l)	<0.05	<0.05	<0.05	<0.05
Cadmium (mg/l)	<0.001	0.001	0.006	0.002
Carbonate (mg/l)	0	0	0	0
Calcium (mg/l)	65	39	49	77
Chloride (mg/l)	27.0	28.9	38.8	65.8
Chromium (mg/l)	0.004	<0.005	0.005	<0.005
Copper (mg/l)	0.003	0.008	0.007	0.010
Fluoride (mg/l)	0.11	0.10	0.15	0.26
Hardness (mg/l CaCO3)	241	221	298	254
Iron (mg/l)	0.34	<0.03	0.46	0.07
Lead (mg/l)	<0.010	0.023	0.041	0.015
Magnesium (mg/l)	16	19	25	28
Manganese (mg/l)	0.012	0.001	0.043	0.048
Mercury (mg/l)	0.0005	<0.0001	0.0004	0.0001
Molybdenum (mg/l)	<0.001	<0.05	<0.05	<0.05
Nickel (mg/l)	0.011	0.010	0.005	0.011
Nitrate (mg/l as N)	<0.02	0.18	0.04	1.76
Nitrite (mg/l as N)	<0.02	0.01	<0.01	<0.01
Oil and Grease (mg/l)	<5	<5	<5	<5
Phosphate (mg/l)	0.08	0.08	0.14	<0.01
Potassium (mg/l)	2	2	2	4
Selenium (mg/l)	0.001	0.001	0.004	0.012
Sodium (mg/l)	14	15	13	25
Solids, Dissolved (mg/l)	305	315	450	405
Solids, Settleable (mg/l)	<1	<0.5	<0.5	<0.5
Solids, Suspended (mg/l)	40	1	11	150
Sulfate (mg/l)	15	12.0	42.8	63.6
Sulfide (mg/l)	0.034	<0.002	0.039	<0.01
Zinc (mg/l)	0.004	0.008	0.012	0.044

TABLE 783.16-7b

CHARGE / TDS BALANCE
CHALK CREEK - DOWNSTREAM

	06/03/85		08/31/85		11/25/85		02/25/86	
	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l
Calcium	65	3.24	39	1.95	49	2.45	77	3.84
Magnesium	16	1.32	19	1.56	25	2.06	28	2.30
Potassium	2	0.05	2	0.05	2	0.05	4	0.10
Sodium	14	0.61	15	0.65	13	0.57	25	1.09
Sum of Cations		5.22		4.21		5.13		7.33
Bicarbonate	196	3.21	197	3.23	201	3.29	218	3.57
Carbonate	<1	0.00	0	0.00	0	0.00	0	0.00
Chloride	27	0.76	28.9	0.82	38.8	1.09	65.8	1.86
Sulfate	15	0.31	12.0	0.25	42.8	0.89	63.6	1.32
Sum of Anions		4.28		4.30		5.27		6.75
Charge Balance (%)		9.9		(1.1)		(1.3)		4.1

Laboratory TDS	305	315	450	405
Calculated TDS	237	214	271	378
TDS Balance (%)	12.5	19.1	24.8	3.5

$$\text{Charge Balance (\%)} = \left(\frac{\text{Cations} - \text{Anions}}{\text{Cations} + \text{Anions}}\right) 100$$

$$\text{TDS Balance (\%)} = \left(\frac{\text{Laboratory} - \text{Calculated}}{\text{Laboratory} + \text{Calculated}}\right) 100$$

TABLE 783.16-8

SURFACE WATER QUALITY ANALYSES
CHALK CREEK - UPSTREAM

10/09/86

Field Measurements	
Temperature (degrees C)	NA
Flow (cfs)	NA
pH	NA
Specific Conductance (umhos/cm at 25 degrees C)	NA
Laboratory Measurements (mg/l)	
Acidity as CaCO3, SM402Y	<0.10
Alkalinity as CaCO3, SM403	150
Aluminum as Al, SM303C	<0.01
Ammonia as NH3-N, SM417F	0.39
Arsenic (dis) as As, SM304	<0.001
Arsenic (tot) as As, SM304	<0.001
Barium (dis) as Ba, SM303A	0.13
Barium (tot) as Ba, SM303A	0.17
Bicarbonate as HCO3, SM403	173.20
Boron (dis) as B, SM404A	<0.001
Boron (tot) as B, SM404A	<0.001
Cadmium (dis) as Cd, SM304	<0.001
Cadmium (tot) as Cd, SM304	<0.001
Calcium as Ca, SM303A	52.80
Carbonate as CO3, SM403	4.80
Chloride as Cl, SM407A	86.0
Chromium (dis) as Cr, SM303A	<0.001
Chromium (tot) as Cr, SM303A	<0.001
Copper (dis) as Cu, SM303A	<0.01
Copper (tot) as Cu, SM303A	<0.01
Fluoride as F, SM413B	0.12
Hardness as CaCO3, SM314B	202
Iron (dis) as Fe, SM303A	<0.01
Iron (tot) as Fe, SM303A	0.09
Lead (dis) as Pb, SM303A	<0.001
Lead (tot) as Pb, SM303A	0.005

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Magnesium (dis) as Mg, SM313B	24.97
Magnesium (tot) as Mg, SM313B	25.50
Manganese (dis) as Mn, SM303A	<0.01
Manganese (tot) as Mn, SM303A	<0.01
Mercury (dis) as Hg, SM32	<0.0002
Mercury (tot) as Hg, SM320A	<0.0002
Molybdenum (dis) as Mo, SM303A	<0.001
Molybdenum (tot) as Mo, SM303C	<0.001
Nickel (dis) as Ni, SM249.2	<0.01
Nickel (tot) as Ni, SM249.2	<0.01
Nitrate as NO3-N, SM418C	<0.01
Nitrite as NO2-N, SM419	<0.01
Phosphate as PO4-P, SM424G	0.05
Potassium as K, SM303A	2.30
Selenium as Se, SM304	<0.001
Settleable Solids, SM209F	<0.1
Sodium as Na, SM303A	20.70
Sulfate as SO4, SM426D	6
Sulfide as S, EPA9030	<0.10
Suspended Solids, SM209D	2.0
Total Dissolved Solids, SM209B	360
Zinc as Zn, SM303A	<0.005

TABLE 783.16-9

SURFACE WATER QUALITY ANALYSES
CHALK CREEK - DOWNSTREAM

	10/09/86
Field Measurements	
Temperature (degrees C)	NA
Flow (cfs)	NA
pH	NA
Specific Conductance (umhos/cm at 25 degrees C)	NA
Laboratory Measurements (mg/l)	
Acidity as CaCO3, SM402Y	<0.10
Alkalinity as CaCO3, SM403	196
Aluminum as Al, SM303C	<0.01
Ammonia as NH3-N, SM417F	1.71
Arsenic (dis) as As, SM304	<0.001
Arsenic (tot) as As, SM304	<0.001
Barium (dis) as Ba, SM303A	0.12
Barium (tot) as Ba, SM303A	0.17
Bicarbonate as HCO3, SM403	190.30
Boron (dis) as B, SM404A	<0.001
Boron (tot) as B, SM404A	<0.001
Cadmium (dis) as Cd, SM304	<0.001
Cadmium (tot) as Cd, SM304	<0.001
Calcium as Ca, SM303A	54.40
Carbonate as CO3, SM403	24.00
Chloride as Cl, SM407A	58.0
Chromium (dis) as Cr, SM303A	<0.001
Chromium (tot) as Cr, SM303A	<0.001
Copper (dis) as Cu, SM303A	<0.01
Copper (tot) as Cu, SM303A	<0.01
Fluoride as F, SM413B	0.13
Hardness as CaCO3, SM314B	228
Iron (dis) as Fe, SM303A	<0.01
Iron (tot) as Fe, SM303A	0.10
Lead (dis) as Pb, SM303A	<0.001
Lead (tot) as Pb, SM303A	<0.001

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Magnesium (dis) as Mg, SM313B	24.01
Magnesium (tot) as Mg, SM313B	25.10
Manganese (dis) as Mn, SM303A	<0.01
Manganese (tot) as Mn, SM303A	<0.01
Mercury (dis) as Hg, SM32	<0.0002
Mercury (tot) as Hg, SM320A	<0.0002
Molybdenum (dis) as Mo, SM303A	<0.001
Molybdenum (tot) as Mo, SM303C	<0.001
Nickel (dis) as Ni, SM249.2	<0.01
Nickel (tot) as Ni, SM249.2	<0.01
Nitrate as NO3-N, SM418C	0.09
Nitrite as NO2-N, SM419	<0.01
Phosphate as PO4-P, SM424G	0.08
Potassium as K, SM303A	2.20
Selenium as Se, SM304	<0.001
Settleable Solids, SM209F	<0.1
Sodium as Na, SM303A	19.40
Sulfate as SO4, SM426D	10
Sulfide as S, EPA9030	<0.10
Suspended Solids, SM209D	<1.0
Total Dissolved Solids, SM209B	375
Zinc as Zn, SM303A	<0.005

CHARGE BALANCE
CHALK CREEK - UPSTREAM

	10/09/86 mg/l	meq/l
Acidity	0.000	0.000
Ammonia	0.390	0.028
Calcium	52.800	2.635
Iron (dis)	0.000	0.000
Magnesium	25.500	2.097
Potassium	2.300	0.059
Sodium	20.700	0.900
Sum of Cations		5.719
Bicarbonate	173.200	2.840
Carbonate	4.800	0.160
Chloride	86.000	2.426
Nitrate	0.000	0.000
Sulfate	6.000	0.125
Sum of Anions		5.551
Charge Balance (%)		1.49

$$\text{Charge Balance (\%)} = \frac{\text{Cations} - \text{Anions}}{\text{Cations} + \text{Anions}} \times 100$$

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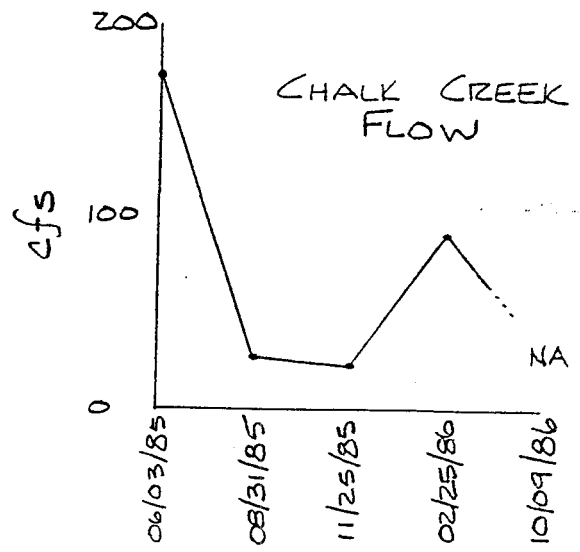
CHARGE BALANCE
CHALK CREEK - DOWNSTREAM

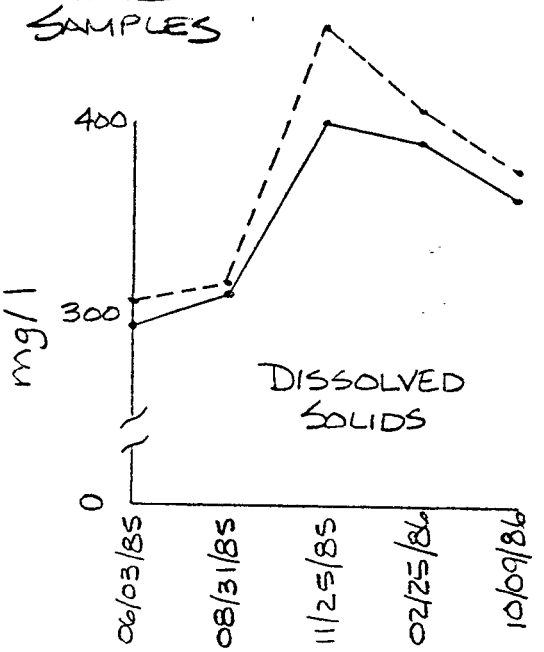
	10/09/86 mg/l	meq/l
Acidity	0.000	0.000
Ammonia	1.710	0.122
Calcium	54.400	2.715
Iron	0.000	0.000
Magnesium	25.100	2.064
Potassium	2.200	0.056
Sodium	19.400	0.844
Sum of Cations		5.801
Bicarbonate	190.300	3.121
Carbonate	24.000	0.800
Chloride	58.000	1.636
Nitrate	0.090	0.001
Sulfate	10.000	0.208
Sum of Anions		5.766
Charge Balance (%)		0.30

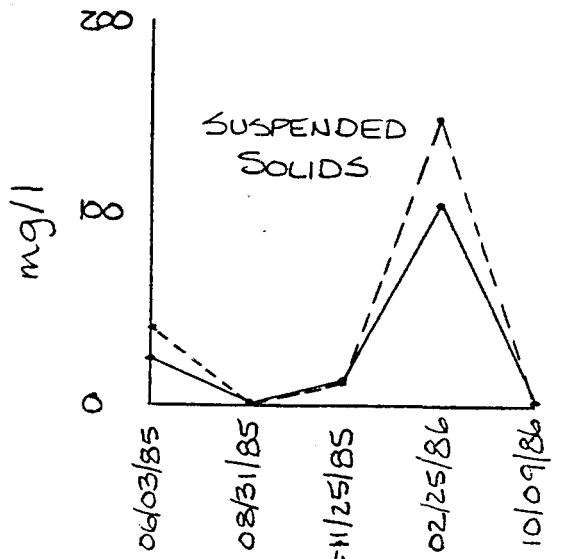
$$\text{Charge Balance (\%)} = \frac{\text{Cations} - \text{Anions}}{\text{Cations} + \text{Anions}} \times 100$$

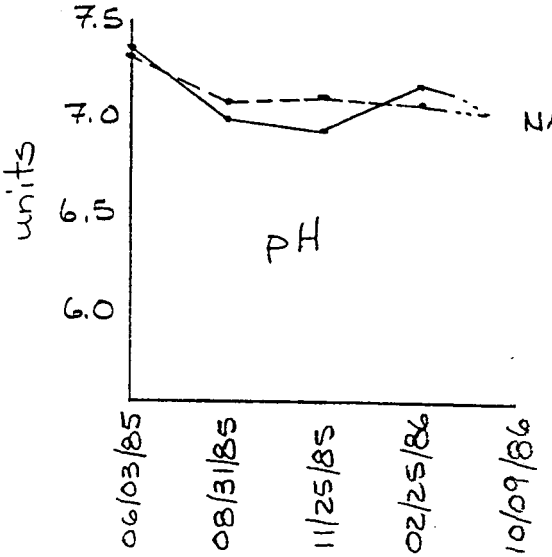
Revision 1: 12/19/86

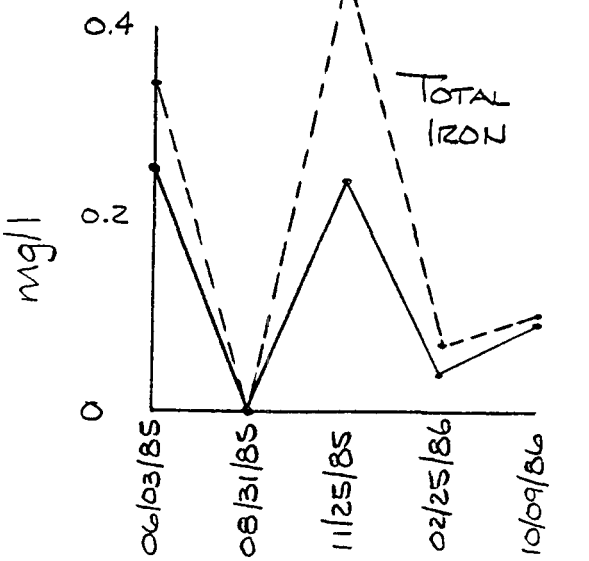
SOLID LINES - UPSTREAM SAMPLES
DASHED LINES - DOWNSTREAM SAMPLES











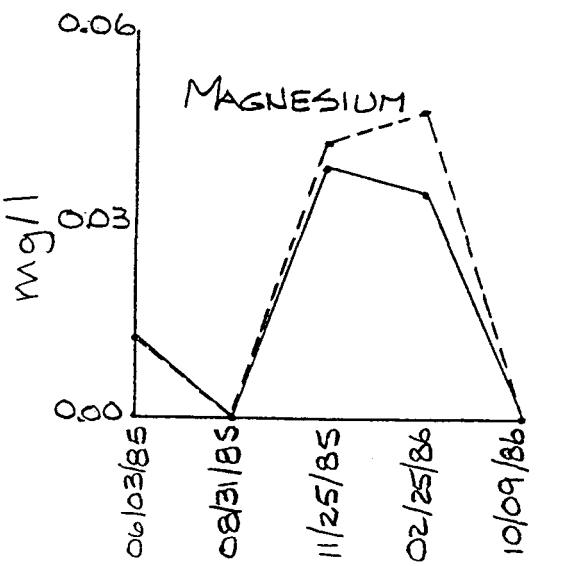
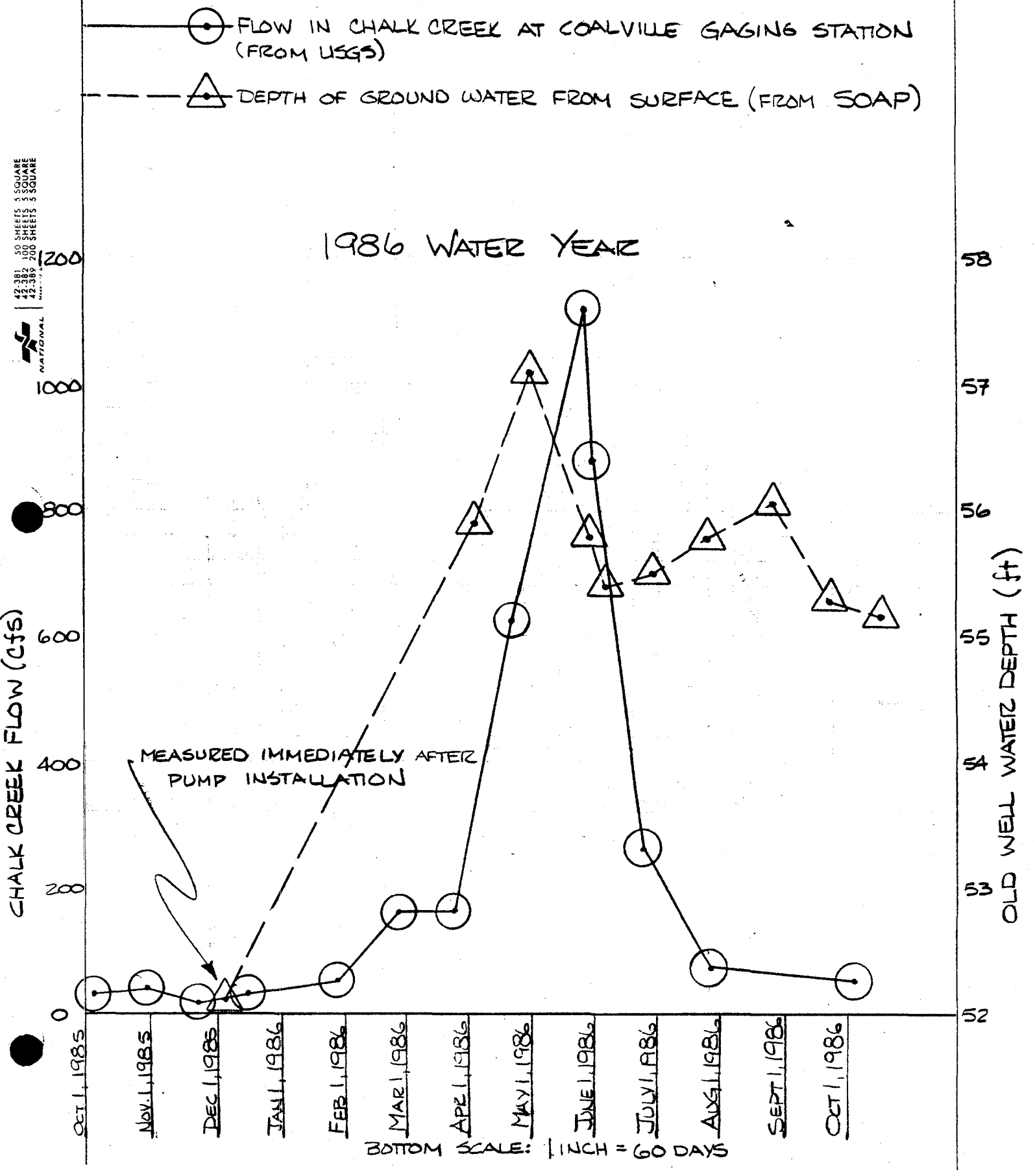


FIGURE 783.16-1 SEASONAL VARIATIONS ON CHALK CREEK

SURFACE-GROUND WATER SEASONAL FLOW CHARACTERISTICS



UMC 783.17 ALTERNATIVE WATER SUPPLY

The reclamation plan does not include provisions for sub-surface excavation or the use of hazardous or toxic materials, so there is no potential impact to ground water. For the same reason there is no potential for the diminution or interruption of surface waters. Untreated surface runoff is the only source of potential contamination of waters flowing in Chalk Creek.

A worst case scenario would be: a precipitation event exceeding the 25 year - 24 hour design could wash out the sedimentation pond allowing untreated runoff from the disturbed area, as well as pond embankment material, to enter Chalk Creek.

According to the Division of Water Rights, as of September, 1986, the Chalk Creek area is closed to new applications for water rights. Should a downstream water user's water supply be contaminated, diminished, or interrupted as a direct result of the reclamation activities, the Operator commits to replace the lost water by one of the following methods: 1) filing a new application for water rights (assuming at such time that the area is again open for applications), 2) filing an exchange right from existing water rights, or 3) obtaining water in bulk from outside sources and trucking such water to the affected water user.

This commitment is made specifically for surface water rights and only for those times when untreated runoff from disturbed areas are shown to have adversely affected the down-stream users water supply. Ground water supply is not a part of this commitment since reclamation activities cannot affect ground water quality or quantity.

UMC 783.18 - CLIMATOLOGICAL INFORMATION

UMC 783.18(a) - GENERAL DESCRIPTION

This section describes the general climatology of the Summit Minerals reclamation area. The climatological data were obtained from a number of sources including records of the National Weather Service Station at Coalville, Utah, from the Hydrologic Atlas of Utah (Jepson and others, 1968), the Utah Weather Guide (Brough and others, 1983), and data presented in the Small Mine Operators Assistance Program (SOAP) study for the Boyer Mine (EarthFax Engineering Inc., 1986). Coalville is the nearest weather monitoring station and is located at Lat. 40 degrees 55 min, Long. 111 degrees 24 min, at an elevation of 5550 feet. The Summit Minerals reclamation area is northeast from the Coalville station at Lat. 40 degrees 57 min 30 sec, Long. 111 degrees 12 min 30 sec, at an elevation of 6280 feet.

The climate of the reclamation area is continental and semiarid. In general the summer season is very short with the normal maximum temperature in the mid-eighties. Spring and fall seasons are highly variable and it is not unusual to have snow in September and as late as mid-June. In the spring precipitation is commonly a mixture of rain and snow. During the fall months the precipitation is mainly in the form of snow. Winters can be very severe with temperatures of minus 30 degrees F or lower at times. Major snowfall is in the months of December, January and February which are also the months with the lowest normal minimum temperature, which averages 13 degrees F for the period. Snow is often on the ground from November until April in depths as much as 6 feet. Two-thirds of the annual average precipitation occurs from October through April (Jeppson and others, 1968).

Winds commonly are light to moderate with estimated maximum average speeds below 20 mph. The prevailing wind direction in the general region is from the northeast. Winds often blow parallel to the canyons except during period of storms.

Table 783.18-1 summaries the climatic information for the Coalville station for the 30-year period 1951-1980. The data are from the National Weather Service weather record files or are based upon calculated or estimated values for the station (Brough and others, 1983). The 30-year averages are updated each 10 years.

Table 783.18-1--Summaries of Climatic Information for the Coalville Weather Station Covering the Period 1951-1980.*

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Means or Totals
Following Information From Weather Record Files:													
TX	37.8	42.4	49.0	59.0	69.6	75.1	85.7	84.2	7.3	66.7	50.9	39.2	61.5
TN	10.9	14.2	19.9	27.4	33.0	39.4	45.4	43.5	35.4	27.1	19.5	13.0	27.4
PP	1.28	1.10	1.35	1.83	1.58	1.12	0.83	0.95	1.03	1.27	1.35	1.35	15.04
SS	16.0	14.7	11.2	2.8	6.0	0.0	0.0	0.0	0.1	1.1	5.8	11.7	69.4
Following Information Based on Calculated or Estimated Values:													
UU	17.5	17.2	46.3	41.9	45.4	23.8	16.0	23.2	24.7	29.1	25.2	17.2	27.3
SO	218	355	457	589	747	778	851	751	636	465	255	247	529
RH	0.40	0.37	0.35	0.28	0.15	0.17	0.06	0.05	0.05	0.07	0.29	0.42	0.22
EP	0.23	0.65	1.78	4.50	5.58	7.13	7.70	6.24	4.85	3.55	1.50	0.65	44.35

EXPLANATION

Normals : By National Weather Service Definition, normals are 30-year averages of a meteorological variable which are updated each 10 years.

TX Normal Maximum Temperature : The average of the monthly maximum temperatures covering the period 1951-1980.

TN Normal Minimum Temperature : The average of the monthly minimum temperatures covering the period 1951-1980.

PP Normal Monthly Precipitation : The average of the monthly precipitation for the period 1951-1980.

SS Average Monthly Snow : The average monthly snowfall accumulated for the period of records at the station.

UU Estimated Daily Wind : An estimate of the expected average wind movement as it would be experienced above an evaporation pan exposed at the station. The value is an estimate in terms of average miles per day for each month.

SO Estimated Daily Solar Radiation : An estimate of the expected solar radiation measured on a horizontal surface at the station location in langleys per day. The estimate is obtained by use of regression equations developed from measurements at the Salt Lake City Airport.

RH Estimated Minimum Humidity : An estimate of the average minimum humidity that can be expected at the station during each month. Calculated from a regression equation developed from humidity measurements taken at all of the first order stations in the nation.

EP Estimated Pan Evaporation : Obtained from regression equations using the estimates of daily wind movement, solar radiation, minimum humidity, and saturation vapor pressure.

