REVEGETATION COST

ITEM	TIME REQ[1]	EQ. COST[2]	OPERATOR[3]	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

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RECLAMATION
SUMMIT MINERALS, INC. BOND ESTIMATE | BAF 10/27/86

REVEGETATION COST

ITEM	TIME REQ[1]	EQ. COST[2]	DELIVERY[3]	MISCELLANEOUS	UNIT COST[4]	TOTAL COST
TRACTOR	7 DA	35.43/HR	115.50/DA			859
HELPER[5]	2 DA		184.40/DA			369
HELPER[5]	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			3076

TOTAL REVEGETATION COST = $31,227

TOTAL B & G COST = 59,520

90,747

ADD 10%: ENGINEERING AND MONITORING 9,075

RECLAMATION BOND AMOUNT $99,822

(5) FERTILIZER COST: ASSUME $50/TON ALFALFA HAY
$20/AC PHOSPHATE

$$\left(\frac{2\ \text{TON}}{\text{AC}}\right)\left(\frac{\$50}{\text{TON}}\right) + \$20/\text{AC} = \$120/\text{AC FERTILIZER}$$

SEED COST:

SPECIES	RATE (LBS/A)	COST ($/LBS)	TOTAL COST ($/AC)
BLUEBUNCH WHEATGRASS	3	6.00	18.00
SLENDER WHEATGRASS	2	2.20	4.40
MOUNTAIN BROME	2	3.00	6.00
~~KENTUCKY BLUEGRASS~~	0.25	2.00	0.50
NEEDLE & THREAD	2	46.00	92.00 / 120.90
YARROW	0.1	28.00	2.80
LEWIS FLAX	1	5.50	5.50
SILKY LUPINE	1	45.00	45.00
YELLOW SWEET CLOVER	0.5	0.65	0.33
PALMER PENSTEMON	0.5	35.00	17.50 / 71.13
SASK. SERVICEBERRY	2	80.00	160.00
SAGEBRUSH	0.2	45.00	9.00
BITTERBRUSH	3	6.00	18.00
SNOWBERRY	2	50.00	100.00 / 287.00

DRILL COST/ACRE = $479.03/AC
BROADCAST COST/ACRE = 814.56/AC

$$(7.03\ \text{AC})(479.03) + (3.61)(814.56) = \$7266\ \text{TOTAL COST}$$

MULCH COST:

$$\left(\frac{1\ \text{TON}}{\text{AC}}\right)\left(\frac{\$50}{\text{TON}}\right) = \$50/\text{AC MULCH}$$

SEEDLING COST:

ASSUME $2.00/STEM - PRICE INCLUDES COMMODITY, LABOR, SUPERVISION, AND CONTINGENCY.

$$(\$2.00/\text{STEM})(400\ \text{STEMS/AC}) = \$800/\text{AC}$$

NOTE: COSTS AND ASSUMPTIONS VERIFIED PER L. KUNZLER, 10/27/86

(6) TRACTOR HELPER - FEED FERTILIZER INTO SPREADER. OPERATE RANGELAND DRILL - 0.81 DA REQD, USE 2 DA.