* From Brough and others, 1983.

UMC 783.18(a)(1) - Average Seasonal Precipitation

Precipitation in the vicinity of the reclamation area varies greatly due to the influence of the Wasatch Mountain range and such local factors as altitude, topography, and geographic location relative to the general west to east storm paths. The normal annual precipitation in the reclamation area is estimated to be greater than at the official National Weather Service station at Coalville. Figure 783.18-1 is a map of the normal annual precipitation for the Coalville area and vicinity, and indicates that the reclamation area probably receives slightly less than 20 inches of precipitation a year. Based on the 30-year averages (Table 783.18-1 and Fig. 783.18-2), most of the precipitation comes mainly during the period October to April, when approximately 14 inches of precipitation falls, mainly as snow. May through September is a period when intense storms of short duration are likely to occur and about six inches of precipitation falls on the average during that period.

Records for the period from 1975 to 1985 indicate that the average monthly precipitation at the Coalville weather station shows two periods of peak activity; one in May and another in September-October (Figure 783.18-2). Overall, that 10-year period appears to have been somewhat wetter than the 30-year period. The 30-year period has different times of peak activities, one in April and another during November-January. Both of the time periods have similar lows in precipitation which occur during February and from June through August. Overall, the 1975-1985 period was slightly wetter than the 30-year period from 1951-1980. The 30-year period has a mean annual precipitation of 15.04 inches, while the 1975-1985 period has 16.41 inches.

The 30-year records for 1951-1980 (Table 783.18-1) indicate that the annual mean snowfall is 69.4 inches for the Coalville station. Snowfall being the heaviest from December through March. The average snow accumulation is about 4.5 feet with expected maximum depths of 6 feet.

Table 783.18-2 presents depth-duration-frequency data for precipitation at the reclamation site. The data were determined by EarthFax Engineering, Inc., as a part of a SOAP study for the Boyer Mine, using methodologies and maps presented by Miller and others (1973).

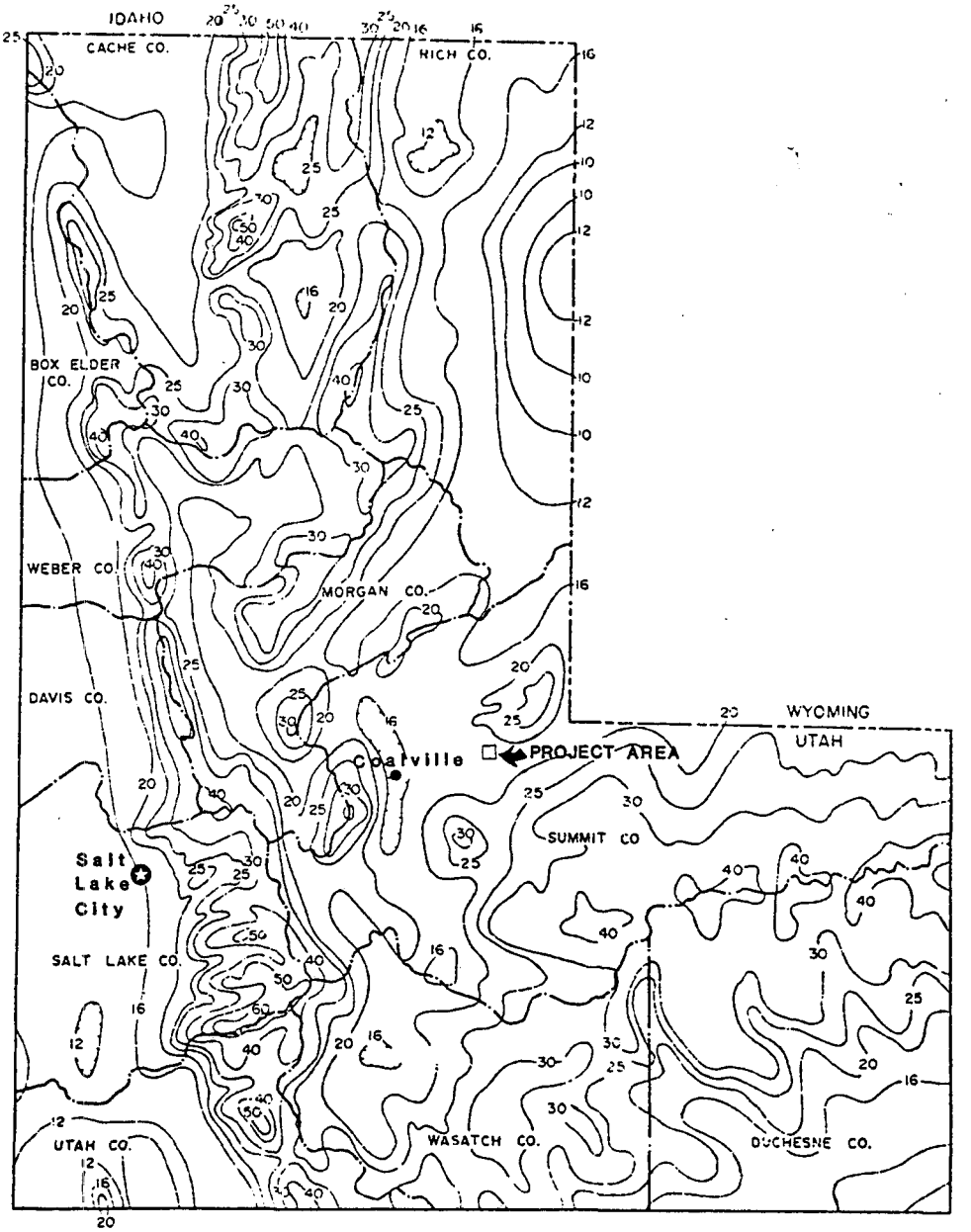


Figure 783.18-1--Normal Annual Precipitation for the Coalville, Utah Area and Vicinity.

Table 783.18-2--Depth-Duration-Frequency Data for Precipitation in the Coalville, Utah Area and Vicinity.

ESTIMATED RETURN PERIODS FOR SHORT DURATION PRECIPITATION
(inches)

Station: Echo Dam — Elevation: 5500
Latitude: 40° 58' — Longitude: 111° 26'

RETURN PERIOD (years)	DURATION									
	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	24 Hr
1	.17	.26	.32	.45	.57	.60	.62	.68	.73	.79
2	.18	.28	.35	.49	.62	.68	.73	.86	.98	1.10
5	.20	.31	.39	.54	.68	.78	.88	1.13	1.35	1.58
10	.21	.33	.42	.58	.74	.87	1.00	1.32	1.60	1.90
25	.23	.35	.44	.62	.78	.96	1.14	1.58	1.97	2.38
50	.26	.41	.51	.71	.90	1.10	1.30	1.79	2.23	2.68
100	.27	.42	.54	.74	.94	1.18	1.41	1.98	2.49	3.02

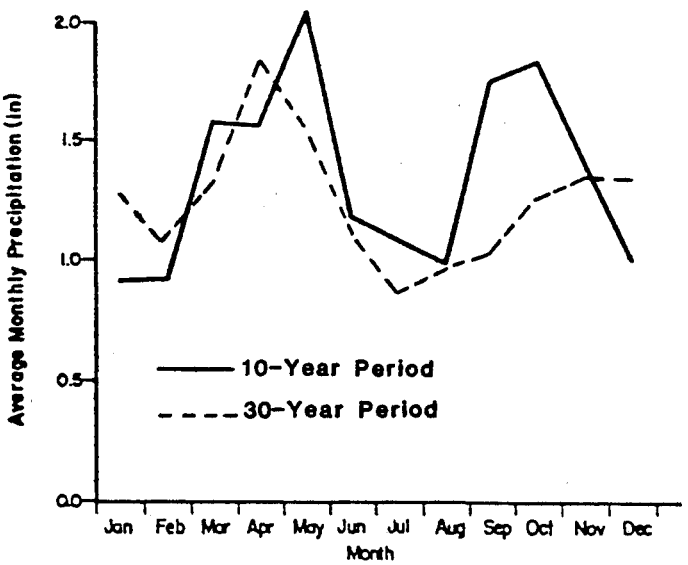


Figure 783.18-2--Average Monthly Precipitation at the Coalville, Utah Weather Station.

UMC 783.18(a)(2) - Prevailing Winds

Generally the winds are light to moderate and have average velocities less than 20 miles per hour. However, wind velocities vary from canyon to canyon. In the reclamation area, the average wind velocity is probably between 10 and 15 miles per hour and comes from the north to northeast. Strong winds are not uncommon in the area, but they never are of the type that could be classified as a tornado. In general, the maximum gusts likely to occur in the area will be in the 40 to 50 mile per hour range and will usually be associated with fronts moving through the region.

UMC 783.18(a)(3) - Temperature Ranges

As is typical of a semiarid-continental climate, the average monthly temperatures in the Coalville region increase steadily from January through July and then decrease through December (Fig. 783.18-3). However, wide daily temperature ranges are common, the result of strong daytime warming and rapid nighttime cooling. Also the temperature is strongly influenced by the elevation and the normal seasonal variables.

The average monthly temperatures range from a low of 21.7 degrees F in January to a high of 63.4 degrees F in July (Fig. 783.18-3). The 30-year normal minimum temperature ranges from 10.9 degrees F in January to 45.4 degrees F in July, with an annual mean minimum temperature of 27.4 degrees F (Table 783.18-1). The 30-year normal maximum temperatures ranges from 37.8 degrees F in January to 85.7 degrees F in July, with an annual mean maximum temperature of 61.5 degrees F (Table 783.18-1). Because of the predominantly cool climate of the area, the average length of the freeze-free period at the site is probably similar to that at Coalville which is approximately 74 days (Brough and others, 1983). At Coalville, the last freeze in the Spring is around June 16th, and the first freeze may come as early as August 20th (Brough and others, 1983).

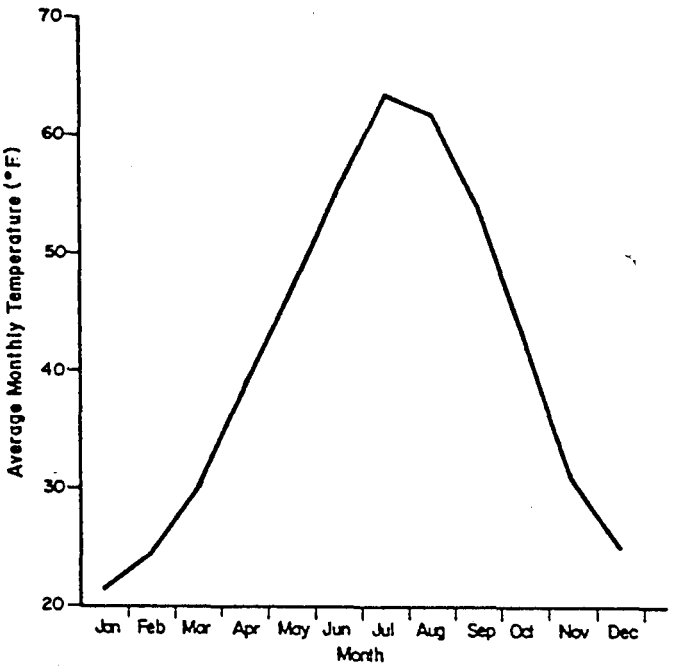


Figure 783.18-3--Average Monthly Temperatures at the Coalville, Utah Weather Station

UMC 783.18(b) - ADDITIONAL DATA

The mean annual evaporation is estimated to be 44.35 inches at the Coalville station. Approximately 90 percent of evaporation occurs from April through November, with almost 50 percent during the period June through August. Transpiration probably is less than 18 inches per year.

The relative humidity ranges from a summer average of about 45 percent to a winter average of 85 percent. The 30-year records indicate that the estimated minimum humidity annual mean is 22 percent. Extremely low average minimum humidity is experienced during July through October.

REFERENCES

Brough, R. C., Griffin, R. D., and Richardson, E. A., 1983, Utah weather guide: Provo, Utah, Society for Applied Climatology and Department of Geography, Brigham Young University, 46 p.

Cruff, R. W., and Thompson, T. H., 1967, A comparison of methods of estimating potential evapotranspiration from climatological data in arid and subhumid environments: U.S. Geological Survey Water-Supply Paper 1939-M.

EarthFax Engineering, Inc., 1986 (Draft), Results of overburden and hydrologic investigation of the Boyer Mine, Summit County, Utah [unpublished]: Utah Division Oil, Gas, and Mining, Small Mine Operators Assistance Program (SOAP).

Frederick, R. H., Miller, J. F., Richards, F. P., and Schwerdt, R. W., 1981, Interduration precipitation relations for storms - western United States: Silver Spring, Maryland, National Oceanic and Atmospheric Administration Report NWS 27, National Weather Service.

Jeppson, R. W., Ashcroft, G. L., Huber, A. L., Skogerboe, G. V., and Bagley, J. M., 1968, Hydrologic Atlas of Utah: Logan, Utah, Utah Water Research Laboratory and State of Utah Department of Natural Resources, PRWG35-1.

Miller, J. F., Frederick, R. H., and Tracey, R. J., 1973, Precipitation-Frequency Atlas of the Western United States: Volume VI - Utah: Silver Spring, Maryland, National Oceanic and Atmospheric Administration Atlas 2, National Weather Service.

Thornthwaite, C. W., and Mather, J. R., 1957, Instructions and tables for computing potential evapotranspiration and the water balance: Publications in Climatology, v. 10, no. 3, p. 185-311.

UMC 783.19 VEGETATION INFORMATION

Vegetation information submitted pursuant to this section is included in the Vegetation Appendix contained in this section.

V E G E T A T I O N A P P E N D I X

VEGETATION SURVEY AT THE SUMMIT NO. 1 COAL MINE

SUMMIT COUNTY, UTAH

S O I L A P P E N D I X

SOIL LABORATORY RESULTS

UTAH STATE UNIVERSITY • LOGAN, UTAH 84322
UMC 48
Telephone (801) 750-2217

Soil, Plant and Water
Analysis Laboratory

October 6, 1986

Richard Kopp
Summit Minerals, Inc.
221 West 2100 South
Salt Lake City, Ut 84115

Sample received September 11, 1986.

USU No.	Ident.	Texture*	Lime**	pH	mmhos /cm ECe	ppm P	ppm K	ppm Fe	ppm Zn	ppm NO_3-N	%>2mm
86-1606	#1A	SL	0	7.3	.3	20	137	15.6	4.3	3.7	9
86-1607	#1B	SL	0	7.0	.2	23	115	30.0	1.7	.8	16
86-1608	#2A	OM	0	6.7	.4	32	365	68.8	6.5	10.2	14
86-1609	#2B	SiL	0	6.8	.2	40	346	65.2	2.6	2.6	41
86-1610	#3A	SiL	0	6.7	.3	39	>400	52.8	4.5	3.1	15
86-1611	#3B	SiL	0	6.8	.3	35	378	46.2	2.4	2.0	12
86-1612	#4A	SiL	0	7.3	.6	37	295	22.4	3.8	20.1	20
86-1613	#4B	SiL	0	7.3	.3	32	255	30.4	3.5	4.7	15
86-1614	#5A	L	++	8.0	.5	15	92	11.1	3.6	1.7	34
86-1615	#5B	L	++	7.9	.5	14	67	13.5	1.3	1.1	60
86-1616	#6A	L	+	7.6	.5	21	86	25.4	4.0	4.5	46
86-1617	#6B	L	+	7.6	.5	25	88	19.8	2.6	2.9	49
86-1618	#7A	L	++	8.2	.5	13	63	8.3	.7	2.0	53
86-1619	#7B	L	++	8.3	.4	13	67	11.2	.6	2.5	64
86-1620	#8A	SL	++	8.1	.5	16	52	7.7	.7	7.9	63
86-1621	#8B	SL	++	8.2	.4	12	51	8.4	.6	2.9	62
86-1622	#9A	L	++	8.0	.5	12	116	7.4	.8	4.7	54
86-1623	#9B	L	++	8.2	.7	5.9	56	7.2	.5	4.8	38

*SL = Sandy Loam
OM = Organic Matter
SiL = Silty Loam
L = Loam
lwt

** 0 = no lime
+ = little lime
++ = alot of lime

K. Topper

UTAH STATE UNIVERSITY • LOGAN, UTAH 84322
UMC 48
Telephone (801) 750-2217

Soil, Plant and Water
Analysis Laboratory

October 1, 1986

Richard Kopp
Summit Minerals, Inc.
221 West 2100 South
Salt Lake City, Ut 84115

Dear Mr. Kopp,

Enclosed are the analytical results for the soil samples submitted to our lab. The texture is an estimated texture and the lime content is also qualitative. The pH & ECe levels indicate there are not any salt problems with these samples.

The critical levels at which we recommend phosphorus (P) fertilization for agronomic crops are values less than 10 ppm. For range revegetation efforts the level would be much lower, so the only sample which may be deficient is sample #9B. A response to P fertilizer is questionable but a rate of about 30 lbs P_2O_5/Ac would suffice.

Growth responses to potassium (K) are very inconsistent with the seed mix you will plant. Soil test values greater than 50 ppm K should not require fertilizer. The critical levels for agronomic crops are around 80-100 ppm K.

The iron (Fe) levels are all quite adequate. Samples 1-6 are high in zinc content while samples 7-9 are somewhat low for production of certain agronomic crops. I do not feel you need to be concerned about iron or zinc.

The nitrogen levels (NO_3-N) appear quite variable, which is not unexpected. It is difficult to predict nitrogen requirements for plants due to the number of soil and climatic factors affecting its availability. By summing the NO_3-N values for a given location you will have a value which can be compared to other locations. (e.g. sample 1 = 3.7 + 0.8 = 4.5 ppm total NO_3-N). Samples totaling 12+ ppm NO_3-N probably do not require additional nitrogen. The rates should be 20-40 lbs N/Ac. The only detrimental effects which can occur from applying nitrogen include stimulation of weedy plants, and suppression of leguminous plants. It is sometimes recommended to not apply nitrogen until the plants are growing and only do so if plant symptoms show a need.

My general recommendation would be to apply no more than 20-40 lbs N ~~lbs~~/Ac and 20-30 lbs P_2O_5/Ac. As I have outlined, not all of the sites require these amounts. Contact me if you have further questions or additional analyses.

Sincerely,

K. Topper

Karl Topper
Lab Supervisor

KT/lwt

USU SOIL TESTING LABORATORY
METHODS SUMMARY (FERTILITY)
(of -2mm soil)

1. pH. Make a soil paste as described in USDA Handbook 60, page 84 (1954). Allow to stand at least 30 minutes. Re-stir, insert electrodes and obtain pH reading to nearest 0.1 unit.

2. Salinity. (electrical conductivity of saturation extract, EC_e). Filter the paste from (1) above and read EC_e by means of a conductivity cell and meter. Report to nearest 0.1 mmho/cm for values <10; to nearest whole unit above 10.
(Note: a probe suitably designed and calibrated may be inserted into the unfiltered paste for rough screening of samples into the categories (a) less than or (b) more than 1.0 mmho/cm. Samples in category (b) must be filtered, and EC_e determined on the extract.)

3. Phosphorus. Olsen's bicarbonate procedure.
Extracting solution is 0.5 M $NaHCO_3$ at pH 8.5.
Soil : solution ratio 1:20.
Decolorizing carbon is necessary.
Shaking time 30 minutes.
Filter.
Determine P in the extract colorimetrically.
Report ppm P in soil (nearest 0.1 ppm for values <10; to nearest whole ppm above 10).

4. Potassium.
Determine K in the $NaHCO_3$ extract for phosphorus, by means of AA or flame emission. Special techniques are often required to reduce problems caused by the $NaHCO_3$ tending to plug aspirators or burner slits. Best procedures must be determined for each instrument.

(Note: if it is not possible to use the $NaHCO_3$ extract in available instruments, the soil may be extracted with NH_4OAc, 1 N, pH 7.0, soil: solution ratio 1:10. Shake for 30 minutes, filter, and determine K by flame or AA. Results will be higher than in $NaHCO_3$ extract, but differences are not great when K is 100 ppm or less.)

5. Lime. (semi-quantitative)
Moisten a small sample with water, then add a few drops of 2N HCl. Report on the basis of efforvescence:
0 = none + = little ++ = much.

6. Texture. Estimate by feel, comparing as necessary with samples of known composition.

7. Nitrate-N.
Use chromotropic acid procedure or equivalent. (See paper by Haby and Larson in proceedings of 1976 conference of NWPFA.)

8. Zinc (and Fe, Cu, Mn on special request)
Extract with buffered DTPA solution.
Detailed procedure is enclosed.

Soil Sample Preparation.

Receive the sample, record its identification, assign a lab number to it, and set it to dry in a shallow pan on a shelf. A fan may be used to speed drying, at room temperature.

Pass the sample through a 2-mm round hole or No. 10 wire mesh sieve. Grind soil lumps (not rocks or coarse organic materials) and add the -2mm portion to the sample to be tested. Discard the portion > 2mm. (Note: for some very rocky samples, it may be desirable to record total sample weight and weight of the >2 mm material.) Blend the -2 mm soil thoroughly and place it in a suitable container showing proper sample number.

DTPA Test for Zinc

EXTRACTANT

To about 700 ml of Zn-free water, add the following:

(a) 1.97 g of DTPA acid (diethylenetriamine pentaacetic acid) also known as [[(Carboxymethyl) imino] bis (ethylenenitrilo)] tetraacetic acid. J.T. Baker E376 or equivalent.

(b) 14.92 g triethanolamine

(c) 1.11 g Ca Cl_2 (or 1.47 g $CaCl_2$-$2H_2O$)

Dilute to 1 liter and adjust pH to 7.30 with HCl.

PROCEDURE

1. To 10 g soil add 20 ml of extractant
2. Shake at moderate speed for 1 hour.
3. Filter.
4. Analyze filtrate for Zn by AA.
5. Calculate ppm Zn on soil basis.

Table 783.21-3 - Results of Soil Sample Analyses (see Figure 783.21-1 for sample locations).

ANALYTICAL RESULTS OF COAL/COAL WASTE MATERIAL
FROM THE SUMMIT NO. 1 MINE

Acid Base Potential (T Lime/1000 Tons)	2.8
Alkalinity as CaCO3 (ppm)	32.0
Boron as B (ppm) SM404A	84.070
Conductivity (umhos/cm) SM205	585
Selenium as Se Tot (ppm) SM304	<0.016
pH Units SM423	5.20

Analysis by: Ford Chemical Laboratory, Inc.
40 West Louise Avenue
Salt Lake City, Utah 84115
(801) 466-8761

UMC 783.22 - LAND-USE INFORMATION

UMC 783.22(a) - GENERAL DESCRIPTION OF LAND CONDITION

The present condition of the surface of the land within the reclamation area can best be described as poor to fair for any other major use besides mining at the present time. The soils within the disturbed area are somewhat limited in their agronomic usefulness. However, soil studies indicate that with very little additions of amendments and limited fertilizer the soils will be able to support more than adequate range-type plant life.

UMC 783.22(a)(1) - Uses of the Land

The existing land uses within the reclamation area and adjacent areas are indicated on maps which show the condition of the land at the time of filing this application (i.e Plate 783.14-4 and Plate 784.23-1). Previous land use for the reclamation area and adjacent areas included the underground mining of coal for over 100 years, the surface mining of sand and gravel for at least 50 years, undeveloped natural vegetation for livestock and wildlife grazing, and hunting. Other land uses for the adjacent areas include that for summer residences, areas generally within 500 feet of the highway along Chalk Creek.

UMC 783.22(a)(2) - Analysis of Land Use

At the present time, the main land use is for coal mining and the extraction of sand and gravel. After reclamation of the surface, the prime land use will be the same use that the land had prior to mining; namely, undeveloped grazing and hunting. The potential of the area to support alternative uses is limited and somewhat questionable. Because of the reclamation area's proximity to highway transportation and Chalk Creek it has some potential for summer home sites or even for more permanent type single-family resident housing for individuals working at the Boyer Mine, just north of the site, or for workers at the oil fields to the east. However, current zoning would have to be changed to allow for such development. Also, an adequate water supply would have to be developed. At the present time there are no available water rights to sustain any such development. Therefore, it is doubtful that even minor housing development can take place.

Recreational opportunities in the reclamation area, particularly hunting of deer and elk are also somewhat limited because of the summer homes which are less than a mile from the area. Hunting of birds and small game such as rabbits will be restored to near previous pre-mining status. It is anticipated that the majority of the recreational activities will remain situated in the lands above and south of the reclamation site and that the area will continue to provide access to such areas.

The prospects for renewed coal mining activities and the extraction of the sand and gravel resource are very likely. In fact, the extensive reclamation of the site before final determination that coal will not be mined in the near future seems inadvisable and a waste of financial resources.

The potential for development of the coal resource should be considered very high. Because of the area's proximity to rail and highway transportation and the high quality of the coal, the coal is a valuable resource which will be fully explored and developed in the very near future.

The sand and gravel resource meets road base specifications with very little processing being required. Therefore, it can be definitely said that sand and gravel mining will occur as new roads are built or old ones upgraded and repaired. The sand and gravel also is valuable for aggregate in cement. Further commercial and residential development in the Park City and Coalville regions will also bring this deposit back into production.

UMC 783.22(a)(2)(i) - Capability of the Land

At the present time, prior to any reclamation efforts, the capability of the land is limited to activities associated with mining. The reclamation site has basically no vegetative cover. The surface is relatively flat and will provide favorable sites for reestablishment of an excellent vegetative cover of grasses and woody plants.

The hydrologic capability of the reclamation site is limited. The available surface water supplies is limited to the flow found in the perennial drainage, Chalk Creek. Most ground water is limited to the amount found in springs and seeps, none of which are found in the reclamation area. Only relatively minor amounts of subsurface water has been encountered during recent underground mining. Therefore, ground water supplies would be extremely limited. Although water flow into Chalk Creek is sufficient to support other land uses, the extent of the area capable of benefiting from that water in the immediate area of the reclamation site is limited.

UMC 783.22(a)(2)(ii) - Productivity of the Land

U. S. Soil Conservation Service Ecological Site descriptions indicate that some portions of the Summit Minerals reclamation area are in a Mountain Gravelly Loam (Mountain Big Sagebrush) site and other portions are in a Mountain Gravelly Loam (Oak) site. The sites occur on mountain slopes and foothills with slopes that are mostly 3 to 40 percent with inclusions up to 60 percent. The characteristic soils in the sites are 40 inches to over 60 inches deep over bedrock and are well drained. The soils formed in residuum and colluvium derived mainly from andesite, conglomerate, and sandstone. The productivity of the land is as follows:

Type of Year	Mountain Big Sagebrush (Lbs./Acre)	Oak (Lbs./Acre)
Favorable years	1,200	2,300
Normal years	1,100	1,900
Unfavorable years	900	1,700

UMC 783.22(b) - PREVIOUS MINING IN RECLAMATION AREA

Records of the mining activities in the reclamation site are very sketchy and unclear concerning precise dates and types of mining activities that took place. Maps are included in this application which show each of the phases where past underground coal mining has taken place. Based on information obtained to date those activities are as follows:

Just west of the permit area, the N. B. Morby Shaft was sunk through 57 feet of gravel and conglomerate in 1879 and drifted on the dip of an 8-foot coal bed (Doelling, 1972). From this entry, additional entries were opened by subsequent operators and developed into the Blackhawk Mine (Plate 771.23-1, Randall, 1952) which was intermittently worked until sometime in the mid-1950's. Those openings were buried during the preparation of the face in 1974-75 for the development of entries by Utah Coal & Energy, Inc. in the permit area (Plate 771.23-2). For the most part, this last development took place before August 3, 1977, but records are unclear concerning if any coal may have been mined after that date.

UMC 783.22(b)(1) - Mining Method Used

Early mining was by hand mining, mule tramming, and working when an order for coal was received. Later mining was mainly by continuous mining methods with some attempts at beginning room and pillar methods.

UMC 783.22(b)(2) - Coal Bed or Other Strata Mined

The coal bed is commonly identified as the Wasatch coal bed which has been the only really commercially important bed in the Coalville mining district. Based on records from several mines in the district, the Wasatch bed varies in thickness from 5 to 14 feet. The coal in the Black Hawk mine varies from 8 to 6 feet thick.

Based on the small outcrop of the Upton Sandstone Member found by Trexler (1966) along the South Fork of Chalk Creek and Trexler's identification of the Grass Creek Sandstone Member near the Boyer mine north of the permit area, it would seem very possible that the coal bed is Dry Hollow Coal.

UMC 783.22(b)(3) - Extent of Coal and Other Material Removed

Based on the workings indicated on the "old" Blackhawk Mine map (Plate 771.23-1), it is estimated that some 129,000 tons of coal were extracted. Based on the entries made by Utah Coal and Energy (Plate 771.23-2), it is estimated that 13,000 tons of coal were removed.

UMC 783.22(b)(4) - Dates of Past Mining

Coal was first mined from the area in and around the reclamation site in 1879, when the Morby shaft was sunk. Coal was mined on a "wagon mine" basis from 1879 to 1953 from the "old" Blackhawk Mine shown on Plate 771.23. Mining from the "new" Black Hawk Mine by Utah Coal and Energy began sometime during the period 1974-75. Records are unclear, but the actual mining of coal probably stopped sometime in the mid-1970's. Sample analysis records indicate shipment of at least "10 loads" from August 1978 to November 1978. However, the records are unclear as to exactly when the coal was mined.

UMC 783.22(b)(5) - Pre-Mining Land Use

From a historical point of view, the pre-mining land use, prior to any underground coal mining, was wildlife habitat and undeveloped lands. The reclamation site has supported mining activities since 1879. Prior to that date, the land use was undeveloped natural vegetation for livestock and wildlife grazing and hunting. The soils within the reclamation area have always been somewhat limited in their agronomic usefulness because of their extensive gravelly nature and the steep slopes that existed prior to the establishment of sand and gravel operations. Examination of aerial photographs beginning in 1953

indicate that the major portion of the flat areas that exist now in the reclamation area are the result of the sand and gravel operations. The coal mining operations that have followed the extraction of the sand and gravel have basically leveled and smoothed the surface of the reclamation area.

UMC 783.22(c) - EXISTING LAND USE

The existing land use for the reclamation area is for coal mining purposes and the extraction of sand and gravel.

LOCAL LAW LAND USE CLASSIFICATION

The Summit County Planning Commission indicates that the main portion of the reclamation site is classified as Agricultural Grazing (AG1). That classification allows for both open pit and tunnel mining, for oil and gas wells, and one dwelling per 40 acres. The areas along the highway and generally within 500 feet of the road, are classified as Rural Residential (RR1 and RR2). The RR1 classification allows for lots of 1 acre in size. On the other hand, the RR2 classification allows for half acre lots but requires that they have at least 110 feet of frontage along the highway.

UMC 783.24 MAPS: GENERAL REQUIREMENTS

UMC 783.24(a) - Location of Ownership Boundaries

Surface ownership is shown on Figure 782.13-1 on page 782.13-2 of this document. Subsurface excavation is not a part of this plan.

UMC 783.24(b) - Location of Boundaries Showing Right of Entry

The access road and permit area boundaries are shown on plate number 784.23-1.

UMC 783.24(c) - Extent of Mining Activities

Coal mining activities are not a part of this plan.

UMC 783.24(d) - Location of Buildings

Buildings located within 1000 feet of the proposed permit area are shown on figure 783.24-1 on page 784.24-3 of this section. The buildings identified as the "Boyer Mine Facilities" are buildings used to support underground coal mine operations. The houses identified as the "Boyer House" and the "Morby House" are seasonal single family dwellings. The buildings within the permit area boundary are used by the Operator for equipment storage and to support site maintenance activities.

UMC 783.24(e) - Location of Man-Made Features

Figure 783.24-1 shows the location of the buried natural gas pipeline which traverses the permit area. There are no major electrical transmission lines, agricultural drainage tile fields or other pipelines known to pass over or through the proposed permit area.

UMC 783.24(f) - Location of Revegetation Reference Area

The proposed reference area for measuring success of revegetation is shown on drawing number 784.19-1.

UMC 783.24(g) - Location of Water Supply Intakes

The locations of water supply intakes as recorded at the Division of Water Rights is included in the Water Rights and Well Information Appendix in section 783.15. Locations are also shown on drawing number 783.15-2 on page 783.15-6 of this document.

The location of the outfall of the sedimentation pond is shown on plate number 784.24-2.

UMC 783.24(h) - Location of Public Roads

State Route 133 is shown on figure 783.24-1 to pass within 100 feet of the permit area boundary.

UMC 783.24(i) - Location of Parks and Historic Resources

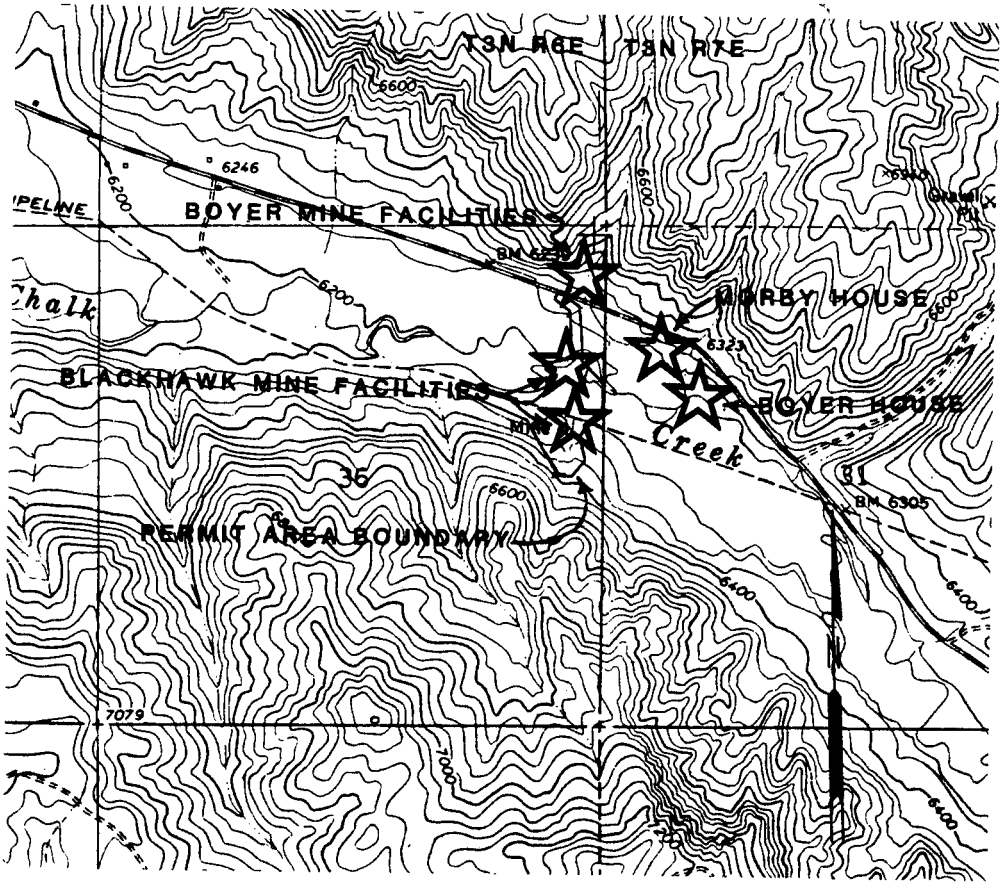
There are no known public parks, cultural or historic resources listed or eligable for listing in the National Register of Historic Places, or archeological sites within the proposed permit or adjacent areas. See section 783.12 of this document.

UMC 783.24(j) - Location of Cemeteries and Burial Grounds

There are no known cemeteries or Indian burial grounds within 100 feet of the proposed permit area.

UMC 783.24(k) - Location of Scenic Rivers

There is no land within the proposed permit or adjacent areas known to be within the boundaries of any units of the National System of Trails or the Wild and Scenic Rivers System, including study rivers designated under Section 5(a) of the Wild and Scenic Rivers Act.



USGS Upton Quadrangle
Scale: 1" = 2000'

Figure 783.24-1 Buildings within 1000 feet of the permit area.

UMC 783.25 CROSS-SECTIONS, MAPS, AND PLANS

UMC 783.25(a) - Locations of Test Borings

Coal exploration drilling is not a part of this plan.

UMC 783.25(b) - Monitoring Locations

The locations of water monitoring stations are shown on drawing number 783.16-1. Area topography is shown on this drawing so that approximate elevations of sampling points can be obtained.

UMC 783.25(c) and (d) - Coal Seam Characteristics

Coal mining activities are not a part of this plan.

UMC 783.25(e) - Location of Mine Workings

The location of known mine workings in and adjacent to the proposed permit area are shown on Plate numbers 771.23-1 and 771.23-2.

UMC 783.25(f) - Location and Extent of Subsurface Water

Drawing number 783.15-2 shows the springs and seeps recorded within a one mile radius of the reclamation area. Plate number 783.15-1 shows drill logs from water wells drilled in the vicinity of the reclamation area.

UMC 783.25(g) - Location of Surface Water Bodies

The location of all surface water bodies within the reclamation area is shown on drawing numbers 783.15-2 and 783.16-1.

UMC 783.25(h) - Location of Previously Surface-Mined Areas

The proposed permit area includes the disturbed area shown on plate number 784.23-1. The disturbance was made persuant to underground coal mine activities by a previous owner/operator.

UMC 783.25(i) - Location of Water Treatment Facilities

The sedimentation pond is shown on plate number 784.23-2 in plan view and on plate number 784.23-3 in cross-section. The spoil pile from sedimentation pond excavation is also shown on those plates. No other spoil, waste, or air pollution control facilities are proposed in this plan.

UMC 783.25(j) - Location of Wells

There are no oil or gas wells within the permit area. The locations of water wells in the reclamation and adjacent areas are shown in section 783.15 on drawing number 783.15-2 of this document. Cross-sectional well logs are shown on plate number 783.15-1.

UMC 783.25(k) - Slope Map

Additional surface disturbance is not a part of this plan.

UMC 783.25(l) - Certification

All maps, plans, and cross-sectoins submitted persuant to this section have been certified by a registered professional engineer or professional geologist.

UMC 783.27 - PRIME FARMLAND INVESTIGATION

The entire reclamation area is deemed unsuitable for prime farmland based on the following:

(1) The land has not been historically used as cropland.

(2) Portions of the land have slopes that are 10 percent or greater.

(3) The land is not irrigated or naturally subirrigated. Furthermore, there are no available water rights of an agricultural nature in conjunction with the land within the reclamation area.

(4) The soil is excessively rocky so as to prohibit most farming activities.

(5) On the basis of soil surveys of the land within the reclamation area, there are no soil map units that have been designated prime farmland by the U. S. Soil Conservation Service.

Based on all of the above aspects, the only possible conclusion is that there are no Prime Farmlands within the reclamation area. See page 783.27-2 for a copy of the SCS Negative Declaration.

United States Department of Agriculture
Soil Conservation Service

SUBJECT: Prime farm land

DATE: Dec. 15, 1986

TO: Barb Filer
221 W. 2100 S.
Salt Lake City, Utah 84115

I can not find any prime farm land on the property in Chalk Creek. I have checked the soil maps and other data in the office.

Jim Watson

Figure 783.27-1: Prime Farmland Negative Declaration

UMC 784.11 OPERATION PLAN: GENERAL REQUIREMENTS

Appropriate signs and markers have been placed to show the permit area boundary, property identification, and stream buffer zones. These signs and markers will remain in place through the bond release period.

UMC 784.11(b)(1) - Construction, Use, and Removal of Sedimentation Pond

The sedimentation pond proposed in this application is an incised pond. Construction techniques will include excavation using a rubber tired front end loader (see Reclamation Plan Appendix for a more detailed discussion of proposed excavation). Dewatering structures will be fabricated and installed as discussed in the Hydrologic Evaluation Appendix of this document.

The sedimentation pond has been designed for full containment of a 10 year - 24 hour precipitation event, and overflow structures have been designed to pass the 25 year - 24 hour event. Pond inflows will be contained a minimum of 24 hours prior to being manually discharged into Chalk Creek. Monitoring of sedimentation pond discharges will be as required by the approved NPDES permit. Results obtained through the NPDES monitoring will be provided to the Division within 90 days after they are received by the Applicant.

Sedimentation pond removal will be according to the plans provided in the Reclamation Plan Appendix on pages RP-23 and RP-24, and shown on plate number 784.23-2.

UMC 784.11(b)(5) - Removal of Mine Facilities

There are three buildings within the proposed permit area. Each is a steel structure built on a concrete foundation. Their locations are shown on Plate numbers 784.23-1 and 784.23-2. They are currently used as necessary to store equipment used in site maintenance. No maintenance or modification to any building is proposed in this plan.

Each building, along with access roads, will be left after reclamation for the surface owner to use to support his ranching operations.

The tipple shown on Plate number 784.23-1 is a concrete structure which was apparantly once used as a coal loading facility. This structure will be demolished, disposed of on site, and backfilled according to the plans in section 784.13.

UMC 784.13 RECLAMATION PLAN: GENERAL REQUIREMENTS

UMC 784.13(a) - Plan Summary

The reclamation of the Summit Minerals, No. 1 Coal Mine is based on a total of 14.41 disturbed acres. Of those disturbed acres, 1.77 acres will be left to support the post mining land use, and the remaining 12.64 acres will be reclaimed according to this plan.

The reclamation project is expected to take approximately six weeks (1032 man hours) to complete. This includes three weeks of backfilling and grading, two weeks of planting in the fall, and one week of planting in the spring. The total cost of reclamation is expected to be $99,822 (1986 dollars).

A general description of the proposed reclamation activities begins on page 1 of the Reclamation Plan and Bond Estimate Appendix in this section.

UMC 784.13(b)(1) - Completion Timetable

The reclamation activities proposed in this plan will take six weeks to complete. A detailed timetable for the completion of each major step in the reclamation plan is included on page 5 of the Reclamation Plan and Bond Estimate Appendix in this section.

UMC 784.13(b)(2) - Cost Estimate

The total cost of reclamation under this plan is $99,822 (1986 dollars). A detailed estimate of the proposed reclamation activities, including calculations and assumptions is included in the Reclamation Plan and Bond Estimate Appendix in this section.

UMC 784.13(b)(3) - Final Surface Configuration

Existing and reclaimed surface configurations are shown on Plate numbers 784.23-1, 784.23-2 and 784.23-3. The cross-sections shown on Plate number 784.23-3 show the proposed cut and fill areas required to achieve the final configuration. A material balance, surface grading and compacting methods, and discussions on soil stabilization is included in the Reclamation Plan and Bond Estimate Appendix in this section.

The proposed surface grading operations have been designed

to closely resemble the general surface configuration of surrounding terrain, while being capable of supporting the postmining land use.

The use of hazardous, toxic, or acid forming materials is not a part of this plan, so groundwater will not be impacted by reclamation activities.

The regraded slopes are shown on Plate number 784.23-2. The proposed slope is not uniform, but makes a transition from the steep, primarily undisturbed upslopes to the flatter reclaimed pad area. This transition is consistant with the configuration of the adjacent, undisturbed valley area. Regraded slopes have been designed for the most moderate slope possible while still maintaining a close resemblance to the surrounding area. No cut-and-fill terraces or permenant depressions are proposed in this plan.

Final grading and seed bed preparation will be accomplished along the contour to minimize any potential erosion or instability. Steep slopes will be prepared by hand as described in the Reclamation Plan and Bond Estimate Appendix of this section.

A discussion of highwalls is included in the Reclamation Plan and Bond Estimate Appendix of this section. No spoil, waste materials, debris, or equipment will be disposed of on the downslope of a steep slope.

A minor amount of coal and/or coal waste will be backfilled according to this plan. The use of acid forming or toxic materials is not proposed in this plan. As discussed in the Reclamation Plan and Bond Estimate Appendix of this section, any coal material will be backfilled using a bulldozer. Backfilling with a bulldozer inherently provides minimal lifts and constant compacting while manipulating the materials. Soil cover over the coal material will be a minimum of three feet thick, which should provide a suitable barrier for the establishment of vegetation.

The proposed backfilling and grading plan has been designed to minimize the erosion potential by controlling surface runoff, minimizing slope gradients, and minimizing the time required in executing the reclamation activities. In the event that rills or gullies exceeding 9 inches form in areas that have been regraded, they will be filled, graded, compacted as necessary, and revegetated according the the Revegetation Plan Appendix of this section.

UMC 784.13(b)(4) - Topsoil Handling Plan

The special handling of topsoils and subsoils is not a part of this plan. No topsoil or subsoil material was segregated at

the time of disturbance for use during reclamation activities. Based on soil sample analyses (section 783.21 of this document), existing disturbed soils are expected to be adequate to support revegetation with only a few soil amendments.

UMC 784.13(b)(5) - Revegetation Plan

A plan for revegetation as required in UMC 817.111 through 817.117 is included in the Revegetation Plan Appendix in this section.

UMC 784.13(c)(7) - Disposal of Waste

Because the disturbed area was once used to support underground coal mining activities, there is evidence of some surface spillage of coal and/or coal waste materials. This is addressed in the Reclamation Plan Appendix of this document. The Applicant will sample the material and have it analyzed for the following parameters: acid-base potential, pH, conductivity, boron, and selenium. Results will be provided to the Division when received by the Operator. Should it be necessary, appropriate revisions to the Reclamation Plan can be made based on the sample results.

UMC 784.13(b)(8) - Portal Sealing Plan

Subsequent to coal mining activities in the late 1970's by a previous owner/operator, two mine portals were left open. In October or November of 1984 during cleanup operations on site, the portals were sealed as per the mine superintendent's letter dated December 4, 1984 (Figure 784.13-1). The Operator feels that the placement and compaction of 27 feet of the incombustible sloughage material in and around the caved No. 1 portal area was the only practical way to seal the opening and that this method adequately meets the requirements of UMC 817.17 and 30 CFR 75.1711-2.

The No. 2 portal however, was basically in tact when fill material was introduced. The Operator proposes to excavate and remove the fill material during reclamation activities and permenantly seal the opening as shown on drawing number 784.13-1, page 784.13-7 of this section.

UMC 784.13(b)(9) - Compliance with Health and Safety Standards

The Operator has applied for a National Pollutant Discharge Elimination System (NPDES) permit from the Environmental Protection Agency for the outfall from the sedimentation pond in compliance with the Clean Water Act (33 U.S.C. Sec. 1251 et seq.). A copy of this filing is included in this document as Figure 784.13-2.

December 5, 1984

Mr. Jack Higgins
Summit Minerals

Dear Mr. Higgins:

On or about 10/15/84, at the Blackhawk Mine located approximately twelve miles east of Coalville, Utah, cleanup work was being performed by myself and two other employees at my direction.

At this time portals #1 and #2 were open, to the extent that neither had been properly sealed and both were caved. Number 2 was caved to within eight feet of a corrigated overcast type portal, extending underground eighteen feet. Number 1 portal was caved to surface and a similar portal structure was buckled by sluffage from the high wall directly above both portals.

On returning to work after the weekend of 10/18/84 we noticed where children had been riding bicycles and playing in and around the old portals area.

Several families live in the immediate area of the mine site with children. It was then determined that the open portals were very hazardous.

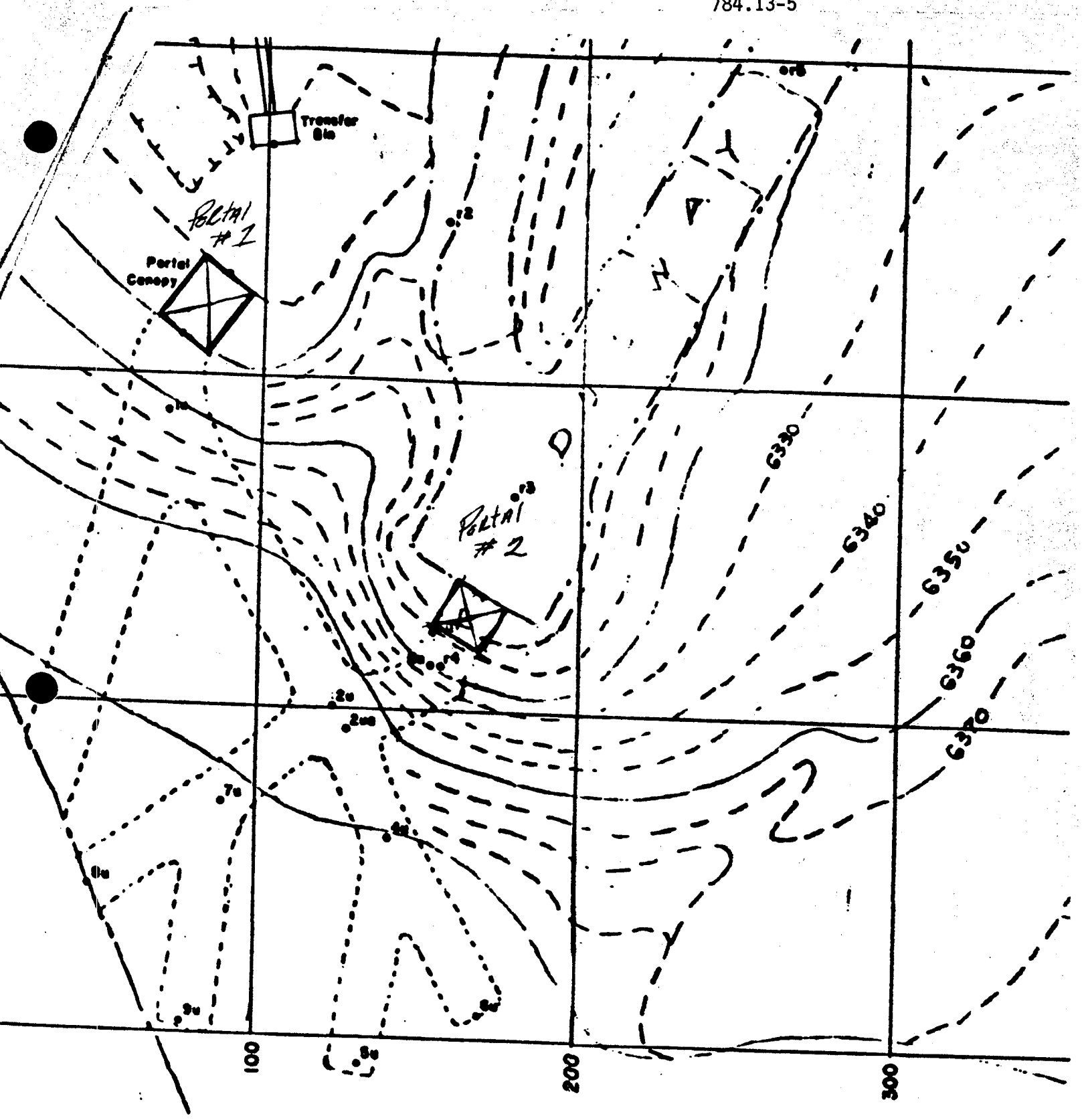
At this time we sealed both portals using a bulldozer and the existing sluffage material from the high wall area. All the portal canopy structure was removed from portal #1 and material was dozed into the subsidance area and compacted by the dozer in 1 foot lifts or layers to a total of 27 feet of cover.

Portal 2 had relatively sound integrity, considering a future mining operation. We filled portal opening with sluffage material, making it inaccessable but still basically intact. This work has been completed as of 11/6/85.

Clayton Timothy
Superintendent Summit Minerals

CT/cn

Figure 784.13-1a - Sealing of Portals at the Blackhawk Mine



Portal #1 Permently Sealed ..-6410--

Portal #2 Inaccessible Temporary Seal

Figure 784.13-1b - Sealing of Portals at the Blackhawk Mine

SUMMIT MINERALS, INC.

221 West 2100 South
Salt Lake City, Utah 84115
(801) 486-1861

October 24, 1986

Mr. Bob Burm
U. S. Environmental Protection Agency
1 Denver Place
999 18th Street
Denver, CO 80202-2413

Dear Mr. Burm:

Please find enclosed EPA Form 3510-1, 3510-2C, and supporting information required for application for a National Pollutant Discharge Elimination System (NPDES) permit under the Clean Water Act, 33 U.S.C. 1251.

The NPDES application is made on behalf of Summit Minerals, Inc. No. 1 Coal Mine for the sole purpose of discharging contained surface runoff water from a sedimentation pond. Effluent waters from the operation of an underground coal mine are not a part of this application. Should it become necessary at some future date to discharge effluent waters from the underground operation, Summit Minerals, Inc. will apply for a separate outfall or an appropriate revision on this outfall in a timely manner which complies with the requirements for coal mining activities.