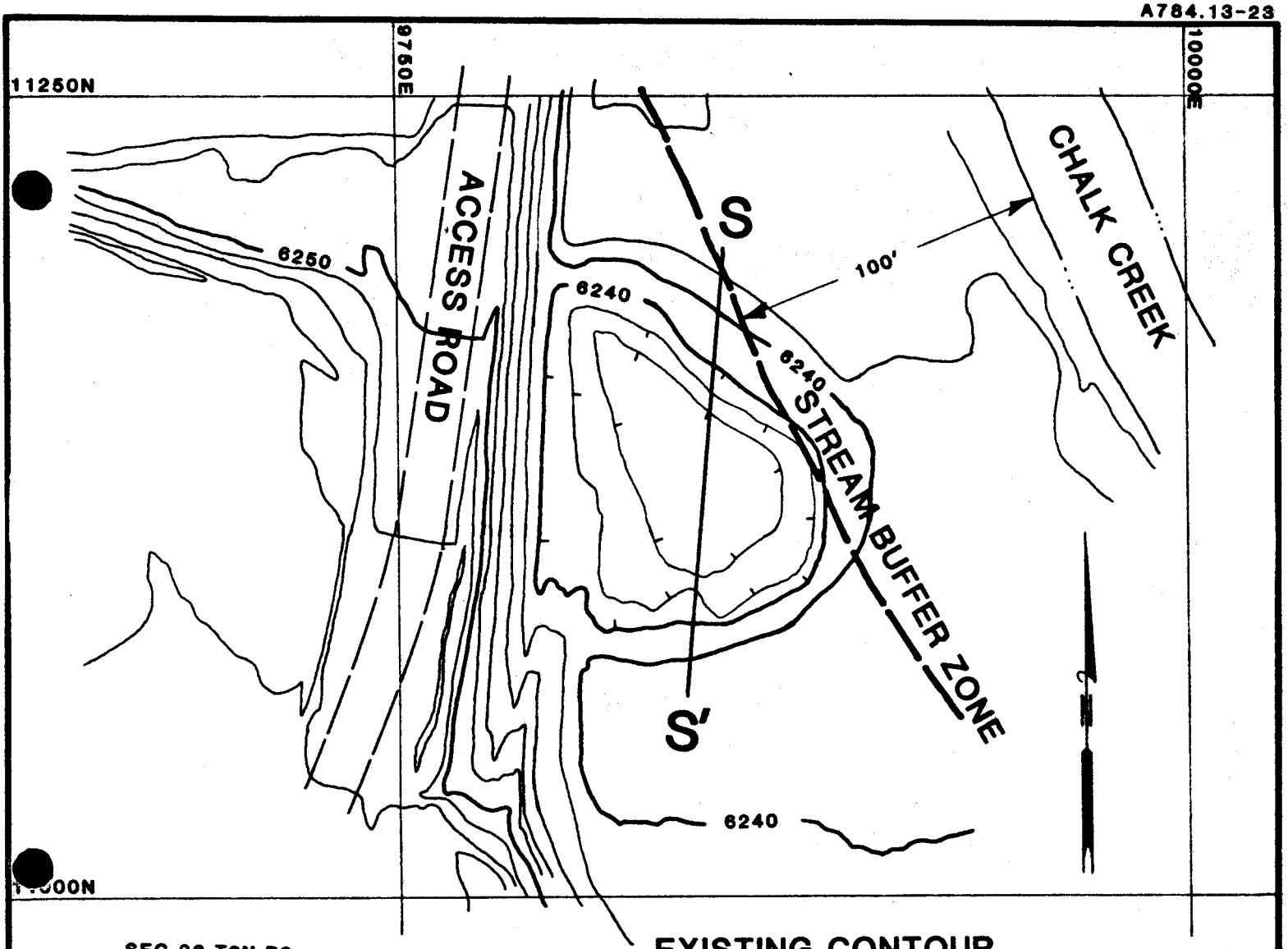
(7) HAYBLOWER HELPER - FEED HAY INTO BLOWER - 2.02 DA REQD, USE 3 DA.

(8) SEE COST DEVELOPMENT, PAGE 16 OF THIS APPENDIX

(9) POLYPROPYLENE NET - $540/ROLL - ONE ROLL COVERS APPROXIMATELY ONE ACRE; $100/AC STAPLE COST - TOTAL NET COST = $640/AC.

NOTE: COST AND ASSUMPTIONS VERIFIED PER L. KUNZLER, 10/27/86

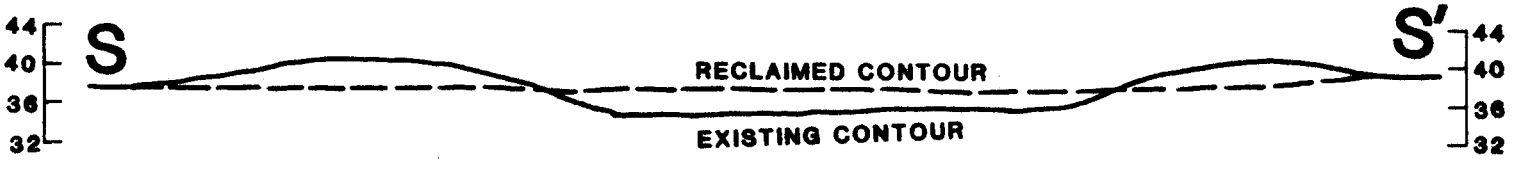
A784.13-23



SEC 36 T3N R6

EXISTING CONTOUR

SCALE: 1" :50'



PROPOSED RECLAMATION PLAN

SCALE: 1" : 20'

THIS DRAWING WAS PREPARED UNDER MY SUPERVISION:

BARBARA A. FILAS — 7007 — 11/7/86 DATE

REGISTERED PROFESSIONAL ENGINEER, UTAH NO. 7007

SUMMIT MINERALS, INC.

EXISTING SEDIMENTATION POND RECLAMATION PLAN

BAF 10/25/86	784.13-2
Scale: As Shown	
Ref. Dwgs.:	

SEDIMENTATION POND RECLAMATION

5208 PCY = 5918 LCY TO MOVE FROM SPOIL PILE

AVG. HAUL DISTANCE ≅ 200 FT

CATERPILLAR D8K BULLDOZER

USING METHODOLOGY DESCRIBED IN "CATERPILLAR PERFORMANCE HANDBOOK", ED. 8, CATERPILLAR TRACTOR CO, PEORIA, IL, OCT, 1977.

FROM CHART: ESTIMATED DOZING PRODUCTION WITH UNIVERSAL BLADE = 670 LCY/HR

JOB CONDITION CORRECTION FACTORS:

- AVERAGE OPERATOR 0.75
- MATERIAL - STOCKPILE 1.20
- EFFICIENCY - 50 MIN/HR 0.84
- GRADE - 10% DOWNHILL 1.14

$$\text{PRODUCTION CORRECTION} = (670\ \text{LCY/HR})(0.75)(1.20)(0.84)(1.14)$$

$$= 577\ \text{LCY/HR}$$

$$\frac{5918\ \text{LCY}}{(577\ \text{LCY/HR})(8\ \text{HR/DA})} = 1.28\ \text{DA}$$

USE: 2 DAYS (TO INCLUDE STRIKING OFF DIVERSION DITCHES)

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DBK: 2 DA @ $895/DA PLUS $28.60/HR OPERATING COST (1)

= $2,247.60

OPERATOR: 2 DA @ $238.80/DA (2)

= 477.60

TOTAL COST = $2,725

NOTE: REVEGETATION COST IS INCLUDED ON PAGE RP-20

(1) 1986 RENTAL RATE BLUE BOOK

(2) 1986 MEANS COST DATA

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RIPRAP REQUIREMENT

STRUCTURE	WIDTH (1) (FT)	DEPTH (2) (FT)	LENGTH (3) (FT)	RIPRAP REQT (4) (CY)
DITCH NO 1	1	1	480	30
DITCH NO 2	2	1.5	1075	93
DITCH NO 4	1	1	370	23
SPILLWAY	2	1	55	4
APRON	SEE DWG. P. HE-23 OF HYD. APDX			13
				163 CY

163 CY @ 21.00/CY (5) = $3,423 RIPRAP COST

(1) DITCHES - BOTTOM WIDTH

(2) DITCHES - DITCH DEPTH ; RIPRAP SURFACE = $2\sqrt{2D}+D$ FOR 2:1 SIDE SLOPES ON ALL DITCHES

(3) SEE PAGE HE-17 OF HYDROLOGIC EVALUATION APPENDIX AND DRAWING NO. 784.23-4.

(4) ASSUMES D_{50} = 3" AND RIPRAP THICKNESS IS $1.5\,D_{50}$ = 0.375 FT.

(5) 1986 MEANS COST DATA

PAGE NO. 1 - 12/1986

REVEGETATION APPENDIX

REVEGETATION PLAN FOR THE RECLAMATION OF THE SUMMIT NO. 1 COAL MINE

REVEGETATION PLAN FOR THE RECLAMATION OF THE SUMMIT NO. 1 COAL MINE

submitted to

SUMMIT MINERALS, INC.