At your direction, Summit Minerals, Inc. requests that the Regulatory Authority waive all analyses required under Part V of Form 2C for the following reasons:

1) Runoff from the disturbed area is an existing condition resulting from a previous owner/operator. Installation of the sedimentation pond will only improve the existing runoff characteristics now entering the creek.

2) Because the pond is not yet constructed, there is no existing concentrated outfall location to sample which would provide meaningful data.

Should you have any questions or require additional information, contact Barbara Filas at (801) 486-1861. Your prompt consideration of this application would be appreciated.

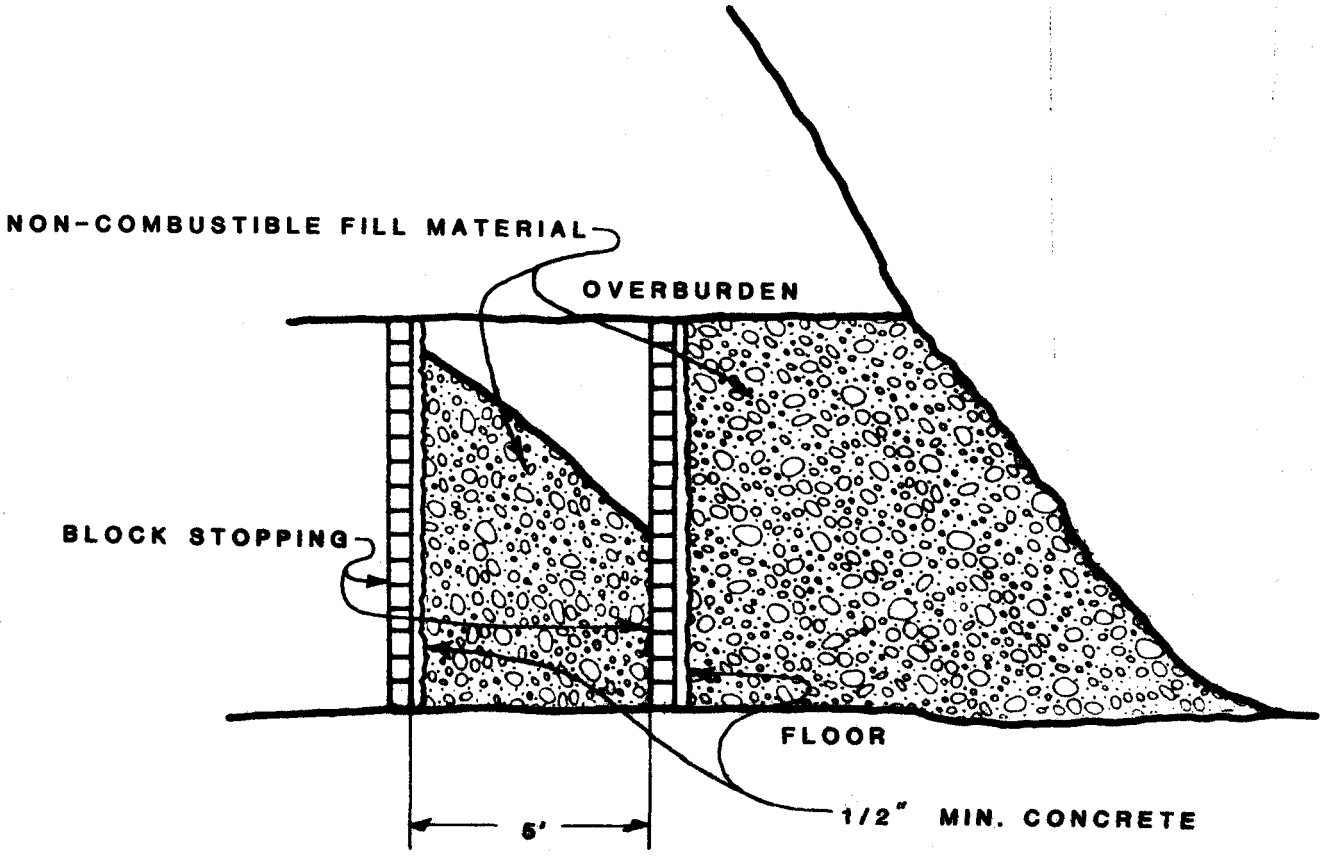
Sincerely,

John L. Higgins, President

Figure 784.13-2 - NPDES Application Proof of Filing

BILL OF MATERIALS:

350 8" X 8" X 16" Solid Masonry Block at $1.03/Block
6 80# Sacks Mortar Mix at $3.10/Sack (1 sack:4cf)



NOTE: Prices and mortar volume assumptions are based on a 10/27/86 quote from Buener Block Co., 2800 South West Temple, Salt Lake City, Utah.

THIS DRAWING WAS PREPARED UNDER MY SUPERVISION

BARBARA A. FILAS — DATE 11/86

REGISTERED PROFESSIONAL ENGINEER, UTAH NO. 7007

SUMMIT MINERALS, INC.	
PORTAL SEALING PLAN	
B.A.F. 10/27/86	784.13-1
Scale: 1":4'	
Ref. Dwgs.	

RECLAMATION PLAN APPENDIX

RECLAMATION PLAN AND BOND ESTIMATE

TABLE OF CONTENTS

Mineral 1 Reclamation Plan

BAF 10/27/86 RPI

...E RECLAMATION OF THE SUMMIT MINERALS, INC No. 1 COAL ...INE IS BASED ON A TOTAL OF 14.41 DISTURBED ACRES. ... ...OSE DISTURBED ACRES, 1.77 ACRES WILL BE LEFT TO SUPPORT THE ...ST MINIMAL GRAZE USE. THE REMAINING 12.64 ACRES ...ILL BE RECLAIMED ACCORDING TO THIS PLAN.

Revised April 20, 1987

CROSS SECTIONS SHOWING EXISTING AND RECLAIMED SURFACES ...RE SHOWN ON PLATE No. 784.243 AND REFERENCED ON PLATE Nos. ...4.23-1: 784.232. THE CUT-FILL BALANCE DEVELOPED PERSUANT TO ...ESE CROSS SECTIONS IS SHOWN ON PAGE 7 OF THE APPENDIX. ...OME 25,300 CUY OF MATERIAL WILL BE MOVED TO ACHIEVE THE ...INAL RECLAIMED CONFIGURATION SHOWN ON PLATE No. 784.23-2

THE SURFACE OWNERS HAVE INDICATED THAT THEY WISH TO HAVE ALL SITE IMPROVEMENTS SUCH AS BUILDINGS, THE BRIDGE ...VER CHALK CREEK, THE CULVERT (IRRIGATION DITCH ONLY), AND THE ACCESS ROAD LEFT IN PLACE FOLLOWING RECLAMATION TO SUPPORT THE LAND USE OF GRAZING. THE BUILDINGS WILL BE USED TO ...UPPORT RANCHING OPERATIONS AND THE ACCESS ROAD AND ...RIDGE PROVIDE SITE ACCESS.

...ACKFILLING AND GRADING WILL BE ACCOMPLISHED USING A ...TERPILLAR D9L BULLDOZER. THE CONCRETE TIPPLE STRUCTURE IS THE ONLY SIGNIFICANT STRUCTURE WHICH IS RECLAIMED UNDER THIS PLAN. BECAUSE THIS STRUCTURE WAS ARRANGED AS A COAL LOADING FACILITY AT ONE TIME, SOME COAL AND/OR ...OAL BEARING MATERIAL HAS SPILLED IN THE VICINITY OF THE ...IPPLE. THERE IS NO REASON TO BELIEVE THAT THE EXTENT OF THE COAL MATERIAL IS GREATER THAN SURFACE SPILLAGE.

UNDER THIS PLAN, THE TIPPLE STRUCTURE WILL BE BROKEN UP AND BACKFILLED. DURING SITE GRADING ANY COAL (BLACK) MATERIAL EXPOSED WILL BE BACKFILLED WITH THE CONCRETE, PRIMARILY IN THE EXISTING DEPRESSION SHOWN ON CROSS SECTION B-B' (PLATE 784.23-3). CONCRETE, COAL, AND ASPHALT WILL BE PLACED, THEN FILL MATERIAL PLACED ON TOP OF IT TO A MINIMUM THICKNESS OF FOUR FEET. BECAUSE FILL WILL BE PLACED WITH THE D9L, LIFTS WILL BE MINIMAL, AND SUCCESSIVE DOZING WILL COMPACT FILL MATERIAL INTO THE VOIDS CREATED BY BROKEN CONCRETE AND ASPHALT.

SHOULD THE EXTENT OF COAL MATERIAL IN THE TIPPLE AREA BE GREATER THAN ANTICIPATED, IT WILL STILL BE DISPOSED OF IN THE MANNER PREVIOUSLY DESCRIBED. CUT-FILL VOLUMES WILL INCREASE, BUT DUE TO THE CONSERVATIVE ASSUMPTIONS MADE IN THE BACKFILLING AND GRADING BOND ESTIMATE, THE TOTAL BOND AMOUNT OF $106,312 SHOULD BE ADEQUATE TO COVER THE UNANTICIPATED VOLUMES.

REVISION 1 - 12/19/86

THE HIGHWALL WHICH TRAVERSES MUCH OF THE SOUTHERN EXTENT OF THE DISTURBED AREA WILL NOT BE REGRADED. AS SHOWN ON PLATE NO. 784.23-2, THE TOE OF THE HIGHWALL WILL BE GRADED TO PROVIDE A UNIFORM CONTACT BETWEEN THE STEEP UNDISTURBED SLOPES AND THE MODERATE RECLAIMED SLOPES.

FIGURE RP-1 SHOWS THE SOUTHWESTERN END OF THE HIGHWALL. JUDGING BY THE APPARENTLY UNDISTURBED VEGETATION STAND ABOVE THE HIGHWALL, THIS HIGHWALL MAY BE A NATURALLY OCCURRING FEATURE.

FIGURE RP-1 : SOUTHWESTERN END OF HIGHWALL, LOOKING SOUTHWEST

FIGURE RP2 SHOWS THE SOUTHEASTERN EXTENT OF THE HIGHWALL. THE PHYSICAL GAP BETWEEN THE LEFT SIDE OF FIGURE RP-1 AND THE RIGHT SIDE OF FIGURE RP-2 IS APPROXIMATELY 30-40 FEET. THERE IS OBVIOUSLY SOIL DISTURBANCE ABOVE THIS HIGHWALL, BUT VOLENTEER VEGETATION IS FAIRLY WELL ESTABLISHED.

BEDDING PLANES IN THIS AREA DIP WESTERLY AT APPROXIMATELY 17° (783.14-4), AND THIS HIGHWALL TRENDS NW-SE. AS SUCH, THE SOIL-ROCK CONTACT ZONE IS DIPPING INTO THE MOUNTAINSIDE, LENDING STABILITY TO THE CONTACT. THIS

CONTACT IS WELL SHOWN IN FIGURE RP-2

FIGURE RP-2 : SOUTHEASTERN END OF HIGHWALL, LOOKING SOUTH

BY COMPARING THE UNDISTURBED SOIL CONTACT IN FIGURE RP-1 TO THE DISTURBED CONTACT IN FIGURE RP-2, SURFACE SLOPES OF THE DISTURBED CONTACT DO NOT APPEAR EXCESSIVE. UNDER THIS PLAN THE DISTURBED CONTACT ZONE WILL BE REVEGETATED ACCORDING TO THE PLAN FOR SLOPES GREATER THAN 15% (ALL WORK IS DONE BY HAND). REVEGETATION HANDWORK CAN BE ACCOMPLISHED WITHOUT DESTROYING THE EXISTING STAND OF VEGETATION. AFTER FERTILIZER, SEED, MULCH, NETTING AND TRANSPLANTS ARE IN PLACE, THE SOIL IN THIS CONTACT ZONE, WITH THE ADDITIONAL VEGETATIVE COVER, WILL BE AT LEAST AS STABLE (PROBABLY MORE STABLE DUE TO THE LESSER SLOPE) AS THE UNDISTURBED CONTACT SHOWN IN FIGURE

REVEGETATION OF UNACCESSIBLE SLOPES GREATER THAN 15% WILL BE ACCOMPLISHED BY HAND IN ACCORD WITH THE REVEGETATION PLAN. THE DISTURBED UP-SLOPES OF THE SAND AND GRAVEL EXCAVATION (THE SOUTHERNMOST PORTION OF THE DISTURBED AREA) WILL BE MANIPULATED BY HAND ONLY. NO FORMAL GRADING IS PROPOSED EXCEPT FOR THE FILL IN THE TOE AREA. THE PRE-DISTURBANCE CONFIGURATION OF THIS AREA WAS AN ALLUVIAL FAN - IE STEEPLY SLOPING

UP-SLOPES, FANNING OUT TO A MORE GRADUAL SLOPE ON THE DOWN-SLOPES. BY LEAVING THE STEEPER UP-SLOPES, AND BACKFILLING THE DOWN-SLOPES TO ABOUT 3H:1V (PLATE No. 784.23-2), THE ORIGINAL CONTOUR IS APPROXIMATED. THE MULCH AND POLYPROPELENE NETTING TO BE USED ON THE STEEPER SLOPES WILL PROVIDE FOR SOIL STABILIZATION UNTIL A STAND OF VEGETATION IS ESTABLISHED.

RECLAMATION SCHEDULE

END SEPTEMBER	WEEK 1	BULLDOZER / BACKFILLING & GRADING 980 LOADER / SED. POND EXCAVATION 913 LOADER / REOPEN PORTAL, SCRAP CUTTING TORCH / SCRAP STEEL JACKHAMMER / CONCRETE DEMOLITION LABORERS (2) / SCRAP, PORTAL SEAL SUPERVISOR (1) / 7 MAN CREW
	WEEK 2	BULLDOZER / BACKFILLING & GRADING 980 LOADER / SED POND EXCAVATION LABORERS (2) / SCARIFY SLOPES >16% SUPERVISOR (1) / 4 MAN CREW
	WEEK 3	BULLDOZER / FINAL GRADING, RIPPING 980 LOADER / SED POND, RIPRAP BACKHOE / DIVERSION DITCHES LABORERS (2) / RIPRAP, FERTILIZE SLOPES SUPERVISOR (1) / 5 MAN CREW
MID OCTOBER	WEEK 4	TRACTOR / DISC, ~~FERTILIZE, SEED, CRIMP~~ ~~HELPER / FERTILIZE, SEED~~ - TRACTOR PICKUP TRUCK / HAYBLOWER HELPER / HAYBLOWER LABORERS (2) / HANDWORK, SEED, MULCH SUPERVISOR (1) / 2-5 MAN CREW
	WEEK 5	LABORERS (2) / HANDWORK, NET SUPERVISOR (1) / 2 MAN CREW
EARLY SPRING	WEEK 6	LABORERS / TRANSPLANT SEEDLINGS SUPERVISOR / CREW AS REQUIRED

NOTE: FLOWS INTO THE SEDIMENTATION POND WILL BE MONITORED UNTIL SUCH TIME THAT THE WATER WILL MEET APPLICABLE STATE AND FEDERAL REQUIREMENTS FOR A RECEIVING STREAM. AT THAT TIME, THE POND AND DIVERSIONS WILL BE RECLAIMED ACCORDING TO THE PLAN (PP. RP-23, 24). VEGETATION WILL BE MONITORED AS DESCRIBED IN THE REVEGETATION APPENDIX CONTAINED IN THIS DOCUMENT.

REVISION 1 - 12/19/86

DISTURBED AREA ACRES (SEE DATE 10.)

C	9.77 Ac		14.41 Ac
3'	3.10 Ac	ACCESS (S)	(0.33 Ac)
POND	0.29 Ac	ACCESS (N.)	(0.93 Ac)
ACCESS (S OF EVILDGE)	0.33 Ac	ACCESS TO PAD AREA	(0.33 Ac)
ACCESS (N. OF EVILDGE)	0.93 Ac	BLDGS	(0.24 Ac)

TOTAL DISTURBED = 14.41 Ac. TOTAL TO RECLAIM = 12.64 AC

OF 12.64 ACRES: 3.61 ACRES > 15% SLOPES

9.03 ACRES < 15% SLOPES

AREA OF BUILDINGS:

So. BLDG	120 X 35	4200
	30 X 20 X 2	1200
	35 X 20	700
No. BLDG	135 X 25	3375
	15 X 20	300
	20 X 25	500
SM. BLDG	10 X 15	150

10,425 ≅ 0.24 AC

AREA OF ACCESS ROAD ON PAD AREA:

ACCESS ROAD	420 X 16	6720
HEADING EAST	250 X 10	2500
HEADING WEST	300 X 10	3000

12,220 ≅ 0.28 AC

MATERIAL BALANCE

SECTION	CUT					FILL		
	AREA (SQIN)	ADJ (FT)[1]	BANK VOL (CY)	LOOSE VOL (CY)[3]	PLACED VOL (CY)[3]	AREA (SQIN)	ADJ (FT)[2]	PLACED VOL (CY)
A-A'	2.41/5	80	3570	4463	3927	0.43/5	70	557
B-B'	5.15/5	80	7630	9538	8393	6.07/5	90	10117
C-C'	1.70/5	130	4093	5116	4502	0.78/5	120	1733
D-D'	—	—	—	—	—	2.26/5	85	3557
E-E'	—	—	—	—	—	0.61/5	95	1073
ASPHALT	30'X50'X1/12'		5	7	7			
CONCRETE	60'X50'X4'		444	622	622			
X-X'						0.19/5	50	176

TOTAL VOLUME = 17,450 PCY TOTAL VOLUME = 17,213 PCY

CLOSE ENOUGH...

(1) SECTION Y-Y', PLATE , THIS DOCUMENT

(2) SECTION Z-Z', PLATE , THIS DOCUMENT

NOTE: SED. POND EVALUATED SEPARATELY, PAGE .

(3) SURFACE MINING, E. P. PFLEIDER, ED., 1968, TABLE 8.3-1, p 466.

SUMMIT MINERALS, INC BACKFILLING & GRADING BAF 10/3/86 RP-7

SEDIMENTATION POND

EXCAVATION REQUIRED = 9764 BCY (SEE PLATE NO. 784.23-3)

9764 BCY = 12205 LCY (3) = 10740 PCY (3)

ADJACENT SPOIL PILE = 5208 PCY (SEE PLATE NO 784.23-3)

5208 PCY = 5918 LCY (3) 5532 PCY = 6257 LCY (3)

EXCESS SPOIL = 5532 PCY

EXCESS SPOIL WILL BE PLACED AT THE TOE OF THE GRAVEL PIT AND GRADED AT A 3:1 SLOPE. THIS WILL PROVIDE ADDITIONAL STABILIZATION OF THE PIT SLOPE, AS WELL AS APPROXIMATING THE CONTOUR OF THE ORIGINAL ALLUVIAL FAN.

EXISTING SLOPES ARE APPROXIMATELY 61.1% AND REGRADED SLOPES WILL BE APPROXIMATELY 5.6% (SEE 3.3 HYDROLOGIC EVALUATION). BACKFILL WILL BE PLACED AT A 3:1 SLOPE. THE SPAN OF THE FILL WILL BE ABOUT 80 FEET, SO:

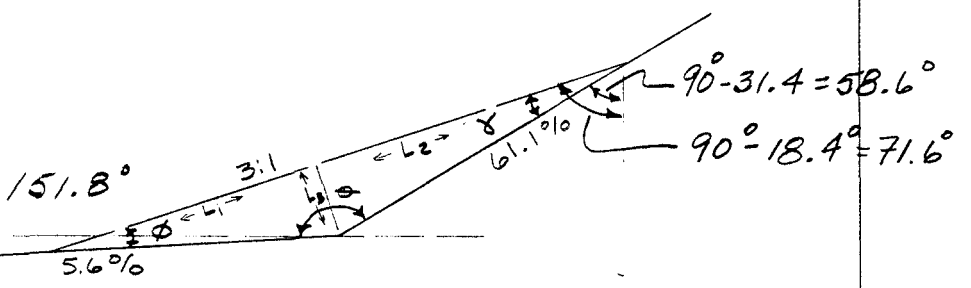
$\tan^{-1}(0.611) = 31.4°$

$\tan^{-1}(0.056) = 3.2°$

$\theta = 180° - 31.4° - 3.2° = 151.8°$

$\gamma = 71.6° - 58.6° = 13.0°$

$\phi = 180° - 151.8° - 13.0° = 15.2°$



$$5532 = \frac{(L_1 L_3/2 + L_2 L_3/2)80}{27}$$

$L_1 = L_3/\tan\phi = 3.68 L_3 \quad L_2 = L_3/\tan\gamma = 4.33 L_3$

$5532(27) = 40(3.68)L_3^2 + 40(4.33)L_3^2$

$L_3 = 21.6$ FT $\Rightarrow L_1 = 79.5$ FT $\Rightarrow L_2 = 93.5$ FT

HORIZ EXTENT = $173 \cos(\tan^{-1}(1/3)) = 164$ FT

(AS PLOTTED ON PLATE 784.23-4)

RECLAMATION EQUIPMENT

1 CATERPILLAR D9L BULLDOZER W/ 3 SHANK REAR RIPPER

1 CATERPILLAR 980 WHEEL LOADER

1 EIMCO 913 PERMISSABLE - DIESEL - WHEEL LOADER

1 JACK HAMMER

1 ACETYLENE TORCH

1 48 HP BACKHOE

EARTHMOVING REQUIREMENT - BULLDOZER

FROM CUT - FILL BALANCE	19117	CY (LOOSE)
ADDITIONAL FROM SED. POND	5532	CY (LOOSE)
CONCRETE & ASPHALT	629	CY (LOOSE)
	25278	CY (LOOSE)

AVG HAUL DISTANCE $\cong$ 400 FT (SEE CROSS-SECTIONS, PLATE)

THE FOLLOWING ASSUMPTIONS ARE BASED ON THE METHODS DESCRIBED IN "CATERPILLAR PERFORMANCE HANDBOOK", EDITION 8, CATERPILLAR TRACTOR CO, PEORIA IL, OCTOBER 1977.

ESTIMATED DOZING PRODUCTION = 430 LCY/HR

JOB CONDITION CORRECTION FACTORS:

- AVERAGE OPERATOR 0.75
- MATERIAL SHOULD BE EASILY DOZED 1.00
- EFFICIENCY - 50 MIN/HR 0.84
- GRADE - 5.6% UPHILL 0.92

NOTE - "SURFACE MINING", PFLEIDER, ED; 1968, TABLE 8.3-1, MATERIAL WEIGHT OF MOIST LOAM ≅ 2080 - 2250 LB/LCY - LOOSE. CAT CURVES ASSUME A LOOSE DENSITY OF 2300 LB/CY. NO DENSITY CORRECTION WILL BE USED.

PRODUCTION CORRECTION: $(430\ LCY/HR)(0.75)(0.84)(0.92) = 249\ LCY/HR$

$$\frac{25{,}278\ LCY}{(249\ LCY/HR)(8\ HR/DA)} = 12.7\ DA$$

TO INCLUDE RIPPING TIME,

USE: 3 WEEKS - BULLDOZER REQUIREMENT

SEDIMENTATION POND EXCAVATION - 980 LOADER

VOLUME TO BE PLACED IN ADJACENT SPOIL PILE = 5918 LCY

VOLUME TO BE PLACED AT TOE OF GRAVEL PIT = 6287 LCY

AVG. HAUL DISTANCE TO ADJACENT SPOIL PILE ≅ 300 FT

AVG. HAUL DISTANCE TO TOE OF GRAVEL PIT ≅ 800 FT

USE: 6000 LCY AT 300 FT

USE: 6300 LCY AT 800 FT

THE FOLLOWING ASSUMPTIONS ARE BASED ON THE METHODS DESCRIBED IN "CATERPILLAR PERFORMANCE HANDBOOK", EDITION 8, CATERPILLAR TRACTOR CO., PEORIA IL. OCTOBER 1977.

BASIC CYCLE TIME	0.40 MIN
BANK MATERIAL	0.04
INCONSISTENT OPERATION	0.04

TOTAL MANEUVER, LOAD, DUMP TIME = 0.48 MIN

HAUL DISTANCE = 300 FT AT APPROX. 8% GRADE
(DESIGN GRADE OF ROADWAY OUT OF SED. POND)

LOADED (8% GRADE)	0.38 MIN
EMPTY (USE MIN. CURVE)	0.27

TOTAL HAUL TIME TO SPOIL PILE = 0.65 MIN

HAUL DISTANCE = 800 FT AT APPROX. 6% GRADE
(DESIGN GRADE OF ROADWAY OUT OF SED POND = 8%;
RECLAIMED SURFACE APPROX. GRADE = 5.6%)

LOADED (6% GRADE)	0.77 MIN
EMPTY (USE MIN. CURVE)	0.53

TOTAL HAUL TIME TO BASE OF PIT = 1.30 MIN

USE: CYCLE TIME (300 FT) = 1.13 MIN

USE: CYCLE TIME (800 FT) = 1.78 MIN

EFFICIENCY FACTORS:

BUCKET FILL	0.95
AVG. OPERATOR	0.75
50 MIN. HRS.	0.83

USE 5.5 CY BUCKET

TIME REQUIRED :

$$\frac{(5.5\ LCY/CYC)(0.75)(8\ HR/DA)(0.83)(60\ MIN/HR)(0.75)}{1.13\ MIN/CYC}$$

$$= 1,382\ LCY/DA$$

$$\frac{6000\ LCY}{1,382\ LCY/DA} = 4.4\ DA$$

$$\frac{(5.5\ LCY/CYC)(0.95)(8\ HR/DA)(0.83)(60\ MIN/HR)(0.75)}{1.78\ MIN/CYC}$$

$$= 877\ LCY/DA$$

$$\frac{6300\ LCY}{877\ LCY/DA} = 7.2\ DA$$

INCLUDE TIME FOR RIPRAP PLACEMENT,

USE 3 WEEKS - 980 LOADER REQUIREMENT

DIVERSION DITCH EXCAVATION - 48 HP BACKHOE

DITCH NO.	LENGTH	VOL. OF EXC.	TOTAL VOL.
No.1	928	3CF/F	103 CY
No.2	1075	4CF/F	159 CY
No.3	380	3CF/F	42 CY
No.4	655	3CF/F	73 CY /377

1986 MEANS : 48 HP BACKHOE FOR DRAINAGE DITCH EXCAVATION - PRODUCTIVITY = 90 CY/DA ⇒ 4.2 DA

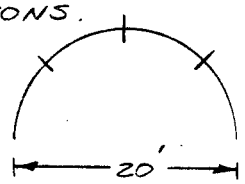
USE 1 WEEK - BACKHOE REQUIREMENT

SCRAP STEEL DISPOSAL - PERMISSIBLE LOADER

AN EIMCO 913 DIESEL POWERED PERMISSIBLE WHEEL LOADER WILL BE USED FOR SCRAP STEEL DISPOSAL. ALL SCRAP STEEL AND MISCELLANEOUS DEBRIS WILL BE PUT INSIDE THE REOPENED MINE PORTAL PRIOR TO ITS PERMENANT CLOSURE (SEE DESCRIPTION IN PART 784.13 OF THIS DOCUMENT). ALL STEEL WILL BE CUT TO MANEUVERABLE SIZES (NOMINAL 5'X8' SECTIONS), LOADED INTO THE BUCKET, AND TRANSPORTED DIRECTLY INSIDE THE MINE PORTAL.

AMOUNT OF CUTTING REQUIRED:

APPROX. 4 STEEL ARCHES
ASSUME EACH IS 20 FT DIA, 35FT LONG
CUT LENGTHWISE INTO 4 SECTIONS.



L-CUTS - 35(3) = 105 LF

4(105) = 420 LF

VERTICAL CONVEYORS
ASSUME EACH IS 40FT LONG AND 3 FT DIA.

PROBABLY NO CUTTING REQUIRED

INCLUDING MISC. SCRAP AND CONTINGENCIES,

ASSUME: 1000 LF OF STEEL TO CUT

ASSUME WELDER AND TORCH ON SITE FOR 1-40 HR WEEK

$\frac{1000\ LF}{(40\ HR)(60\ MIN/HR)} = 0.50\ LF/MIN$ OK

VERY CONSERVATIVE!

EIMCO 913 LOADER IS RATED AT APPROX. 100 HP (PER EIMCO MINING MACHINERY INTERNATIONAL - 537 W 600 S, SALT LAKE CITY, UT). FOR COST PURPOSES, IT WILL BE COMPARED WITH A CATERPILLAR 930 WHEEL LOADER, WHICH ALSO HAS A 100 HP RATING.

THE LOADER WILL EASILY BE ABLE TO KEEP UP WITH THE CUTTING UP OF SCRAP STEEL, PRELIMINARY WORK WILL INCLUDE EXCAVATING (REOPENING) MINE PORTAL.

USE: 1 WEEK - LOADER REQUIREMENT

USE: 1 WEEK - ACETYLENE TORCH

IT IS EXPECTED THAT THE CONCRETE AND ASPHALT DEMOLITION CAN BE ACCOMPLISHED WITH THE HEAVY EQUIPMENT ALREADY DISCUSSED. FOR THE PURPOSE OF A PRUDENT ESTIMATE, WE WILL INCLUDE A COST FOR HAVING A JACKHAMMER FOR TWO DAYS...

USE: 2 DAYS - JACKHAMMER

AFTER ALL BACKFILLING AND GRADING IS ACCOMPLISHED, A 3 SHANK REAR RIPPER WILL BE USED ON THE D9U FOR SCARIFYING - SEED BED PREPARATION. IT IS EXPECTED THAT THE SOIL WILL BE EASILY RIPPED AND CAN BE DONE IN ONE OR TWO DAYS. DUE TO THE CONSERVATIVE ESTIMATE OF BULLDOZER TIME REQUIREMENT, THE 3 WEEK VALUE WILL NOT BE CHANGED. THE RIPPER IS ASSUMED ON SITE FOR ONE WEEK.

USE: 1 WEEK - RIPPER REQUIREMENT

SUMMIT MINERALS, INC. RECLAMATION BOND ESTIMATE BAF 10/14/86

BACKFILLING AND GRADING COST (INCL. SOIL SCARIFICATION)

EQUIPMENT	TIME REQ'D	EQ. COST	OP. COST	OPERATOR[1]	TOTAL COST	COMMENTS
DOZER	3 WK	16,455/MO[2]	43.75/HR[2]	238.80/DA	25,287	
RIPPER	1 WK	705/WK[2]	3.00/HR[2]	INCLUDED	825	DOZER OPERATOR
BACKHOE	1 WK	171.60/DA[1]	INCLUDED[1]	238.80/DA	2,052	
TORCH	1 WK	18.00/WK[1]	0.05/HR[1]	272.80/DA	1,384	
J'HAMMER	2 DA	4.81/HR[1]	INCLUDED	22.19/HR	432	
PERM. LOADER	1 WK	1310/WK[2]	9.95/HR[2]	238.80/DA	2,902	
980 LOADER	3 WK	9855/MO[2]	28.40/HR[2]	238.80/DA	16,845	
LABORER[3]	6 WK			184.40/DA	5532	2 LABORERS SLOPES & RIPRAP
FOREMAN	3 WK			207.60/DA	5114	

TOTAL B & G COST = $59,141

PORTAL SEAL MATERIALS[4] = $379

(1) MEANS COST DATA - 1986

(2) RENTAL RATE BLUE BOOK - 1986

(3) TWO GENERAL LABORERS FOR LOADING SCRAP AND MISC. DEBRIS. REOPENING AND BUILDING PERMENANT MINE SEALS WILL ALSO BE ACCOMPLISHED IN THIS TIME. RIPRAP, AVAILABLE ON SITE, WILL BE HAULED TO LOCATIONS ADJACENT TO DIVERSION DITCHES WITH THE 980 LOADER, AND HAND SPREAD IN THE DITCH CHANNELS. SEEDBED PREP. ON SLOPES >15%

CULVERTS AND DECANT

CORRUGATED PRICES PER E. LARSEN ARMCO, 1255 N. 900 W. SALT LAKE CITY, QUOTE 10/22/86:

12"	$ 5.69/FT
18"	8.36/FT
24"	11.07/FT
36"	16.53/FT
18X24 REDUCER	106.00 EA (6' TOTAL LENGTH)
18" 90-ELBOW	40.00 EA

DECANT:

18"	NEED 82 FT @	$8.36/FT	686
24"	NEED 1 FT @	11.07/FT	11
36"	NEED 3 FT @	16.53/FT	50
18X24 REDUCER	NEED 1		106
18X18-90	NEED 1		40
4' (3) ANTI SEEP COLLAR	(ASSUME 20 EA)		60
			953

TOTAL PLUS 10% FABRICATION $1048 DECANT

CULVERT

12"	NEED 140 FT @	$5.69/FT	$797 CULVERT

EXISTING SEDIMENTATION POND RECLAMATION

THE EXISTING SEDIMENTATION POND, CONSTRUCTED BY A PREVIOUS OWNER/OPERATOR, IS LOCATED IN THE [illegible] FLOOD PLAIN. IT APPEARS TO HAVE BEEN MINED, AND THE SOIL MATERIAL USED IN THE IMPOUNDING STRUCTURE. IT DOES NOT APPEAR STRUCTURALLY OR VOLUMETRICALLY ADEQUATE FOR USE AS A SEDIMENTATION POND DURING RECLAMATION ACTIVITIES. THE SPECIFIC PROCESS TO REMOVE THIS POND CONCURRENTLY WITH SITE RECLAMATION IS, ALL THE STEEP BANK SHOWN ON SITE NO. 784.23-1 WILL BE [illegible] AND THE SEDIMENTATION POND SHOWN ON SITE NO. 784.23-2 IS COMPLETED AND DISPOSED).

FIGURE 784.13-1 SHOWS THIS POND IN PLAN AND CROSS SECTION. IT IS EXPECTED THAT THIS STRUCTURE CAN BE BACKFILLED USING THE D7H BULLDOZER IN AN HOUR OR TWO. ALL THAT IS REQUIRED IS TO DOZE THE IMPOUNDING FILL MATERIAL INTO THE EXCISED POND AREA. THIS IS A VERY MINOR JOB.

THE AREA OF THIS DISTURBANCE IS APPROXIMATELY 0.29 ACRES (REF DWG NO. 783.16-1). BECAUSE IT IS LOCATED IN THE FLOOD PLAIN OF CHALK CREEK, NO SEDIMENTATION CONTROL STRUCTURES BEYOND THE EXISTING VEGETATIVE FILTER WILL BE USED. THIS AREA IS INCLUDED IN THE "SMALL AREA EXEMPTION" REQUEST ON PAGE 2-2 OF APPENDIX 784.14. THIS AREA IS INCLUDED AS A DISTURBED AREA SUBJECT TO REVEGETATION UNDER THE PLAN.

IT SHOULD BE NOTED THAT RECLAMATION OF THIS POND WILL INVOLVE BACKFILLING AND GRADING WITHIN THE STREAM BUFFER ZONE.

REVEGETATION EQUIPMENT

FORD 555A FARM TRACTOR WITH DISC, [illegible] DRILL, HAYBLOWER, [illegible]

TIME REQUIREMENT

TRACTOR/FERTILIZER SPREADER

ASSUME SPREAD WIDTH IS 8 FT, TRACTOR AT 4 MPH

$$8\,\text{FT}\ \frac{5280\,\text{FT}}{\text{MI}}\ \frac{4\,\text{MI}}{\text{HR}}\ \frac{1\,\text{AC}}{43560\,\text{FT}^2} = 3.88\ \text{AC/HR}$$

$$\left(\frac{9.03\,\text{AC}}{3.88\,\text{AC/HR}}\right)\left(\frac{50\,\text{MIN}}{60\,\text{MIN}}\right)\left(\frac{\text{DA}}{8\,\text{HR}}\right) = \underline{0.24\,\text{DA}}$$

PICKUP TRUCK/HAYBLOWER - FERTILIZER

ASSUME BLOWER RANGE IS 50 FT. AREA COVERED PER STOP = $\pi(50)^2 \cong 7800$ SF

$$\left(\frac{4000\,\text{LB}}{\text{AC}}\right)\left(\frac{\text{AC}}{43560\,\text{SF}}\right)\left(\frac{7800\,\text{SF}}{\text{STOP}}\right)\left(\frac{\text{BALE}}{65\,\text{LB}}\right) = 11\ \text{BALES/STOP}$$

ASSUME 10 MIN TO BREAK UP 11 BALES AND FEED BLOWER AND MOVE 100 FT

ASSUME 50 MIN HOURS AND 8 HOUR DAY

$$\left(9.03\,\text{AC}\right)\left(\frac{43560\,\text{FT}^2}{\text{AC}}\right)\left(\frac{\text{STOP}}{7800\,\text{FT}^2}\right)\left(\frac{10\,\text{MIN}}{\text{STOP}}\right)\left(\frac{\text{HR}}{50\,\text{MIN}}\right)\left(\frac{\text{DA}}{8\,\text{HR}}\right)$$

$$= \underline{1.26\,\text{DA}}$$

TRACTOR/DISC

ASSUME DISC WIDTH IS 10 FT, TRACTOR AT 4 MPH

$$\left(10\,\text{FT}\right)\left(\frac{5280\,\text{FT}}{\text{MI}}\right)\left(\frac{4\,\text{MI}}{\text{HR}}\right)\left(\frac{1\,\text{AC}}{43560\,\text{FT}^2}\right) = 4.85\ \text{AC/HR}$$

$$\left(\frac{9.03\ AC}{4.85\ AC/HR}\right)\left(\frac{50\ MIN}{60\ MIN/HR}\right)\left(\frac{DA}{3\ HR}\right) = \underline{0.19\ DA}$$

TRACTOR / RANGELAND DRILL

ASSUME DRILL CAPACITY = 10 FT, TRACTOR AT 4 MPH

$$= \underline{0.19\ DA}$$

PICK-UP TRUCK / HAND CREW - MULCH

$$\frac{2000\ LB}{AC}\left(\frac{1\ AC}{43560\ FT^2}\right)\left(\frac{78000\ FT^2}{STAND}\right)\left(\frac{BALE}{65\ LB}\right) = 5.5\ BALES$$

ASSUME 6 MIN TO BREAK UP 5.5 BALES AND FEED EVENLY INTO MULCHER. ALSO 50 MIN USE PER 8 HR DAY.

$$9.03\ AC\left(\frac{43560\ FT^2}{AC}\right)\left(\frac{STAND}{5000\ SQ\ FT}\right)\left(\frac{6\ MIN}{STAND}\right)\left(\frac{HR}{50\ MIN}\right)\left(\frac{DA}{8\ HR}\right)$$

$$= \underline{0.76\ DA}$$

TRACTOR / CRIMPER (DISC)

ASSUME CRIMPER = 10 FT, TRACTOR AT 4 MPH

$$= \underline{0.19\ DA}$$

IT IS ASSUMED THAT PICKUP TRUCKS ARE INCLUDED UNDER THE SUPERINTENDENCE OPERATING COST SINCE SITE ACCESS FOR LABORERS IS INCLUDED IN THIS COST.

TRACTOR REQUIREMENT = 0.81 DA

USE: 2 DA TRACTOR REQUIREMENT

REVEGETATION COST

ITEM	TIME REQ[1]	EQ. COST[2]	OPERATOR[4]	COMMODITY	COMM COST[5]	TOTAL COST
TRACTOR	2 DA	25.48/HR	225.60/DA			859
HELPER[6]	2 DA		184.40/DA			369
HELPER[7]	3 DA		184.40/DA			553
				FERTILIZER	120/AC	1517
				SEED	574.86/AC	7266
				MULCH	50/AC	632
				SEEDLINGS	800/AC	10,112
				CULVERT	797/UNIT[8]	797
				DECANT	1048/UNIT[8]	1048
				POLYP. NET	640/AC[9]	2310
LABORER	4 WK		184.40/DA			3688
SUPERVISOR	2 WK		207.60/DA			2076

TOTAL REVEGETATION COST = $31,227

TOTAL B & G COST = 59,520 (P. RP-15)

RIPRAP = 3,423 (P. RP-25)

TOTAL PHASE I RECLAMATION = $94,170

ADD 10% - ENGINEERING AND MONITORING 9,417

SEDIMENTATION POND & DITCH REMOVAL 2,725 (P. RP-24)

TOTAL RECLAMATION BOND AMOUNT = $106,312

REVISION 1 - 12/19/86

UMC 784.14 RECLAMATION PLAN: PROTECTION OF THE HYDROLOGIC BALANCE

UMC 784.14(a)(1) - Quality of Surface and Ground Water

Underground mining activities or the use of hazardous or toxic materials are not a part of this reclamation plan and therefore ground water cannot be adversely affected.

Surface water quality will be protected by the installation and proper usage of the sedimentation pond shown on plate number 784.23-2. Design information for this pond is included in the Hydrologic Evaluation Appendix of this section. Runoff from the disturbed area is the only potential impact to surface water quality from reclamation activities.

UMC 784.14(a)(2) - Rights of Present Users

Reclamation activities are not expected to impact the rights of present water users. Refer to section 783.17 of this document for a discussion on alternative water supplies.

UMC 784.14(a)(3) - Quantity of Surface and Ground Water

Underground coal mining activities are not a part of this reclamation plan, so there is no potential for a reduction in the quantity of surface or ground water.

UMC 784.14(a)(4) - Location of Mine Openings

Existing mine openings were excavated by a previous owner-/operator and it is unknown to the Applicant what design parameters were used. Relative to the prevailing dip of the coal seam in the abandoned mine workings (reference section 783.14 of this document), the portals are generally up-dip from the workings. There is no visible drainage from the sealed portals, so it is concluded that there is no hydrostatic pressure on the seals (considering the method of portal closure - see section 784.13 of this document).

UMC 784.14(b)(1) - Drainage Control

Underground mining activities or the use of hazardous, toxic, or acid forming materials are not a part of this plan, so there will be no affect on the ground water. The Operator

proposes to neither control nor monitor groundwater activities in or near the reclamation site. Ground water information gained from the SOAP program at the adjacent Boyer mine is pertinant to the reclamation site due to the proximity of the two properties. Ground water quality data obtained from the Earth Fax draft report is included in this document as Table 783.15-2a through Table 783.15-4b.

Surface drainage and runoff control is shown on drawing number 783.16-1 and plate number 784.23-2. These drawings show the coursing of runoff waters into, around, through, and out of the reclamation site. Design criteria for the development of this drawing is presented in the Hydrologic Evaluation Appendix of this section.

UMC 784.14(b)(2) - Treatment of Pollutants

All runoff which traverses a disturbed surface will be treated by some means of sedimentation control. Drawing number 783.16 and plate number 784.23-2 show that the bulk of the runoff from the disturbed area is coursed into the sedimentation pond where it will be detained for at least 24 hours before discharging into Chalk Creek. An NPDES discharge application has been filed with the appropriate agencies for this outfall (Figure 784.13-2). The Operator will sample any discharges from this outfall and analyze the water as required in the NPDES permit - or for total iron, total manganese, total settleable solids, total dissolved solids, total suspended solids, and pH, - whichever is more stringent.

The Operator requests a small area exemption for those portions of the access road which are not located in the drainage area of the sedimentation pond. Anticipated runoff volumes and proposed treatment methods are detailed in Hydrologic Evaluation Appendix in this section. The Operator will sample any outfall from the sedimentation filter when it occurs. The water will be analyzed for total iron, total manganese, total suspended solids, and pH.

UMC 784.14(b)(3) - Collection of Water Data

Ground water monitoring is not a part of this plan.

The Operator will monitor surface water quality at the locations shown on drawing number 783.16-1. Samples will be obtained quarterly until adequate baseline data is obtained, and then twice a year, once during high flow and once during and once during low flow, for the duration of the bond period.

Surface water quality and quantity information gained through the SOAP program for the adjacent Boyer Mine is available and pertinent to the reclamation site due to the close proximity of the two properties. Data obtained from Earth Fax' draft report is included on Tables 783.16-6a through 783.16-7b. Additional quality information is included on Tables 783.16-8 and 9.

Surface water samples will be analyzed for the parameters shown on Table 784.14-1 to establish a baseline, then those shown on Table 784.14-2 after baseline is established. During construction periods, weekly checks of the settleable and suspended solids will be conducted on Chalk Creek both upstream and downstream to demonstrate that the surface activities do not adversely affect the creek quality. Results of these monitoring programs, as well as the NPDES monitoring, will be provided to the Division within 90 days of its receipt by the Operator.

Outfall from the sedimentation pond which is regulated by the NPDES permit will be monitored in accordance with the permit. In the event that discharged water exceeds permit effluent limitations, the Operator will report the noncompliance to the appropriate regulatory authorities in a timely manner.

During the seventh year after reclamation activities, the Applicant will begin sampling surface runoff inflows entering the sedimentation pond to establish compliance with UMC 817.46(u). A single-stage sediment sampler (Guy and Norman, 1970) will be located at each of three diversion ditch outlets into the pond (see plate number 784.23-2). This type sampler will automatically collect a sample during a runoff event by siphoning water from the ditch into the collection bottle. The Applicant will make every effort to monitor the bottles following precipitation events where runoff may occur so that collected samples will not stagnate in the sample bottles.

A composite sample will be obtained from the ditches and analyzed for the parameters indicated on Table 784.14-2 (excluding the field measurements). Should the composite sample technique indicate repeated non-compliance, individual ditch samples will be analyzed to isolate the quality problem areas. This water monitoring program will continue through the remainder of the bond period.

UMC 784.14(c) - Consequences of Mining Activities

Underground mining activities or the use of hazardous,

toxic, or acid forming materials are not a part of this plan. As such, the only probable hydrologic consequence resulting from this reclamation plan is the contribution of untreated sediment to surface waters from the disturbed area. A worst case scenario is presented in section 783.17 of this document. This scenario is assumed from a significant precipitation event (high flow) and would result in additional sediment loading (TSS) in Chalk Creek. Because runoff in this scenario would only course over reclaimed surface disturbances, it not expected to affect iron, manganese, or pH levels.

UMC 784.14(d) - Hydraulic Heads on Mine Openings

Section 784.13 of this document provides a description of the portal sealing methods already used, and to be used, under this plan. Section 783.14 describes the prevailing dip of stata in the reclamation area as westerly, which positions old underground mine workings generally down-dip from the portals.

The underground mine workings of Utah Coal and Energy, Inc. were excavated in the late 1970's. There was no known interception of water in those underground workings and, to date, there has been no known discharge from the sealed mine openings. Similarly, there has been no known interception of water in the underground workings at the adjacent Boyer Mine. It is therefore concluded that there will be no hydraulic head on the abandoned mine openings.

T A B L E 7 8 4 . 1 4 - 1

SURFACE WATER BASELINE QUALITY PARAMETER LIST
Monitoring Frequency: Four Times Per Year

Field Measurements:

Flow (cfs)
pH
Specific Conductivity (umhos/cm)
Temperature (degrees C or F)
Dissolved Oxygen (ppm)

Laboratory Measurements: (mg/l) (Major, minor ions and trace elements will be analyzed in total and dissolved forms)

Total Settleable Solids
Total Suspended Solids
Total Dissolved Solids
Total Hardness (as CaCO3)
Acidity (CaCO3)
Aluminum (Al)
Arsenic (As)
Barium (Ba)
Boron (B)
Carbonate (CO3)
Bicarbonate (HCO3)
Cadmium (Cd)
Calcium (Ca)
Chloride (Cl)
Chromium (Cr)
Copper (Cu)
Fluorine (F)
Iron (Fe)
Lead (Pb)
Magnesium (Mg)
Total Manganese (Mn)
Mercury (Hg)
Molybdenum (Mo)
Nickel (Ni)
Nitrogen (NO3)
Nitrate (NO2)
Nitrite (NO3)
Potassium (K)
Phosphate (PO4)
Selenium (Se)
Sodium (Na)
Sulfate (SO4)
Sulfide (S)
Zinc (Zn)
Oil and Grease
Cation - Anion Balance

T A B L E 7 8 4 . 1 4 - 2

SURFACE WATER POSTMINING QUALITY PARAMETER LIST
Monitoring Frequency: Two Times Per Year

Field Measurements:

- Flow (cfs)
- pH
- Specific Conductivity (umhos/cm)
- Temperature (degrees C or F)
- Dissolved Oxygen (ppm)

Laboratory Measurements: (mg/l) (Major, minor ions and trace elements will be analyzed in total and dissolved forms)

- Total Settleable Solids
- Total Suspended Solids
- Total Dissolved Solids
- Total Hardness (as CaCO3)
- Acidity (CaCO3)
- Carbonate (CO3)
- Bicarbonate (HCO3)
- Calcium (Ca)
- Chloride (Cl)
- Iron (Fe)
- Magnesium (Mg)
- Total Manganese (Mn)
- Potassium (K)
- Sodium (Na)
- Sulfate (SO4)
- Oil and Grease
- Cation - Anion Balance

H Y D R O L O G Y A P P E N D I X

HYDROLOGIC EVALUATION

TABLE OF CONTENTS

GENERAL

THE DISTURBED AREA AT THE SUMMIT No. 1 COAL MINE IS APPROXIMATELY FOURTEEN ACRES. THE AREA WAS DISTURBED BY PREVIOUS COAL OPERATIONS MANY YEARS AGO. DISTURBED SURFACES APPEAR TO BE STABILIZED, WITH LITTLE EVIDENCE OF EROSION FROM THE PAD AREA.

EXCAVATION OF SAND AND GRAVEL IN THE AREA SOUTHEAST OF THE PAD AREA IS THE ONLY KNOWN ADDITIONAL SURFACE DISTURBANCE SINCE 1977. THERE IS EVIDENCE OF SOME EROSION FROM THE CUT SLOPES OF THE SAND AND GRAVEL OPERATION. TEMPORARY SEDIMENTATION PONDS ALREADY IN PLACE PROTECT RECEIVING WATERS FROM SEDIMENT CONTRIBUTIONS BY SURFACE RUNOFF FROM THE DISTURBED AREA.

THIS PLAN DOES NOT INCLUDE PROVISIONS FOR ADDITIONAL SURFACE DISTURBANCES. IT DOES NOT INCLUDE PROVISIONS FOR SUBSURFACE EXCAVATION OR MINING ACTIVITIES. IT DOES NOT INCLUDE PROVISIONS FOR THE USE OF HAZARDOUS, TOXIC, OR ACID FORMING MATERIALS. IMPACTS ON THE HYDROLOGIC REGIME FROM THIS DISTURBANCE HAVE ALREADY BEEN REALIZED, AND THE PROPOSALS CONTAINED IN THIS DOCUMENT CANNOT AFFECT GROUND-WATER IN ANY WAY, OR SURFACE WATER QUANTITIES. THIS SECTION ADDRESSES HYDROLOGIC EVALUATIONS PREPARED PERSUANT TO THE PROTECTION OF SURFACE WATER QUALITY.

THE SEDIMENTATION POND AND DIVERSION DITCHES ARE DESIGNED FOR A 10 YEAR - 24 HOUR PRECIPITATION EVENT. METHODOLOGIES FOR EACH EVALUATION ARE INCLUDED DIRECTLY OR AS FOOTNOTES THROUGHOUT THIS APPENDIX.

CURVE NUMBER DEVELOPMENT

UNDISTURBED AREAS

- % COVER = 42.5 % (DISREGARDING ROCK, LITTER.)(1)
- SOIL GROUP = TOEHEAD, HORROCKS ⇒ USE C (2)
- VEGETATION TYPE = MOUNTAIN SAGE & OAK (1)

USE CN = 68 (3)

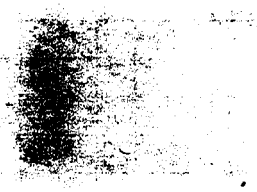
DISTURBED AREAS

USE CN = 90 (3)

DESIGN STORM INTENSITIES

RETURN	DURATION	INCHES
10 YEAR	24 HOUR	1.90 ✓
25 YEAR	24 HOUR	2.38 ✓
100 YEAR	24 HOUR	3.02 ✓

ESTIMATED RETURN PERIODS FOR SHORT DURATION PRECIPITATION IN UTAH - STATION: ECHO DAM, p. 22



(1) VEGETATION SURVEY AT THE SUMMIT NO. 1 COAL MINE, MARY M. BOUCEK, SEPT. 1986. SEE APPENDIX OF THIS DOCUMENT.