Salt Lake City, Utah

prepared by

MARY M. BOUCEK
Wildlife & Reclamation Biologist
7001 Emigration Canyon Road
Salt Lake City, Utah

October 1986

TABLE OF CONTENTS

APPLICABLE REGULATORY CROSS INDEX

LIST OF TABLES

The following revegetation plan for the reclamation of the Summit No. 1 Coal Mine has been formulated pursuant to the requirements of UMC 784.13 (b)(5), 817.100 and 817.111-.117, Utah Coal Mining and Reclamation Permanent Program and according to the Division of Oil, Gas and Mining's Draft Revegetation Guidelines for the Utah Coal Regulatory Program. This plan has been designed to achieve a permanent, diverse and effective vegetation cover on the 14 acre disturbed area of the mine site in order to realize the designated post mining land use as wildlife habitat and grazing land.

I. REVEGETATION SCHEDULE

Contemporaneous Reclamation

In order to control erosion and enhance soil viability, all areas requiring contemporaneous reclamation will be seeded during the appropriate planting time following disturbance, either late fall (October 1 until snow cover) or spring (after snow melt until June 1). Examples of such areas requiring contemporaneous reclamation are waste banks, road cuts and fills, embankments, outslopes, temporary diversion ditches and drainage ways (not riprapped). Species to be used in interim reclamation are discussed under Section III of this report.

Final Reclamation (UMC 784.13 (b)(5)(i) and UMC 817.113)

Following cessation of mining, removal of facilities and final recontouring/regrading of the disturbed area, the seedbed will be prepared during the fall, within one week prior to seeding. Seeding will occur during mid October. It is anticipated that seedbed preparation, planting and mulching will take approximately two to three weeks and will be completed by the end of October.

Shrub seedlings will be planted the following spring, immediately after winter snows have melted. Spring planting will take approximately two to three weeks and should be completed by May 15.

II. SEEDBED PREPARATION

Contemporaneous Reclamation

The soil surface for these areas will be scarified by hand prior to seeding. No fertilizers or soil amendments are planned unless visual inspection (see Monitoring) indicates that interim vegetation is not becoming well established.

REV. 4/15/87

The following revegetation plan for the reclamation of the Summit No. 1 Coal Mine has been formulated pursuant to the requirements of UMC 784.13 (b)(5), 817.100 and 817.111-.117, Utah Coal Mining and Reclamation Permanent Program and according to the Division of Oil, Gas and Mining's Draft Revegetation Guidelines for the Utah Coal Regulatory Program. This plan has been designed to achieve a permanent, diverse and effective vegetation cover on the 14 acre disturbed area of the mine site in order to realize the designated post mining land use as wildlife habitat and grazing land.

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Following cessation of mining, removal of facilities and final recontouring/regrading of the disturbed area, the seedbed will be prepared during the fall, within one week prior to seeding. Seeding will occur during mid October. It is anticipated that seedbed preparation, planting and mulching will take approximately two to three weeks and will be completed by the end of October.

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Final Reclamation (UMC 784.13 (b)(5))

Currently it is anticipated that in situ soil material will be suitable for reestablishment of a diverse and effective native vegetation cover. Please see section 783.21 of the Reclamation Plan. After final regrading of the disturbed area, the soil surface will be ripped on the contour to a depth of approximately 18 inches utilizing a D-9 Cat and ripper. Ripping will break up compacted soil allowing for improved water infiltration, drainage and root penetration. Following the addition of recommended soil nutrients and fertilizers (section 783.21), the soil surface will be disk-harrowed on the contour utilizing standard farm machinery. This will mix soil amendments with the soil as well as create a favorable, roughened surface for seed reception. As the majority of the area to be reclaimed will consist of final grades less than 15% (plate 784.23-2), and in view of the favorable precipitation received on the site (≥ 16 inches), additional physical manipulation of the soil surface (gouging, pitting, contour furrowing) is not planned. On steeper slopes (>15-20%) where use of machinery may be limited, soil will be loosened and the seedbed will be scarified by hand prior to seeding.

III. SPECIES SELECTION

Contemporaneous Reclamation

Species to be used for interim stabilization are presented in Table 1. 10.4 pounds per acre application (pure live seed) of these species will yield about 63 seeds per ft2.