(2) PLATE 783-11 OF THIS DOCUMENT; SCS - NEH, NOTICE 4-102, TABLE 7-1, 1972

(3) RANGELAND HYDROLOGY, F.A. BRANDSON, G.F. GIFFORD, K.G. RENARD, R.F. HADLEY, SOCIETY OF RANGE MANAGEMENT - RANGE SCIENCE SERIES NO. 1, 1981.

DRAINAGE AREA CHARACTERISTICS

WATER-SHED (4)	AREA (AC) (4)	SUM OF (4) CONTOURS (FT)	CONTOUR INTERVAL (4) (FT)	HYDRAULIC LENGTH (FT) (4)	PERCENT SLOPE	COMMENTS
A	5.42			725		UNDISTURBED
B	10.73	4230	50	1726	45.3 (5)	UNDISTURBED
C	9.77			1305	5.6 (6)	PAD ONLY
C'	3.10			235		DISTURBED HIGHWALL
A+C'	8.52	4534	50	960	61.1 (5)	STEEP SLOPE AREA
A+C+C'	18.29			1764	32 (7)	TOTAL DRAINAGE

SMALL AREA EXEMPTIONS (SEE PAGE 21 OF THIS APPENDIX)

ROAD - SOUTH OF BRIDGE

AREA = 0.61 AC (4)

SLOPE = 3.3% (AVG. SLOPE OF ROADWAY)

ROAD - NORTH OF BRIDGE

AREA = 0.93 AC (4)

SLOPE = 3.6 % (AVG. SLOPE OF ROADWAY)

(4) PLATE ? OF THIS DOCUMENT.

(5) % SLOPE = $\frac{(\Sigma \text{CONTOURS})(\text{CONTOUR INTERVAL})}{\text{AREA}} \times 100$

(6) SLOPE CALCULATION IN REF. (5) GIVES ERRONEOUS RESULTS ON FLAT SLOPES - USE MAXIMUM SLOPE OF AN HYDRAULIC LENGTH

(7) WEIGHTED SLOPE = $\left(\frac{8.52A}{18.29A}\right)61.1 + \left(\frac{9.77A}{18.29A}\right)5.6 = 31.44 \Rightarrow$ USE 32%

PEAK FLOW EVALUATION

PEAK FLOWS FOR WATERSHEDS ARE EVALUATED BELOW. FLOWS ENTERING THE SEDIMENTATION POND (W.S. - A, C, AND C') ARE EVALUATED BY TWO METHODS:

- A+C+C' ASSUMES THAT THE ENTIRE WATERSHED WILL PEAK AS A SINGLE HYDROLOGIC UNIT.
- A+C' AND C ASSUMES THAT THE STEEP WATERSHED AND THE FLATTER WATERSHED WILL PEAK AS TWO SEPARATE, ADDITIVE HYDROLOGIC UNITS.

RESULTS OF BOTH METHODS ARE VERY CLOSE, LENDING CREDIBILITY TO THE EVALUATION. THE ADDITIVE METHOD (A+C' AND C) APPEARS TO BE THE MORE CONSERVATIVE, AND WILL BE USED IN SUBSEQUENT DESIGN PARAMETERS.

WATERSHED (4)	AREA AC (FT) (4)	HYD. (4) LENGTH (FT)	PERCENT SLOPE	CURVE NO.	TIME OF CONC (HR)	$Q_{10\text{-}24}$ PEAK (8) (CFS @ HRS)	$Q_{25\text{-}24}$ PEAK (8) (CFS @ HRS)
B	10.73	1726	45.3 (5)	68	0.1714 (8)	1.10 @ 12.59	3.13 @ 12.57
A+C+C'	18.29	1764	32 (7)	84 (9)	0.1294 (8)	12.75 @ 12.52	19.11 @ 12.52
A+C'	8.52	960	61.1 (5)	76 (9)	0.0739 (8)	3.38 @ 12.51	5.85 @ 12.50
C	9.77	1306	5.6 (6)	90	0.178 (10)	9.59 @ 12.53	13.31 @ 12.53

$Q_{10\text{-}24}^{PEAK} = 12.97$ $\qquad$ $Q_{25\text{-}24}^{PEAK} = 19.16$ cfs

(8) METHODOLOGY DESCRIBED IN SCS - NEH, NOTICE 4-102, CHAPTERS 15 AND 16, AUGUST 1972.

(9) WEIGHTED CURVE NUMBER:

$\left(\frac{5.42\,A}{18.29\,A}\right) 68 + \left(\frac{12.87\,A}{18.29A}\right) 90 = 83.48$; USE 84; $\left(\frac{5.42A}{8.52A}\right) 68 + \left(\frac{3.10A}{8.52A}\right) 90 = 76.00$ USE 76

(10) FLOOD STUDIES IN DESIGN OF SMALL DAMS, D.L. MILLER, R.A. CLARK, S. SCHAMACH, USDI, BUREAU OF RECLAMATION, 1974, p. 67, KIRPITCH'S FORMULA $T_c = \left(\frac{11.9\,L^3}{H}\right)^{0.385}$, T_c IN HRS, L IN MI, H IN FT.

RUNOFF EVALUATION

DIRECT RUNOFF INTO THE SEDIMENTATION POND IS ESTIMATED USING A WEIGHTED CURVE NUMBER, WEIGHTED AREA, AND A COMBINATION OF BOTH. THE THREE METHODS ARE:

- A+C+C' ASSUMES ENTIRE WATERSHED ACTS AS SINGLE HYDROLOGIC UNIT
- A+C' AND C ASSUMES A STEEP AND A FLATTER WATERSHED ACT AS TWO ADDITIVE HYDROLOGIC UNITS
- A AND C+C' ASSUMES A DISTURBED AND UNDISTURBED WATERSHED ACT AS TWO ADDITIVE HYDROLOGIC UNITS.

WATER SHED (4)	AREA (AC) (4)	CURVE NUMBER	S ($S = 1000/CN - 10$)	Q_{10-24} (IN) (11)	VOLUME (CU FT)	POND REQT. (CU FT)
A+C+C'	18.29	84 (9)	1.90	0.676	44881	44881
A+C'	8.52	76 (9)	3.16	0.363	11227	47023
C	9.77	90	1.11	1.009	35796	
A	5.42	~~68~~ 40	4.70	0.163	3207	50361
C+C'	12.87	90	1.11	1.009	47154	

USE: 50,361 CF

(11) METHODOLOGY DESCRIBED IN SCS-NEH, NOTICE 4-102, CHAPTER 10, AUGUST 1972, EQNS 10.10 AND 10.12.

SOIL LOSS EVALUATION

SOIL LOSS IS CALCULATED USING THE METHODOLOGY DESCRIBED IN "APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS" B.J. BARFIELD, R.C. WARNER, CT HAAN, CHAPTER 5, 1981, FOR THE UNIVERSAL SOIL LOSS EQUATION. FOOTNOTES CITED ARE FOUND IN THIS REFERENCE.

WATER SHED (4)	AREA (AC) (4)	R (12)	K (13)	LS (14)	CP	TONS PER YR.
A	5.42	20	0.15	63.5 (17)	0.004 (15)	4.13
C+C'	12.87	20	0.20	9.0 (17)	1.0 (16)	463.32

TOTAL = 467.45 TON/YR

DESIGN LOSS: $\frac{(467.45\ T/YR)(3\ YR)(2000\ LB/T)}{100\ LB/FT^3}$ (18) = 28047 CU FT

$\frac{28047\ CU\ FT}{(43560\ CF/AC)(12.87\ AC)} = 0.050$ A-F/AC $\frac{oh}{817.46(6)(2)}$ FOR

USE: 28,047 CF

(12) FIG. 5.3 $R \tilde{=} 30$; $R = 27 P_{2,6}^{2.2}$ WHERE $P_{2,6} \tilde{=} 0.85$ (FIG 5.4) $\tilde{=} 19$
USE **R=20**

(13) PER TIM WATSON, SCS - COALVILLE UTAH, FOR MOUNTAIN GRAVELLY LOAM AT SUMMIT NO. 1 COAL MINE SITE. VALUE IS INCREASED BY ___ % FOR DISTURBED AREAS.

(14) $LS = \left(\frac{\lambda}{72.6}\right)^m \left(\frac{430\chi^2 + 30\chi + 0.43}{6.613}\right)$ WHERE λ = HYD. LENGTH (FT)
$m = 0.5$ ($S > 5\%$ ALWAYS)
χ = SIN (ANGLE OF SLOPE (DEG))

(15) TABLE 5.A.4 FOR 42.5% CANOPY AND 85% LITTER

(16) TABLE 5.A.1 FOR BARE SOIL (CONSERVATIVE)

(17) $\lambda_A = 725$, $\chi_A = SIN(TAN^{-1}\frac{61.1}{100})$; $\lambda_{C-C'} \tilde{=} 1039$, $\chi_{C-C'} = SIN(TAN^{-1}(\frac{6420-6255}{1039}))$
↑ SLOPE OF $\lambda_{C-C'}$

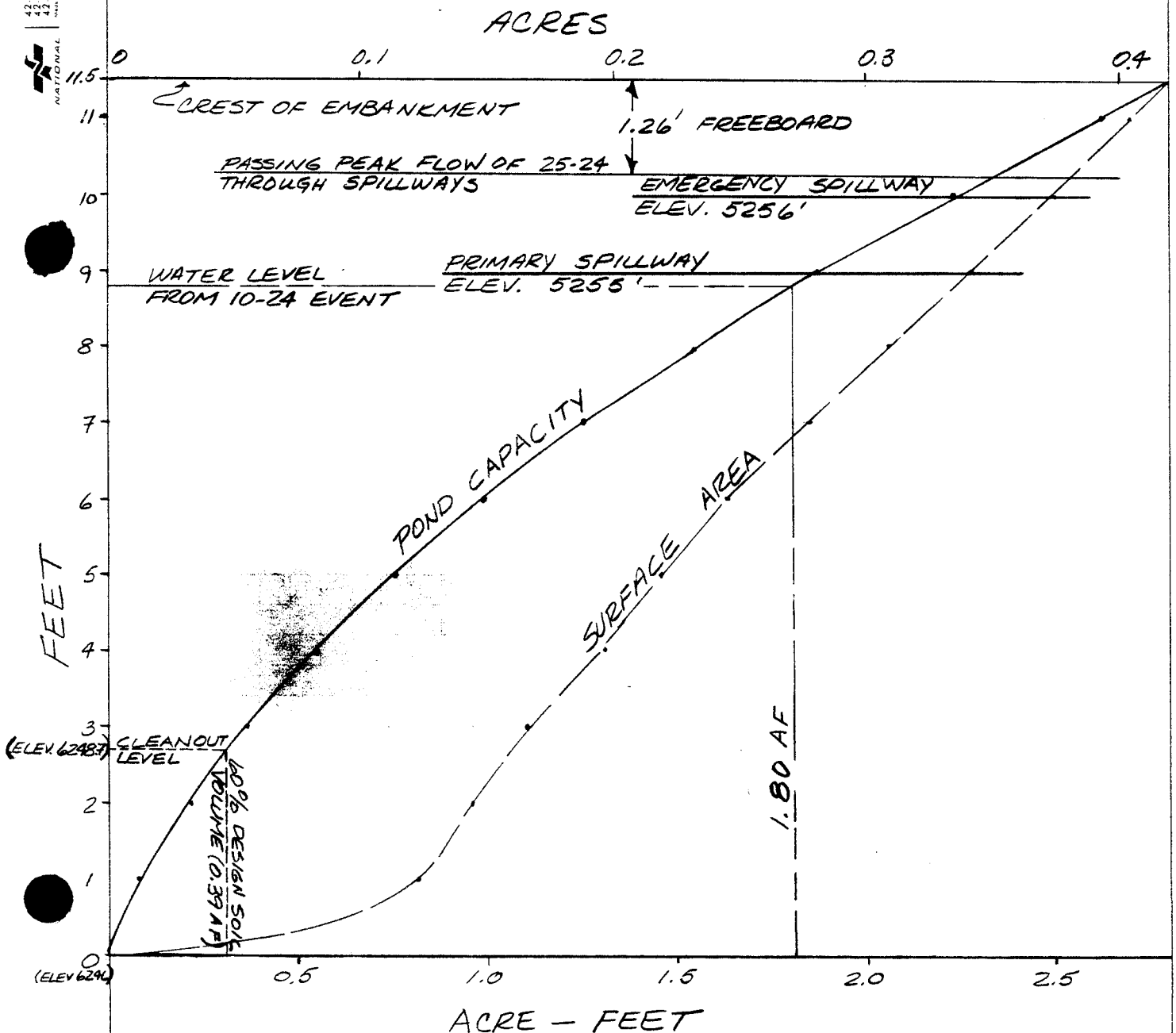
SEDIMENTATION POND ADEQUACY

RUNOFF REQUIREMENT = 50,361 CF = 1.16 AF

SOIL LOSS REQUIREMENT = 28,047 CF = 0.64 AF

TOTAL REQUIREMENT = 78,906 CF = 1.80 AF

AREA - CAPACITY CURVE (REF. PLATE 784.23-2)



OVERFLOW AND DEWATERING STRUCTURES

THE SEDIMENTATION POND WILL BE EQUIPPED WITH A DEWATERING SYSTEM, A PRIMARY SPILLWAY, AND AN EMERGENCY SPILLWAY.

THE PRIMARY SPILLWAY AND DEWATERING SYSTEM ARE SHOWN ON PAGE ___ OF THIS SECTION. THE SPILLWAY CONSISTS OF A TWO FOOT DIAMETER DROP INLET CORRUGATED STEEL CULVERT. THE DEWATERING DEVICE CONSISTS OF A TWO INCH STEEL-THREADED NIPPLE WELDED TO THE STAND PIPE. A TWO INCH GATE VALVE WILL BE PLACED IN THE CLOSED POSITION ON THE NIPPLE. A LONG VALVE STEM WILL BE STABILIZED INSIDE STEEL CONDUIT AND EXTENDED TO THE TOP OF THE RISER. A GRATED STEEL WALKWAY FROM THE EMBANKMENT TO THE TOP OF THE RISER WILL PROVIDE ACCESS FOR DEWATERING PURPOSES. THE VALVE HANDLE WILL BE LOCKED OR REMOVED AT ALL TIMES WHEN DEWATERING IS NOT REQUIRED TO MINIMIZE TAMPERING BY UNAUTHORIZED PERSONS.

THE EMERGENCY SPILLWAY IS A TRAPEZOIDAL-SHAPED OPEN CHANNEL DITCH. A COMBINATION OF THE PRIMARY AND EMERGENCY SPILLWAYS WILL ACEQUATELY PASS THE PEAK FLOW FROM A 25 YEAR - 24 HOUR EVENT WHILE MAINTAINING APPROXIMATELY 1.25 FT OF FREEBOARD.

THE METHODOLOGY USED IN EVALUATING THESE DEWATERING STRUCTURES IS DETAILED IN "APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS", BJ BARFIELD, R.C. WARNER AND C.T. HAAN, 1981, CHAPTERS 3 AND 4. FIGURES, TABLES, AND PAGE NUMBERS CITED IN THIS SECTION ARE FOUND IN THIS REFERENCE — UNLESS OTHERWISE NOTED.

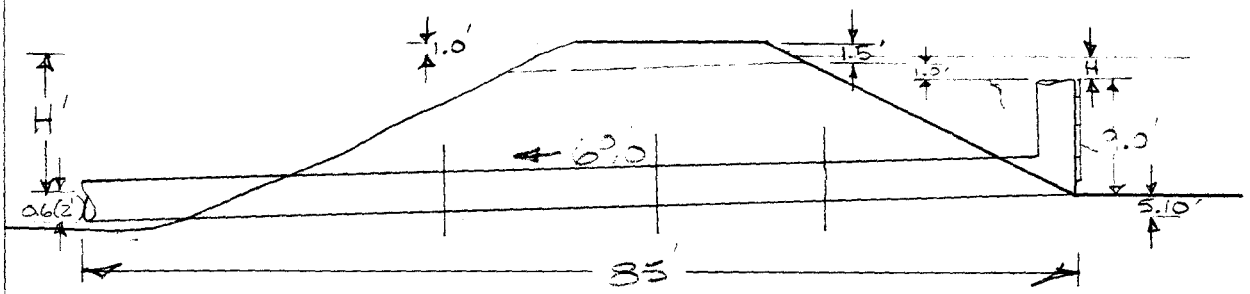
(18) SURFACE MINING, E.P. PFLEIDER, ED, 1968, TABLE 8.3-1, P. 466 FOR "WET LOAM".

CREST ELEV. = ^{6}5257.5' BOTTOM ELEV. = ^{6}5246.0'

EMERGENCY SPILLWAY ELEV. = ^{6}5256.0'

PRINCIPAL SPILLWAY ELEV. = ^{6}5255.0'

MAX. WATER ELEV. = ^{6}5255.5'



CORRUGATED 2' ϕ PIPE INLET, REDUCE TO 18" ϕ

WIER FLOW: $Q = CLH^{1.5}$ (p. 230 EQ^{N} 4.1)

WHERE C = WIER COEF = $3.27 + 0.4\,H/W$ (FIG. 4.3)

$= 3.27 + 0.4\,H/9 = 3.27 + 0.044H$

L = WIER LENGTH = $\pi(2) = 6.28$

$$Q = (20.55 + 0.279H)\,H^{1.5}$$

ORIFICE FLOW: $Q = C'A\sqrt{2gH}$ (p. 230 EQ^{N} 4.2)

WHERE C' = ORIFICE COEF. = 0.6 (p. 230)

A = AREA = $\pi(2)^2/4 = 3.14$

g = GRAV. CONST = 32.2

$$Q = 15.13\sqrt{H}$$

PIPE FLOW : $Q = \frac{A(2g\,H')^{1/2}}{(1+K_e+K_b+K_c L)^{1/2}}$ (p 232, EQN 4.4)

WHERE A = AREA = 1.77

g = GRAV. CONST. = 32.2

K_e = ENTRANCE LOSS = 1.0 (p. 252)

K_b = BEND LOSS = 0.5 (p. 252)

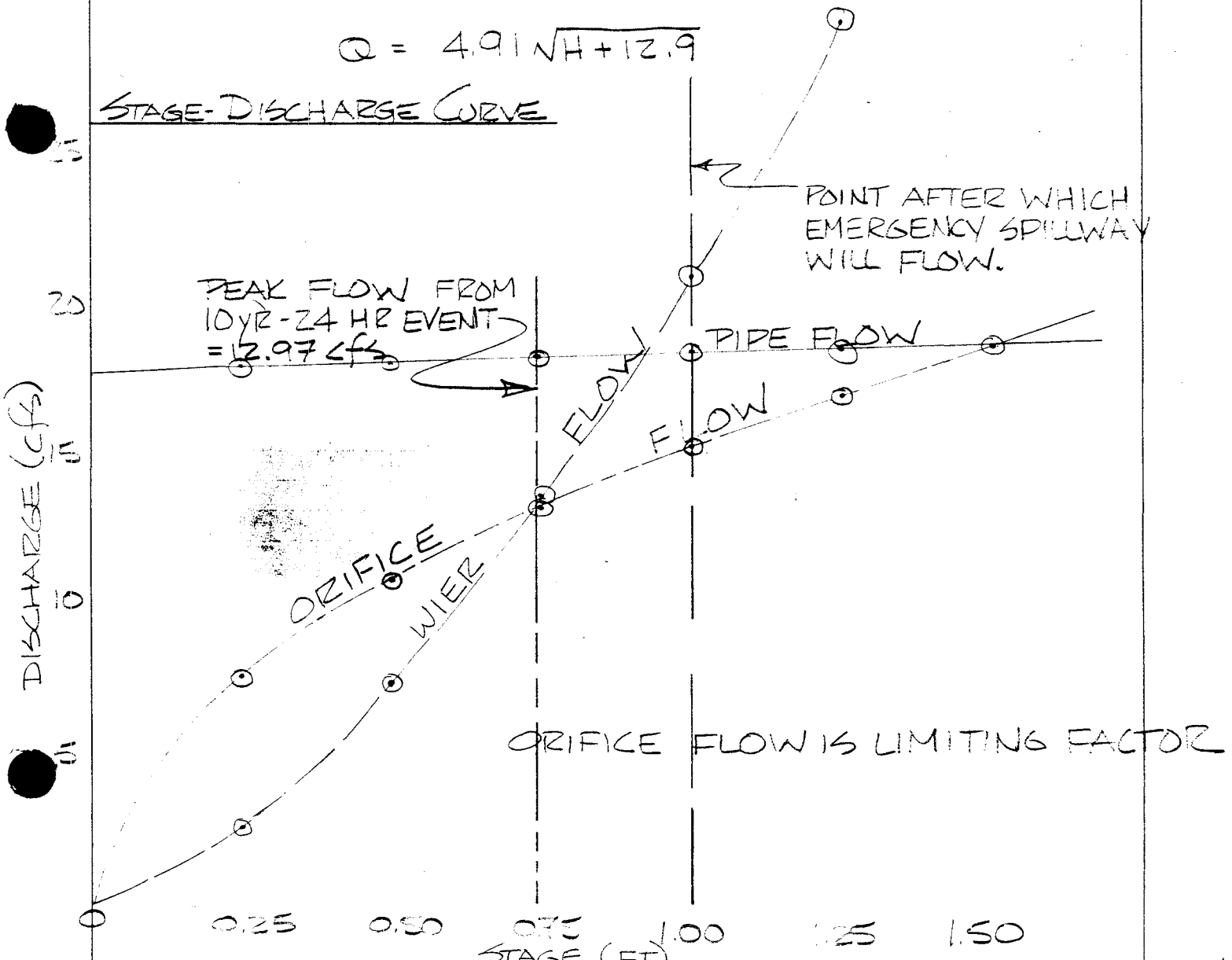
K_c = FRICTION LOSS = 0.0621 (TAB 4.1, AT 18" Ø PIPE & η = 0.024)

L = PIPE LENGTH = 85 + 9 = 94

$H' = H + 9 + 5.1 - 0.6(2) = H + 12.9$

$Q = 4.91\sqrt{H+12.9}$

STAGE-DISCHARGE CURVE



PEAK FLOW FROM 25YR 24 HR EVENT = 19.16 cfs

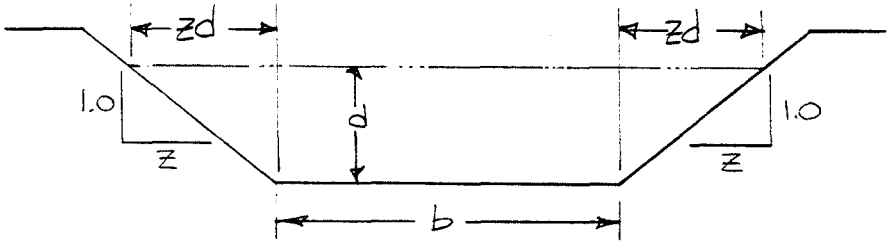
EMERGENCY SPILLWAY WILL BEGIN TO FLOW AT H = 1.0 FT.

MANNING'S EQ^N: $V = \frac{1.49}{n} R^{2/3} S^{1/2}$; $Q = AV$

(p157, EQ^N 3.21)

FOR TRAPEZOIDAL DITCH:

b = BOTTOM WIDTH = 2.0
Z = CHANNEL SIDE SLOPE = 2:1
S = CHANNEL GRADE = 0.06 (6.0%)
n = 0.0314 FOR 3 IN DIA AVG. RIPRAP SIZE IN SPILLWAY CHANNEL (19)(20)
d = DEPTH OF FLOWING WATER IN CHANNEL



$$R = \frac{bd + zd^2}{b + 2d\sqrt{d^2+1}}$$

MANNING EQ^N FOR EMERGENCY			ORIFICE FORMULA FOR PRIMARY		
EMERGENCY SPILLWAY d (ft)	VELOCITY (fps)	VOLUME (cfs)	PRIMARY SPILLWAY H = d + 1.0	VOLUME (ORIFICE FL) (cfs)	COMBINED VOLUME (cfs)
0.20	3.51	1.69	1.20	16.57	18.26
0.23	3.80	2.15	1.23	16.78	18.93
0.24	3.90	2.32	1.24	16.85	19.17 → Q_{25-24} PEAK = 19.16 cfs.
0.25	3.99	2.49	1.25	16.92	19.41

(19) SURFACE MINING WATER DIVERSION DESIGN MANUAL, US DEPT. OF INTERIOR - OFFICE OF SURFACE MINING, SEPTEMBER 1982, EQ^N 4.18.

(20) SEE PAGE 17 OF THIS SECTION FOR RIPRAP SIZE JUSTIFICATION.

DIVERSION DITCH DESIGN

ALL DIVERSION DITCHES ARE TEMPORARY, AND WILL BE RECLAIMED CONCURRENTLY WITH THE SEDIMENTATION POND. EACH DITCH IS DESIGNED TO SAFELY PASS THE PEAK FLOW FROM A 10 YEAR - 24 HOUR PRECIPITATION EVENT WHILE MAINTAINING NO LESS THAN 0.3 FEET OF FREEBOARD.

ALL MATERIAL SPOILED FROM DIVERSION DITCH EXCAVATION WILL BE PLACED ALONG THE DOWNSTREAM BANK AS CLOSE AS IS PRACTICAL TO ITS POINT OF EXCAVATION. ANY FILL REQUIRED IN A DIVERSION CHANNEL TO ACHIEVE THE GRADE SPECIFICATION WILL BE COMPACTED USING A PNUEMATIC JACK-HAMMER WITH A FLAT PLATE (APPROX. 5"X8") ON THE BASE, OR EQUALLY SUITABLE COMPACTING EQUIPMENT. ALL SPOILED MATERIAL WILL BE SEEDED WITH EITHER THE TEMPORARY OR PERMENANT SEED MIX (SEE REVEGETATION PLAN, THIS DOCUMENT). DEPENDING ON WHICH IS MORE READILY AVAILABLE. (IF THE DIVERSIONS ARE CONSTRUCTED CONCURRENTLY WITH PERMENANT RECLAMATION BACK-FILLING AND GRADING ACTIVITIES, THE PERMENANT MIX WILL BE USED WHEN AREA SEEDING IS ACCOMPLISHED. IF DITCHES ARE CONSTRUCTED PRIOR TO GRADING, THE TEMPORARY MIX WILL BE USED.)

THE METHODOLOGIES USED IN THIS SECTION ARE THOSE DESCRIBED IN "SURFACE MINING WATER DIVERSION DESIGN MANUAL", U.S. DEPT. OF THE INTERIOR - OFFICE OF SURFACE MINING, TR-82/2, SEPTEMBER 1982, PART I. UNLESS OTHERWISE NOTED, ALL PAGE NUMBERS, FIGURES AND TABLES CITED IN THIS SECTION CORRESPOND TO THIS REFERENCE.

DITCHES DESIGNED IN THIS SECTION ARE SHOWN ON PLATE NO. 784.23-2. DITCH NUMBERS SHOWN ON THE DRAWING CORRESPOND TO THE DITCH NUMBERS REFERENCED IN THIS SECTION.

OPEN CHANNEL FLOW: MANNING EQ^N

$$V = \frac{1.49}{\eta} R^{2/3} S^{1/2} \quad (p\,4.8, EQ^N\ 4.13)$$

$$Q = AV \quad (p.\ 4.5, EQ^N\ 4.9)$$

ALL DITCHES WILL BE TRAPEZOIDAL. VARIABLES REFERENCED IN THIS SECTION CORRESPOND TO THE CROSS-SECTION SHOWN FOR SPILLWAY DESIGN ON PAGE 11 OF THIS APPENDIX.

DITCH NO. 1

THE GRADIENT OF DITCH NO 1 IS SHOWN ON PLATE NO. 784.23-C TO CONSIST OF THREE SEGMENTS: STEEP, TRANSITIONAL AND FLAT. VARIABLES FOR EACH SEGMENT ARE AS FOLLOWS:

VARIABLE	STEEP	TRANS.	FLAT
b	1.0	1.0	1.0
z	2.0	2.0	2.0
S	0.217	0.066	0.013
η	0.0329(21)	0.0293(21)	0.025(22)

$Q_{10\text{-}24}$ PEAK = 1.10 cfs (SEE P. 4 OF THIS APPENDIX)

MANNING EQ^N:

STEEP			TRANSITIONAL			FLAT		
d(ft)	V(fps)	Q(cfs)	d(ft)	V(fps)	Q(cfs)	d(ft)	V(fps)	Q(cfs)
0.15	5.04	0.98	0.20	3.65	1.02	0.29	2.32	1.06
0.16	5.22	1.10	0.21	3.75	1.12	0.30	2.36	1.13
0.17	5.40	1.23	0.22	3.85	1.22	0.31	2.40	1.21

DITCH WILL BE CONSTRUCTED ONE FOOT DEEP FOR ENTIRE LENGTH.

(21) p. 4.10, EQ^N 4.18 AS DEVELOPED ON P. 17 OF THIS APPENDIX

(22) TABLE 4.2, MAX. VALUE FOR STRAIGHT, UNIFORM, EARTH

DUE TO THE FLAT SLOPES, LOW VELOCITIES, AND VEGETATION STAND AT THE LOCATION OF DISCHARGE, NO ENERGY DISSAPATORS ARE PROPOSED.

NOTE: FROUDE NUMBERS (p. 4.5, EQ^{N} 4.7) ARE LESS THAN 2.5 FOR ALL THREE SEGMENTS.

DITCH No. 2

THE GRADIENT OF DITCH No.2 IS SHOWN ON PLATE No. 784.23-4 THE CHANNEL WILL REQUIRE EXCAVATION IN SOME LOCATIONS AND BACKFILLING IN OTHERS TO ACHIEVE THE DESIGN GRADE.

VARIABLES: $b = 2.0$
$z = 2.0$
$S = 0.015$
$\eta = 0.0314$ (21)

Q_{PEAK} 10-24 = 9.59 cfs (SEE P. 4 OF THIS APPENDIX)

MANNING EQ^{N}

d(ft)	V(fps)	Q (cfs)
0.74	3.59	9.24
0.75	3.61	9.49
0.76	3.64	9.74

DITCH WILL BE CONSTRUCTED 1.5 FEET DEEP FOR ENTIRE LENGTH. AT LOCATION WHERE DITCH CROSSES THE ACCESS ROAD, A WATER BAR WILL BE CONSTRUCTED IN THE ROAD A MINIMUM OF 1.1 FEET IN HEIGHT SO THAT THE DITCH CHANNEL CAN BE FOIZDED WITHOUT DAMAGING ITS INTEGRETY.

THE TRAPEZOIDAL DITCH CONFIGURATION WILL RESUME AFTER CROSSING THE ROAD, SHORTLY AFTER WHICH IT ENTERS THE SEDIMENTATION POND.

LARGER RIPRAP WILL BE PLACED AS NECESSARY ON THE DOWNSLOPE OF THE SEDIMENTATION POND TO MINIMIZE EROSION.

DITCH NO. 3

THE GRADIENT OF DITCH NO. 3 IS SHOWN ON PLATE NO. 784.234
A 100 FOOT LONG CULVERT WILL BE INSTALLED UNDER THE ROAD WHICH DISCHARGES NEAR THE BOTTOM OF THE SEDIMENTATION POND.

THE PEAK FLOW FOR THE DISTURBED PAD AREA IS 9.59 cfs FOR A 10 YEAR - 24 HOUR EVENT. THE PEAK FLOW FROM THIS AREA IS ESTIMATED TO BE PROPORTIONAL TO THIS PEAK.

$$\frac{9.59 \text{ cfs}}{9.77 \text{ AC}} = \frac{x}{1.05 \text{ AC}}$$

$$Q_{10\text{-}24 \text{ PEAK}} = 1.03 \text{ cfs}$$

VARIABLES: $b = 1.0$
$z = 2.0$
$S = 0.016$
$\eta = 0.025$ (22)

MANNING EQN

d (ft)	V (fps)	Q (cfs)
0.26	2.43	0.96
0.27	2.48	1.03
0.28	2.53	1.10

DITCH WILL BE CONSTRUCTED ONE FOOT DEEP FOR ENTIRE LENGTH (APPROX. 290 FT). THE DITCH WILL DISCHARGE INTO A 12 ϕ CULVERT WHICH DISCHARGES INTO THE SEDIMENTATION POND. (SEE PAGE 19 OF THIS SECTION)

DITCH No. 4

THE GRADIENT OF DITCH NO. 4 IS SHOWN ON PLATE No. 784-23-4 TO CONSIST OF THREE SEGMENTS: STEEP, FLAT AND STEEP. VARIABLES FOR EACH SEGMENT ARE:

VARIABLE	STEEP (U)	FLAT	STEEP (D)
b	1.0	1.0	1.0
z	2.0	2.0	2.0
S	0.131	0.012	0.118
n	0.0341 (21)	0.025 (22)	0.034 (21)

$Q_{PEAK\ 10\text{-}24}$ = 3.38 cfs (SEE p. 4 OF THIS APPENDIX)

MANNING EQN:

STEEP (UPSTREAM)			FLAT			STEEP (DOWNSTREAM)		
d(ft)	V(fps)	Q(cfs)	d(ft)	V(fps)	Q(cfs)	d(ft)	V(fps)	Q(cfs)
0.33	5.79	3.17	0.52	3.05	3.23	0.34	5.58	3.19
0.34	5.88	3.36	0.53	3.08	3.36	0.35	5.67	3.37
0.35	5.97	3.55	0.54	3.11	3.49	0.36	5.75	3.56

DITCH WILL BE CONSTRUCTED ONE FOOT DEEP FOR ENTIRE LENGTH.

RIPRAP PLACED IN STEEP DOWNSTREAM SECTION WILL EXTEND ONTO THE DOWNSLOPE ENTERING THE SEDIMENTATION POND.

RIPRAP REQUIREMENTS

EMERGENCY SPILLWAY ON SEDIMENTATION POND

DIVERSION DITCHES - No 1, No.2, No. 3, No.4

STRUCTURE	VELOCITY	RIPRAP DIA
SPILLWAY	3.90	3" (23)
No 1 - STEEP	5.22	4" (23)
No 1 - TRANS	3.75	2" (23)
No 1 - FLAT	2.36	— (24)
No. 2	3.64	3" (23)
No. 3	2.48	— (24)
No. 4 - STEEP	5.88	5" (23)
No. 4 FLAT	3.08	— (24)
No. 4 STEEP	5.67	5" (23)

NOTE: THE NOMOGRAPH (23) PROVIDES MAXIMUM STONE SIZES WHICH CORRESPONDS TO $2D_{50}$ (FIGURE 3.17 (24))

CALCULATION OF MANNING n VALUES USE THE MAXIMUM STONE SIZE AS THE D_{50} SIZE, WHICH RESULTS IN A CONSERVATIVE ESTIMATE.

THE OPERATOR WILL USE RIPRAP OF A D_{50} VALUE GREATER THAN OR EQUAL TO ONE HALF THE RIPRAP DIAMETER SHOWN ABOVE, DEPENDING ON AVAILABILITY AND PRACTICALITY.

(23) HYDRAULIC DESIGN OF STILLING BASINS AND ENERGY DISSIPATORS, US DEPT OF THE INTERIOR - BUREAU OF RECLAMATION, ENGINEERING MONOGRAPH No. 25, SECTION II, FIGURE 165.

(24) APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, BJ BARFIELD, RC WARNER, CT HAAN, 1981, TABLE 3.2 FOR LOAM.

IN THE AREAS WHERE CHANNEL GRADIENT CHANGES IN DIVERSION DITCHES 1 & 4, THE LARGER SIZED RIPRAP MATERIAL WILL BE EXTENDED A MINIMUM OF 15 FEET PAST THE TRANSITION TO MINIMIZE SCOURING. WITH FROUDE NUMBERS ALL LESS THAN 2.5, SCOURING IS NOT EXPECTED TO BE A PROBLEM.

CULVERT DESIGN

ONE TEMPORARY CULVERT WILL BE INSTALLED TO COURSE DIVERSION DITCH NO. 3 INTO THE SEDIMENTATION POND. A 12 INCH Ø CORRUGATED STEEL CULVERT APPROXIMATELY 140 FEET LONG WILL BE INSTALLED AT A 3.5% GRADE, TO INTERSECT THE POND AT ABOUT ELEVATION 5250.

NOMOGRAPHS FOUND IN "HANDBOOK OF STEEL DRAINAGE & HIGHWAY CONSTRUCTION PRODUCTS", 2ND ED, AMERICAN IRON AND STEEL INSTITUTE, PUB. 1971, WERE USED TO DETERMINE CULVERT ADEQUACY. THE FIGURES CITED IN THIS SECTION ARE FOUND IN THIS REFERENCE.

DIVERSION DITCH No1 - $Q_{10\text{-}24\ PEAK} = 1.03$ cfs

INLET CONTROL (FIG 4-18) $\Rightarrow$ $HW/D = 0.6$ $\therefore$ $HW = 0.6$ FT

NOTE: TRAPEZOIDAL DITCH CONFIGURATION IS DESIGNED AT A DEPTH OF ONE FOOT. THIS WILL STILL MAINTAIN AT LEAST 0.3 FT OF FREEBOARD

OUTLET CONTROL (FIG 4-22) WHERE $L' = 140(0.21) = 29.4'$

- NO OUTLET CONTROL

SINCE INLET IS LESS THAN PIPE DIAMETER, CHECK OPEN CHANNEL FLOW (MANNING) THROUGH PIPE AT 0.6 FT DEPTH:

$$\left(\frac{1.49}{0.024}\right)\left(\frac{45(0.6)}{\pi(360-156.9)}\right)\left(2\pi - \frac{\pi(156.9)}{180} + \sin(156.9)\right)^{2/3} 0.035^{1/2}$$

(SEE OSM/TR-82/2 TABLE 4.1, p.4.3 FOR R & A)

$V = 3.03$ fps $\quad Q = 1.19$ cfs > 1.03 cfs

CULVERT WILL FLOW AS AN OPEN CHANNEL A LITTLE MORE THAN HALF FULL.

THIS CULVERT WILL BE REMOVED CONCURRENTLY WITH THE SEDIMENTATION POND AND DIVERSION DITCHES. SIMPLE GRADING AFTER REMOVAL WILL RESULT IN A RECLAIMED CONTOUR CONSISTANT WITH THE REMAINDER OF THE RECLAIMED SITE.

THERE IS AN EXISTING CULVERT WHICH ALLOWS THE IRRIGATION DITCH, SHOWN ON PLATE NO 784.32, PASSAGE BENEATH THE SITE ACCESS ROAD NORTH OF CHALK CREEK. BECAUSE FLOWS IN THIS DITCH ARE MANUALLY REGULATED AND NOT CONTROLLED BY THIS OPERATOR, AN EVALUATION FOR CULVERT ADEQUACY FOR PEAK FLOWS IS NOT INCLUDED. THE CULVERT IS APPROXIMATELY 36" ϕ AND APPEARS TO BE ADEQUATE FOR ITS PURPOSE.

SMALL AREA EXEMPTIONS

BECAUSE THE SITE ACCESS ROAD CROSSES CHALK CREEK, IT IS NOT PRACTICAL TO PROVIDE SEDIMENTATION CONTROL WITH PONDS FOR ALL DISTURBED AREAS. RUNOFF FROM ALL OF THE PAD AREA, AND MOST OF THE ROADWAYS, IS CONTAINED IN THE SEDIMENTATION POND. THOSE PORTIONS OF THE ACCESS ROAD WHICH DECEND TOWARD THE BRIDGE SPANNING CHALK WILL NOT DRAIN INTO THE SEDIMENTATION POND (SEE DWG 784.16-1, SEC 784.16). THIS ROAD HAS BEEN IN THIS LOCATION FOR MANY YEARS AND APPEARS TO BE WELL STABILIZED. PONDS FOR CONTAINING RUNOFF FROM THESE AREAS WOULD HAVE TO BE CONSTRUCTED ADJACENT TO THE CREEK (IN THE FLOOD PLAIN), INSIDE THE BUFFER ZONE. THE OPERATOR BELIEVES THAT DISTURBANCE FOR POND CONSTRUCTION IN THESE AREAS WOULD RESULT IN INCREASED SEDIMENT CONTRIBUTIONS OVER THE TREATMENT STRUCTURES PROPOSED HEREIN.

A BERM WILL BE CONSTRUCTED DOWN BOTH SIDES OF THE SITE ACCESS ROAD, ON BOTH SIDES OF THE CREEK, TO CHANNEL RUNOFF DOWN THE ROADWAY. AT THE LOCATIONS SHOWN ON PLATE No 784.23-2 RUNOFF WILL COURSE OFF THE DISTURBED AREA AND THROUGH A SEDIMENT FILTER SUCH AS STRAW BALES, SILT FENCE, OR EQUAL PRIOR TO DISCHARGE INTO CHALK CREEK. THERE IS A GOOD STAND OF VEGETATION IN THE AREA TO FURTHER FILTER DISTURBED AREA RUNOFF.

USING THE METHODS DESCRIBED IN FOOTNOTE (11) OF THIS APPENDIX, THE RUNOFF FROM THE AREAS IS APPROXIMATELY 3407 CF AND 2235 CF FOR THE NORTH AND SOUTH SIDES OF THE CREEK, RESPECTIVELY.

DISCHARGE THROUGH THE SEDIMENT FILTERS WILL BE SAMPLED AND ANALYZED FOR THE SAME PARAMETERS AS A SEDIMENTATION POND DISCHARGE (SEE SECTION OF THIS DOCUMENT). DURING SMALL PRECIPITATION EVENTS, IT MAY NOT BE PRACTICAL TO OBTAIN A DISCHARGE SAMPLE DUE TO SLOW FILTERING RATES, SMALL VOLUMES, AND SHORT DURATION. THE OPERATOR WILL MAKE ALL REASONABLE ATTEMPTS TO OBTAIN A REPRESENTATIVE DISCHARGE SAMPLE DURING OR FOLLOWING ANY PRECIPITATION EVENT WHERE RUNOFF OCCURS.

(25) $CN = 90$, $A_N = 0.93$ Ac, $A_S = 0.61$ AC - SEE REFERENCE (11)

DISCHARGE STRUCTURE ON SEDIMENTATION POND OUTLET

PLATE NO 784.23-2 SHOWS BOTH THE PRIMARY OVERFLOW AND EMERGENCY SPILLWAY DISCHARGE AT THE SAME LOCATION. BECAUSE OF THE DITCH CONFIGURATION, VOLUMES AND VELOCITIES, THE RIPRAP APRON WILL BE DESIGNED BASED ON THE PIPE DISCHARGE.

CALCULATIONS ON PAGE 11 OF THIS APPENDIX SHOW THAT THE PRIMARY SPILLWAY PASSES 16.35 CFS AND THE EMERGENCY SPILLWAY PASSES 2.32 cfs TO DEWATER THE PEAK FLOW FROM A 25 YR-24 HR EVENT. THE STAGE-DISCHARGE CURVE ON PAGE 10 IS VERY NEARLY PIPE FLOW FLOWING FULL, SO THE TAILWATER CONDITION ON THIS STRUCTURE WILL BE GREATER THAN HALF THE PIPE DIAMETER.

USING BARFIELD, WARNER & HAAN (24), FIG. 7.26, AND TO BE CONSERVATIVE, ASSUMING Q = 19.16 cfs (PEAK FLOW-25-24), THE MINIMUM APRON LENGTH = 30 FT. THE D_{50} RIPRAP SIZE IS 4". FOR MAXIMUM TAILWATER CONDITIONS, AND REFERRING TO FIG. 7.24, WIDTH = 13.5 FT.

VELOCITIES ASSOCIATED WITH THE EMERGENCY SPILLWAY ARE AS FOLLOWS (REF. P. 11 OF THIS APPENDIX FOR METHODOLOGY)

SPILLWAY - 6% FOR 20 FT (PLAN) (CONTROL FOR Q)
40% FOR 35 FT (PLAN) (CONTROL FOR V)

TRAPEZOIDAL DITCH:

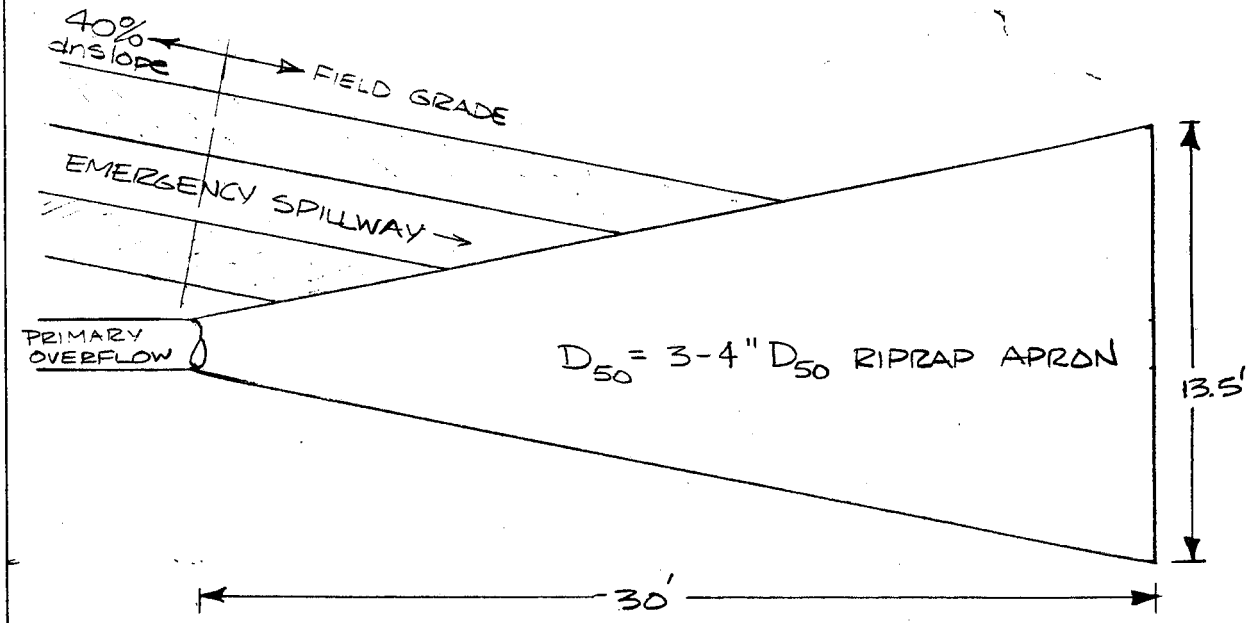
b = BOTTOM WIDTH = 2.0 FT
z = SIDE SLOPE = 2:1
S = SLOPE = 0.40
η = 0.0352 (AT 6" = D_{50} RIPRAP (19))

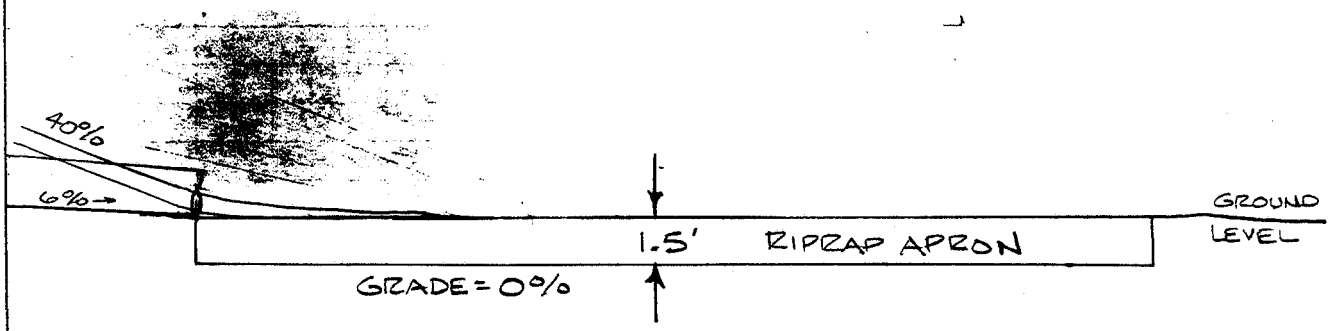
Q = 2.32 cfs WHEN $d \cong 0.15$ FT AND $V \cong 6.84$ fps

RIPRAP NOMOGRAPH (23) INDICATES AT V = 6.84 fps. $D_{MAX} \cong 6.5$ INCHES. THE 3-4" RIPRAP IN APRON IS ADEQUATE TO DISSIPATE VELOCITIES, SINCE $D_{MAX} = 2D_{50}$ (24)

SEDIMENTATION POND OVERFLOW DISCHARGE STRUCTURE

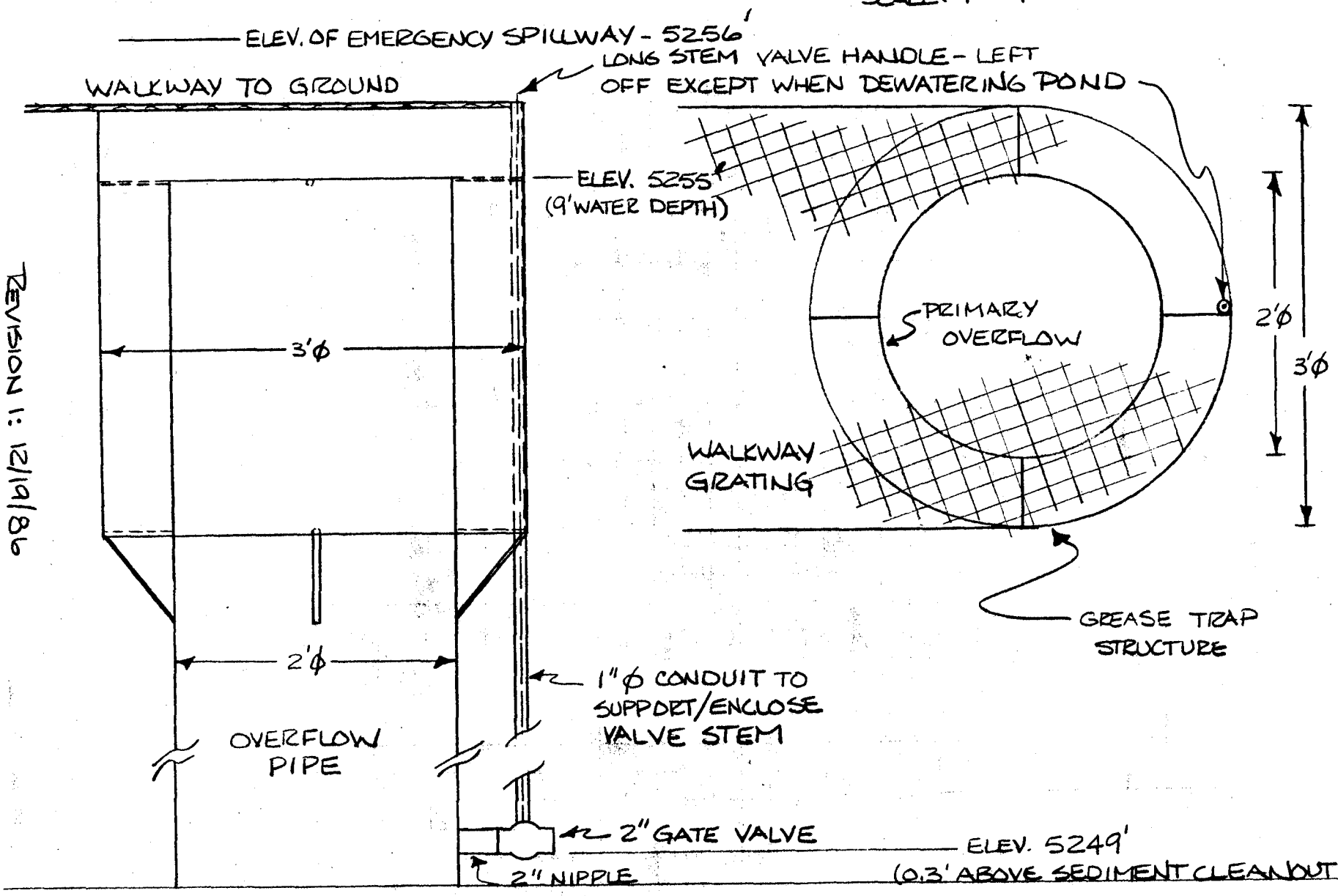
SCALE: 1" = 6'





GREASE TRAP/DECANT DETAIL

SCALE: 1" = 1'



REVISION 1: 12/19/86

SUPPLEMENT TO DEWATERING STRUCTURE DRAWING, P. HE 9

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UMC 784.15 RECLAMATION PLAN: POSTMINING LAND USE

UMC 784.15(a) - Summary of Postmining Land Use

The postmining land use for the reclaimed disturbed area is grazing and wildlife habitat. These land uses are consistant with what is believed to be the premining land use (mining on this property began as early as the late 1800's, so there is no known documentation referring to the premining land use).