Table 1. TEMPORARY SEED MIX FOR INTERIM RECLAMATION

Species	Rate (PLS per acre)
Agropyron dasystachyum Thickspike wheatgrass	7
Melilotus officinalis Yellow sweetclover	3
Poa pratensis Kentucky bluegrass	0.4

Final Reclamation (UMC 784.13 (b)(5)(ii), UMC 817.111,.112,.117)

Species to be used for final seeding of the disturbed area are presented in Table 2. All species selected are native and found in undisturbed areas surrounding the mine site (See section 783.19 , Vegetation Report) with the exception of Kentucky bluegrass (Poa pratensis) and yellow sweetclover (Melilotus officinalis). Kentucky bluegrass is one of the major components of the herbaceous understory in the reference area and yellow sweetclover has been selected due to its rapid establishment, nitrogen-fixing capability and low persistence. The remainder of the native species have been selected for use due to their compatibility with the surrounding area and their ability to achieve the postmining land use of wildlife habitat and grazingland.

Five woody plant species (Table 3) have been selected for seedling transplant to enhance shrub establishment. As with the seeded species, these native seedlings have been selected on the basis of their compatibility with surrounding undisturbed communities, as well as their ability to achieve the desired postmining land use.

Seeding rates in Pure Live Seed (PLS) are also presented for each species in Table 2, as well as the percentage of the total mix that is comprised by each species and life form group (based on seeds per ft2). Rates indicated (19.55 lbs PLS per acre; 74 seeds per ft2) are for drill seeding, which will be done on the majority of the reclaimed area. Where seed is to be broadcast, the rates for grasses and forbs will be doubled (24.7 lbs per acre; 115 seeds per ft2) and the shrub seeding rate will be increased by a factor of 1.5 (14.4 lbs PLS per acres; 26 seeds per ft2).

The transplant stocking rate (containerized stock) will be 400 shrubs per acre. Due to the fairly evenly dispersed occurrence of shrubs in the surrounding undisturbed area (see section 783.19) all shrub seedlings will be planted in an evenly distributed manner on 10.5 ft. centers with the exception of gambel oak (Quercus gambelii), which will be clumped in groups of 25 seedlings (4 groups per acre) on slopes >15%. On these steeper slopes, the three additional shrub species will be evenly distributed on 12 ft. centers. Exact placement of the oak clumps will be determined in consultation with the Division of Oil, Gas and Mining prior to planting. Mountain big sagebrush (Artemisia Tridentata vaseyana) will be evenly planted on slopes <15% in place of gambel oak, along with the three other shrub species.

Although the shrub density in the reference areas is +11,000 shrubs per acre (>1 ft. in height), this is not a realistic or economical standard for reestablishment. Further, research has

Table 2 SEED SPECIES FOR FINAL RECLAMATION, SUMMIT MINERALS NO. 1 COAL MINE

Species	Pounds/acre † Drilling Rate (PLS)	Seeds/ft^2	percent*
GRASSES			
Agropyron spicatum Bluebunch wheatgrass	3	7	9
A. trachycaulum var. primar Slender wheatgrass	2	7	9
Bromus marginatus Mountain brome	2	4	5
Poa pratensis Kentucky bluegrass	0.25	12	16
Stipa comata Needle & thread grass	2	5	7
	9.25	35	47
FORBS			
Achillea millefolium Yarrow	0.1	6	8
Linum lewisii Lewis flax	1	6	8
Lupinus sericeus Silky lupine	1	0.3	0.4
Melilotus officinalis Yellow sweetclover	0.5	3	4
Penstemon palmeri Palmer penstemon	0.5	7	9
	3.1	22.3	30

Table 2 CONTINUED

Species	Pounds/acre † Drilling Rate (PLS)	Seeds/ft2	percent*
SHRUBS			
Amelanchier alnifolia Saskatoon serviceberry	2	2	3
Artemisia tridentata vaseyana Mountain big sagebrush	0.2	11	15
Purshia tridentata Bitterbrush	3	1	1
Symphoricarpos oreophilus Snowberry	2	3	4
	7.2	17	23
Total	19.55	74.3	-

† Broadcast rate will be 2 X for grasses and forbs and 1.5 X for shrubs.