Section 783.21 of this document discusses the capability of the soils to support the proposed revegetation plan (section 784.13 - Revegetation Appendix). Species proposed in the Revegetation Plan have been selected to provide a variety of forage to enhance the habitat for wildlife as well as domestic animals.

Because of the limited water supply, the possibility of managing this land for other uses is limited. As of September, 1986, this area was closed to new applications according the the State of Utah - Division of Water Rights. Water flowing in the surface drainages is the only available water. The surface owner of the property holds water rights for stockwatering so domestic grazing is consistant with water availability.

The Summit County Planning Commission has classified the reclamation area as Agricultural Grazing. This classification is obviously consistant with the proposed use of grazing and wildlife habitat.

UMC 784.15(a)(1) - How to Achieve the Postmining Land Use

Reclamation activities are detailed in section 784.13 of this document. The Revegetation Plan was developed utilizing species which will enhance forage for grazing and browsing of both domestic and wild animals. Methods for monitoring the success of the plan are detailed in the Revegetation Appendix (section 784.13).

UMC 784.15(a)(2) - Proposed Alternative Use

The proposed postmining land use is believed to be consistant with the premining land use.

UMC 784.15(a)(3) - Consistence with Mining Activity

Underground coal mining activities are not a part of this plan.

UMC 784.15(b) - Comments of Surface Owner

Conversations with legal council for the surface owner on 11/6/86 indicate that discussions with the surface owner were to proceed on 11/7/86 regarding the consistancy of the proposed postmining land use of the property and their long range plans. Their comments will be provided when available.

UMC 784.16 RECLAMATION PLAN: PONDS, IMPOUNDMENTS, BANKS, DAMS, AND EMBANKMENTS

UMC 784.16(a) - Plans

This reclamation plan involves only one sedimentation pond which falls under the requirements of this section.

UMC 784.16(a)(1)(i)

All plans submitted persuant to this section have been certified as having been prepared by, or under the direction of, a registered professional engineer or professional geologist.

UMC 784.16(a)(1)(ii) - Description of Structures

A description and design criteria for the sedimentation pond are included in the Hydrologic Evaluation Appendix in section 784.14 of this document. Plate number 784.23-2 shows the pond design in plan view. Cross sections referenced on that drawing are included on Plate number 784.23-3.

UMC 784.16(a)(1)(iii) - Hydrologic Impact Assessment

The sedimentation pond will be incised at the location shown on Plate number 783.23-2. This area has been disturbed for some time and appears well compacted and stabilized. It is not expected to adversly affect the hydrologic impact of this structure.

UMC 784.16(a)(1)(iv) - Potential Subsidence

Underground mining activities are not a part of this plan. There are no potential subsidence affects.

UMC 784.16(a)(1)(v) - Certification Statement

Design plans for sedimentation pond construction submitted in this document are complete. No construction will begin on the sedimentation pond until written approval from the Division is received.

UMC 784.16(a)(2) - Meeting MSHA Size Criteria

The sedimentation pond does not meet the size or other criteria of 30 CFR 77.216(a).

UMC 784.16(3) - Not Meeting MSHA Size Criteria

UMC 784.16(3)(i) - Certification

Design plans for the sedimentation pond have been certified by a registered professional engineer.

UMC 784.16(3)(ii) - Geotechnical Information

Design and construction requirements are included in the Hydrologic Evaluation Appendix in section 784.14 of this document.

UMC 784.16(3)(iii) - Operation and Maintenance

Operation and maintenance of the sedimentation pond is discussed in part (b) of this section.

UMC 784.16(3)(iv) - Removal Plans

A timetable for sedimentation pond removal is included in part (b) of this section.

UMC 784.16(b)(1) - Sedimentation Pond Design

The sedimentation pond included in this plan is a temporary structure and will be constructed prior to any reclamation activities. The sedimentation pond is located outside of the apparant Chalk Creek flood plain, and is shown in Plate number 784.23-2.

Design parameters are detailed in the Hydrologic Evaluation Appendix in section 784.14 of this document. Those parameters include: capacity to contain a 10 year - 24 hour precipitation event plus three years of anticipated sediment accumulation, a minimum of 24 hours detention time, the installation of a dewatering device and the capacity to pass the runoff from a 25 year - 24 hour event through the emergency spillway.

Plate number 784.23-2 illustrates that the pond has been designed to prevent short circuiting to the extent possible.

Sediment will be removed from the pond when the accumulated

volume reaches 60 percent of the design sediment volume. This level will be marked in the pond for visible inspection.

The sedimentation pond is an incised pond. No side slope into the pond will exceed 1V:2H.

The sedimentation pond has been designed, will be monitored during construction, and certified within 30 days after construction by a registered professional engineer. The pond will be inspected a minimum of four times per year for structural weakness, erosion, and other hazardous conditions. A copy of the inspection form is included as Figure 784.16-1.

The sedimentation pond will not be removed until the disturbed area has been restored to the vegetation success standards detailed in the revegetation plan and the drainage entering the pond meets the applicable State and Federal water quality requirements for the receiving stream. Water entering the sedimentation pond will be sampled at the pond inlet and analyzed as necessary to determine if the quality requirements can be met. When the sedimentation pond is removed, it will be graded to the configuration shown on drawing number 784.16-1, and revegetated in accordance with the revegetation plan contained in this document.

UMC 784.16(b)(2) - MSHA Compliance

The sedimentation pond does not meet the size requirements of 30 CFR 77.216-1 or 77.216-2.

UMC 784.16(c) - Impoundments

Permenant or temporary impounding structures are not a part of this plan.

UMC 784.16(d) - Coal Processing Waste Banks

Coal processing waste banks are not a part of this plan.

UMC 784.16(e) - Coal Processing Waste Dams and Embankments

Coal processing waste dams or embankments are not a part of this plan.

UMC 784.16(f) - Stability Analysis

The proposed incised sedimentation pond structure does not impound more than 20 acre feet.

SEDIMENTATION POND QUARTERLY INSPECTION

Structural Weakness: _____

_____

_____

Erosion: _____

_____

_____

Other Hazardous Conditions: _____

_____

_____

Pond Freeboard: _____

Inspected by: _____

Date: _____

Figure 784.16-1 - Sedimentation Pond Inspection Form

UMC 784.20 SUBSIDENCE CONTROL PLAN

Underground mining activities and the excavation of coal related products are not a part of this plan.

Coal was excavated from the reclamation area by previous owners and operators as shown on Plate 783.14-4. Most of the underground excavation was completed prior to the 1950's and, considering the shallow overburden, the affects of subsidence have probably already been realized. Excavations made in the 1970's by Utah Coal and Energy, Inc. are not extensive, but could potentially develop some surface cracking.

The Applicant will visually monitor mined out areas within the permit area for surface displacement during the bond release period. Should cracking occur to the extent that it becomes hazardous to area inhabitants, the Applicant will, after consulting the Division of Oil, Gas, and Mining, develop and implement appropriate remedial action.

UMC 784.21 - FISH AND WILDLIFE PLAN

UMC 784.21(a) - MINIMIZE DISTURBANCES & ADVERSE IMPACT

Summit Minerals plans to implement a fish and wildlife plan which will contain several measures to limit impacts to fish and wildlife during the initial phases of the reclamation project when activities will be at the highest level. The net overall effect of the reclamation work and revegetation will be to increase and enhance habitats for the wildlife of the area.

AQUATIC WILDLIFE

Because no impact to Chalk Creek is expected due to reclamation activities, no special mitigation plan is presented here. Chalk Creek will be monitored for water quality twice a year during the 10-year liability period to make sure that water quality is not being impacted by the reclamation efforts. During the initial phases of the reclamation work, particular care will be taken to minimize any disturbance to the stream channel and adjacent buffer zone because of work performed by equipment.

During the 10-year reclamation liability period, all drainage from the reclaimed area will pass through a sedimentation pond before being discharged into Chalk Creek. Therefore, the impact on the quality of the water in Chalk Creek will be minimal and there will be little, if any, affect on the biological community in the creek.

TERRESTRIAL WILDLIFE

The area to be reclaimed is basically devoid of vegetation and habitats for most types of wildlife. Therefore, the reclamation project and revegetation efforts can only have a positive affect on the wildlife of the area. The overall impact on the wildlife will be very positive and will more than compensate for any short term negative impacts to a few animals during the initial phases of the reclamation work.

Birds

No impacts are expected on the birds of the area because of the reclamation project. Throughout the area, there are large areas of similar habitats, and because of the transient nature of birds they will not be stressed during the reclamation activities. The overall effect of the reclamation project on the birds will be to enlarge and enhance their habitats in the reclamation area.

Mammals

Impacts on mammals could occur during sensitive periods in their life cycle. Two sensitive periods are common to most mammals; (1) when the young are born, and (2) when the young accompany their mother on initial foraging or hunting expeditions in order to learn how to survive. In general, these sensitive periods occur from late February to mid-August. Therefore, most of the reclamation work and revegetation will take place during late summer and early fall which commonly are not sensitive periods for the wildlife.

Small mammals may suffer some impacts during the initial phases of the reclamation efforts because of the work of equipment. There is a chance that burrows will be caved or their continuity changed because of fracturing of the strata. However, this will cause only a temporary alteration in the population density and age structure. With reduced human activity and increases and enhancement of favorable habitats, their recovery would be imminent and very rapid.

Amphibians

Because of the wide range and distribution pattern of the amphibian species that may inhabit the reclamation area, it is doubtful that the reclamation and revegetation activities will seriously impact even a small portion of the population.

Reptiles

The reptiles likely to be found in the reclamation area are found in many similar habitats and any impacts caused by the reclamation efforts will not seriously damage the population. However, if any denning sites are discovered during the reclamation activities, they will be preserved until proper procedures are implemented by UDWR personnel to either move the den site to a new location or the reclamation plan is modified so as not to disturb the den.

UMC 784.21(a) - ENHANCEMENT OF FISH AND WILDLIFE

The reclamation and revegetation plans have been formulated so as to enhance the wildlife habitat of the area. Areas will be reseeded and revegetated with native species that are proven for their value as winter browse for mule deer and as a bird habitat. Shrub islands will be created to provide new habitats for the wildlife. Revegetation rates for the woody plant species will be adequate to support the proposed post-mining land use of wildlife habitat. The most successful methods known at the time the reclamation begins will be used to reclaim the land.

UMC 784.21(b) - MEASURES FOR PROTECTION OR ENHANCEMENT

UMC 784.21(b)(1) - Endangered Species (1973 Act)

There are no known threatened or endangered species of mammals, reptiles, amphibians, fish, or plants in the reclamation area or in the immediate surrounding areas.

Two species of endangered raptors could be found in the reclamation area. These are the bald eagle and peregrine falcon. However, there are no known roosting trees or nesting sites within the reclamation area. Therefore, the reclamation project should not have any adverse affects on those raptors.

UMC 784.21(b)(2) - Other Species

Except as noted in this report, there are no other migratory birds, other animals, or habitats which are protected by State or Federal laws which occur within or near the reclamation site.

UMC 784.21(b)(3) - Unusually High Value Habitats

There are no known habitats of unusually high value for fish and wildlife currently in the reclamation area. The reclamation area does not currently contain any wet lands, riparian areas, cliff supporting raptors, areas which offer special shelter or protection, reproduction and nursery areas, or wintering areas.

The reclamation area has the potential for being a high value habitat for mule deer during the winter. However, at the present time

the area is of little value because of the lack of an adequate vegetative cover. The reclamation and revegetation efforts will, after plant life becomes fully established, provide new habitats for the mule deer during the winter. In order to fully establish such habitats it may be necessary to provide protective measures to limit the use of the area until it becomes stabilized.

UMC 784.22 - Diversions

All diversions included in this reclamation plan are for the purpose of either diverting runoff away from or into the sedimentation pond. All diversions are therefore designed to pass a 10 year - 24 hour event. All diversions are temporary, and have been designed to minimize additional sediment contributions by minimizing gradients and stabilizing side slopes. Design criteria and details are included in the Hydrologic Evaluation Appendix in section 784.14 of this document. Channel profiles are shown on plate number 784.23-4 and referenced on plate number 784.23-2.

All diversions will be reclaimed at the time that the sedimentation pond is reclaimed, and in accordance with the revegetation plan included in this document.

No diversion has been designed to divert water into abandoned underground workings.

Stream channel diversions are not a part of this plan.

UMC 784.23 OPERATION PLAN: MAPS AND PLANS

UMC 784.23(a) - Affected Lands

The proposed permit area and disturbed area are shown on Plate number 784.23-1. This drawing shows the area as it exists now, including buildings, structures, and runoff control features. No changes to the facilities or features shown on this drawing are proposed in the interim period between submittal of this application and the proposed reclamation activities included in this document.

UMC 784.23(b)(1) - Buildings and Facilities

Buildings and facilities are shown on Plate number 784.23-1.

UMC 783.23(b)(2) - Affected Lands

See UMC 784.23(a).

UMC 783.23(b)(3) - Bonded Land

All land for which the performance bond is posted is shown on Plate number 784.23-1.

UMC 784.23(b)(4) - Coal Storage, Cleaning, and Loading Areas

Coal excavation is not a part of this plan.

UMC 784.23(b)(5) - Topsoil, Spoil, and Waste

The spoil pile from sedimentation pond excavation is shown on Plate number 784.23-2 in plan view and Plate number 784.23-3 in cross section.

UMC 784.23(b)(6) - Water Diversion, Treatment, or Storage Facility

Water diversions, treatment structures, and the sedimentation pond are shown on Plate number 784.23-2 in plan view and Plate numbers 784.23-3 and 784.23-4 in cross section.

UMC 784.23(b)(7) - Coal Processing Waste

Coal processing is not a part of this plan.

UMC 784.23(b)(8) - Facilities for Fish and Wildlife Enhancement

Facilities for the enhancement of fish and wildlife are not a part of this plan. Plant species selected for revegetation enhance wildlife forage.

UMC 784.23(b)(9) - Explosive Storage Facilities

The use of explosives is not a part of this plan.

UMC 784.34(b)(10) - Location of Ponds, Impoundments, Waste Banks, and Embankments

The sedimentation pond is shown on Plate number 784.23-2. Impoundments, waste banks and embankments are not a part of this plan.

784.23(b)(11) - Regraded Surface Configuration

The regraded surface configuration is shown on Plate number 784.23-2 in plan and Plate 784.23-3 in cross section.

UMC 784.23(b)(12) - Monitoring Locations

Water monitoring locations are shown on drawing number 783.16-1 on page 783.16-6 of this document. Subsidence monitoring is not a part of this plan.

UMC 784.23(b)(13) - Location of Permanent Features and Facilities

Permanent features and facilities are shown on Plate number 784.23-2.

UMC 784.23(c) - Certification

All maps, plans and cross sections submitted persuant to this section have been certified by a registered professional engineer or professional geologist. Sedimentation pond and spoil pile maps, plans and cross-sections have been certified by a registered professional engineer.

FIGURE 1. MOUNTAIN SHRUB COMPLEX COMMUNITY

The mountain gravelly loam-oak sub-type is dominated by Gambel oak (Quercus gambelii) in the overstory. The herbaceous understory is also dominated by grasses such as bromes (Bromus spp.), wheatgrasses (Agropyron spp.) and Kentucky bluegrass. Other components of the understory are creeping barberry (Mahonia repens), violet (Viola spp.), bedstraw (Galium spp.) and yarrow.

Due to the interspersed nature of the two sub-types in the area of the mine, the vegetation community was treated as one complex and sampled as such. A complete list of those species observed during this investigation is presented in Table 1.

Disturbed Area Vegetation

Within the area disturbed by past mining activity, a variety of introduced and native species has invaded and become well established. Among these are big sagebrush, rubber rabbitbrush (Chrysothamnus nauseosus), thistle (Cirsium spp.), gumweed (Grindelia squarrosa), hound's tongue (Cynoglossum officinale), yellow sweetclover (Melilotus officinalis), cheatgrass (Bromus tectorum) and a variety of borages (Boraginaceae). A disturbed area species list is presented in Table 2.

It is of particular interest to note that in an area directly east of the old mine site, which has undergone some disturbance in the past as evidenced by a sizeable population of thistle, that needle and thread grass (Stipa comata) has become very well established in the understory. This observation may indicate the potential for this native species, as well as others, to revegetate the area after all mine related activity has ceased.

As has been previously noted, the area of the Blackhawk Mine has been disturbed by past mine related activity for many years. Both sand and gravel operations and coal mining have impacted the area. Currently, the surrounding undisturbed areas provide wildlife habitat (discussed later in this report) and limited grazing for domestic livestock, primarily sheep.

Table 1 SPECIES OCCURRING IN THE MOUNTAIN SHRUB COMPLEX REFERENCE AREA

TREES	
Juniperus osteosperma	Utah juniper
J. scopulorum	Rocky Mountain juniper
SHRUBS	
Amelanchier alnifolia	Saskatoon serviceberry
Artemisia tridentata	Big sagebrush
Cercocarpus montanus	True mountain mahogany
Chrysothamnus viscidiflorus	Low rabbitbrush
Mahonia repens	Creeping barberry
Purshia tridentata	Bitterbrush
*Quercus gambelii**	Gambel oak
Rosa woodsii	Woods rose
Symphoricarpos oreophilus	Snowberry
FORBS	
Achillea millefolium	Yarrow
Allium spp.	Wild onion
Asteraceae	composites
Castilleja spp.	Indian paintbrush
Eriogonum spp.	Wild buckwheat
Galium spp.	Bedstraw
Geranium spp.	Geranium
Linum lewisii	Lewis flax
Lupinus sericeus	Silky lupine
Thalictrum fendleri	Fendler meadowrue
Verbascum thapsis	Verbascum
Viola spp.	Violet
GRASS AND GRASS LIKE PLANTS	
Agropyron spicatum	Bluebunch wheatgrass
A. trachycaulum	Slender wheatgrass
Bromus spp.	Brome grass
Carex rossii	Ross sedge
Festuca spp.	Fescue
Poa pratensis	Kentucky bluegrass
Poa spp.	Bluegrass

*For purposes of this investigation, this species was treated as a shrub.

Table 2 SPECIES OBSERVED WITHIN THE DISTURBED AREA OF THE BLACKHAWK MINE

SHRUBS	
Artemisia tridentata	Big sagebrush
Chrysothamnus nauseosus	Rubber rabbitbrush
FORBS	
Boraginaceae	Borages
Brassicaceae	Mustards
Cirsium spp.	Thistle
Cynoglossum officinale	Hounds tongue
Grindelia squarrosa	Gumweed
Helianthus annuus	Sunflower
Melilotus officinalis	Yellow sweetclover
Verbascum thapsis	Verbascum
GRASSES	
Bromus tectorum	Cheatgrass
Stipa comata	Needle & thread grass

Cover

Total ground cover by living vegetation was estimated to be 42.5% through guantitative sampling (Table 3). Relative vegetative cover by shrubs was 47.4%, cover by grass equalled 40.3% and cover by forbs contributed the least at 12.3%. Of the major ground surface categories, litter and vegetation together totalled more than 85% (Table 4).

Major species contributing to total vegetation cover (>10%) were big sagebrush, low rabbitbrush, gambel oak, perennial forbs and Kentucky bluegrass. Percent cover by species as a component of total vegetation cover is presented in Table 5. In-plot frequency by species is also included in Table 5. The most frequently encountered species (>50%) in the mountain shrub community were big sagebrush, low rabbitbrush, snowberry, yarrow, Fendler meadowrue, perennial forbs and Kentucky bluegrass.

Table 3 PERCENT COVER BY MAJOR LIFE FORM AND TOTAL VEGETATION COVER IN THE MOUNTAIN SHRUB COMPLEX REFERENCE AREA

Life Form	% of total vegetation cover	% of total ground cover
Shrub	47.4	20.2
Forb	12.3	5.2
Grass	40.3	17.1
TOTAL	-	42.5

Table 4 PERCENT GROUND COVER BY MAJOR CATEGORY IN THE MOUNTAIN SHRUB COMPLEX REFERENCE AREA

Total vegetation	Rock	Litter	Bareground	Cryptogams
42.5	7.8	43.1	5.9	0.7

Table 5 PERCENT GROUND COVER BY SPECIES AS A COMPONENT OF TOTAL VEGETATION COVER IN THE MOUNTAIN SHRUB COMPLEX REFERENCE AREA

Species (alpha code*)	Plot 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	$\bar{x}$	Percent Frequency
Shrubs																	
AMALA							1		3	6	3		2	7	5	2	47
ARTR	25	30	15	15		20	20	30	30	30	20			10	40	19	80
CEMO											4			8		T	13
CHVI	25	35	20	20		10	1	50	15	7	8	8	10	12	10	15	93
MARE					5		2									T	13
PUTR									20							1	7
QUGA			50	50	50											10	20
SYOR	10					1	25			1	20	3	12	15	5	6	60
Forbs																	
ACMI	1	4	T	T	2	1		T			4	4			1	1	67
ALLIU			T	T		T	T						T	T		T	40
CASTI													5			T	7
ERIOG	2		T	T				T	T							T	33
GERAN							1									T	7
LILE		3	T	T		2	3	5								T	40
THFE			5	5		3		T	10	6			5		T	2	53
VIOLA					4											T	7
Unid. Perennials	17	3	T	T	1	8	6	5	10	10	8	31	8	30	12	10	100
Unid. Annuals		T†				T										T	13

Table 5 CONTINUED

Species (alpha code*)	Plot 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	$\bar{x}$	Percent Frequency
Grasses																	
AGSP		5				25	15				15	30				6	33
BROMU					25											2	7
CARO	19	5	15	15					10							4	33
POPR	1	5	5	5	T	30	40	15	20	40	35	30	70	40	35	25	100
Unid. Perennials		30			25			20	10	10						6	33

*Intermountain Range Plant Names and Symbols, USDA Forest Service, general Technical Report INT-38, 1977.

† T = trace (<1%)

Shrub Density

Shrub density within the mountain shrub reference area was estimated to be 11,869 shrubs per acre (29,316 shrubs per hectare). Using the sample standard deviation obtained, the shrub density range is 7589 to 27,225 shrubs per acre. Shrub composition was dominated by big sagebrush, low rabbitbrush and snowberry (Table 6).

Table 6 PERCENT COMPOSITION OF SHRUBS IN THE MOUNTAIN SHRUB COMPLEX RESERVE AREA

Shrub Species	Percent Composition
Amelanchier alnifolia	8
Artemisia tridentata	25
Cercocarpus montanus	1
Chrysothamnus viscidiflorus	21
Purshia tridentata	2
Quercus gambelii	14
Rosa woodsii	1
Symphoricarpos oreophilus	28

Productivity and Range Condition

Annual production in the mountain shrub complex has been estimated by the SCS at 1900 pounds per acre in the Mountain gravelly loam-oak sub-type and 1100 to 1200 pounds per acre in the mountain gravelly loam-big sagebrush sub-type (see Appendix B). On site inspection of the reference area by Mr. Tim Watson, SCS, Coalville, Utah, indicated that the area is in good condition with an upward trend.

Sample Adequacy

Sample adequacy data are presented in Table 7. A statistically adequate number of samples was taken with regards to total vegetation cover (n=15; n_{min}=9). The maximum number of samples was taken (n=40) regarding the shrub density parameter, but additional samples would be required to meet statistical adequacy as detailed under the Methodology section of this report.

Table 7 SAMPLE ADEQUACY

Vegetation Parameter	$\bar{x}$	s	n	n_{min}
Total cover	42.5%	9.7	15	9
Shrub Density	3.67 ft	2.07	40	52

Precipitation

Precipitation received in the region of the Blackhawk Mine in the ten months prior to the August, 1986 sampling exceeded the 30 year average as is demonstrated in Table 8. Therefore, the sampling was conducted during a normal or above normal precipitation year.

Table 8 PRECIPITATION (INCHES) IN COALVILLE, UTAH

	Actual Ppt. 1985-86	30 yr. Average Annual Ppt.
October	2.25	1.27
November	3.32	1.35
December	0.68	1.35
January	0.74	1.28
February	2.82	1.10
March	1.82	1.35
April	3.92	1.83
May	2.18	1.58
June	0.47	1.12
July	1.71	0.83
August	-	0.95
September	-	1.03
TOTAL	18.91	15.04

Threatened and Endangered Species

There are no known threatened or endangered plant species occurring in the area of the Blackhawk Mine, nor are there any species under consideration for listing as such (L. England, personal communication, Sept. 3, 1986).

Wildlife Habitat

This discussion is limited to those species of special significance such as economically or aesthetically important wildlife.

The mountain shrub complex herein described provides habitat for a variety of wildlife, most significant of which is mule deer (Odocoileus hemionus). The area lies within the bounds of critical winter range for this species (Mr. George Wilson, personal communication, Sept. 3, 1986). During periods of light to moderate snowfall mule deer could be expected to make heavy use of the mountain shrub complex for both forage and cover. During periods of extremely heavy snowfall, snow accumulations on these northerly exposures may force deer to more marginal areas as was the case during the winter of 1983. Bitterbrush observed during this investigation was heavily hedged and numerous mule deer pellet groups were noted in the area. Elk (Cervus elaphus) could also be expected to utilize the mountain shrub complex as transitional or limited winter range, but not to the same extent as deer. Moose (Alces alces) would be expected to make occasional use of this habitat.

Riparian vegetation along Chalk Creek north of the mine site could be expected to be used by bald eagle (Haliaeetus leucocephalus) during winter and the entire area supplies habitat, both nesting and hunting, for a variety of raptors.

REFERENCES CITED

Cottam, G. and J. T. Curtis. 1956. The use of distance measures in phytosociological sampling. Ecology 37(3):451-460

England, L. U.S. Fish and Wildlife Service, Threatened and Endangered Species Team, Salt Lake City, Utah. Personal communication to M. Boucek, Sept 3, 1986.

U.S.D.A. Forest Service. 1977. Intermountain range plant names and symbols. General Technical Report INT-38. 82pp.

Utah State Dept. Agriculture. 1986. Utah agricultural statistics. 103pp.

Wilson, G. Utah Division Wildlife Resources, Northern Regional Resource analyst, Ogden, Utah. Personal communication to M. Boucek, Sept. 3, 1986.