* Percentage calculated on the basis of total seeds per ft2.

Table 3 SHRUB SEEDLINGS FOR FINAL RECLAMATION, SUMMIT MINERALS NO. 1 COAL MINE

Species	Rate per acre	Spacing
Amelanchier alnifolia Saskatoon serviceberry	100	10.5'
Artemisia tridentata vaseyana* Mountain big sagebrush	100	10.5'
Cerococarpus montanus True mountain mahogany	100	10.5'
Purshia tridentata Bitterbrush	100	10.5'
Quercus gambelii † Gambel oak	100	clumped

* This species will be planted on gentle slopes, <15%

† This species will be planted in clumps of 25 at upper reaches of reclaimed area on slopes >15%. Spacing for the three shrubs to be evenly distributed will then be on 12' centers.

indicated that reduction of gambel oak density increases wildlife use in dense gambel oak communities (Kunzler 1980 and as reported by Harper et.al. 1985). Therefore, a shrub density standard of 2000 viable shrubs per acre over 1 ft. in height is proposed. On fairly gentle slopes of northerly exposure in a favorable precipitation zone, fair success should be achieved through shrub seeding (+740,000 shrub seeds per acre will be planted). Assuming 0.2 to 0.3% survivability from seeding, and supplementation by planting 400 shrub seedlings per acre, the 2000 shrub per acre standard should be met within the 10 year bond release period. Natural shrub increase and invasion will also enhance post mining shrub density. This standard is a realistic goal for achieving the post mining land use of wildlife habitat and grazingland.

IV. SEEDING/PLANTING METHODS

Contemporaneous Reclamation

For interim revegetation, seed will be broadcast by hand or by use of a cyclone broadcast seeder. Seeded areas will then be hand raked to cover the seed with soil.

Final Reclamation (UMC 784.13 (b)(5)(iii), UMC 817.111)

On slopes less than 15% grade, seeding will be accomplished by use of a rangeland drill, seeding on the contour. Approximately 9.03 acres (71.4 % of the reclaimed area - see dwg. no. 784.23-2) will be seeded using this method. If, however, attempts to drill seed are found to be impractical or ineffective during actual revegetation, these areas will then be broadcast seeded using standard farm machinery at the previously indicated broadcast rate. On slopes greater than 15% where machinery access is limited, seed will be broadcast using a cyclone spreader. These areas comprise 28.6 % of the total area to be reclaimed (3.61 acres).

Where broadcast seeding is used, seed will be covered with soil using standard machinery (on slopes <15%) or will be hand raked (on slopes >15%).

Shrub seedlings will be comprised of containerized stock and will be hand planted. As previously discussed, all species will be planted on approximate 10.5' centers with the exception of gambel oak, which will be clumped in groups of 25 on slopes >15% (4 groups per acre). Mountain big sagebrush will replace the gambel oak on slopes <15% and will be evenly distributed on 10.5' centers as will the other shrub species.

REV. 12/19/86

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V. MULCHING

Contemporaneous Reclamation

All temporary revegetation areas will be mulched using an aged native hay mulch at a rate of 2000 pounds per acre. On steep cuts (>20%), polypropylene netting will be laid over the hay mulch and stapled in place to stabilize the slope and anchor the mulch. On slopes <20%, the mulch will be hand crimped.

Final Reclamation (UMC 784.13 (b)(5)(iv), UMC 817.114)

Immediately following seeding, all areas will be mulched with aged native hay at a rate of 2000 pounds per acre on slopes <15% and 3000 pounds per acre on slopes >15%. Mulch will be mechanically crimped into the soil using standard machinery on slopes <15%. Polypropylene netting, stapled in place, will be used to anchor the mulch on the steeper slopes (>15%).

As previously discussed, physical manipulation of the soil surface is not planned during final reclamation.

VI. IRRIGATION (UMC 784.13 (b)(5) (v))

The area surrounding the Summit No. 1 Coal Mine receives about 16 inches precipitation per year on the average. This is sufficient to reestablish vegetation without supplemental watering. Therefore, no irrigation is planned during either interim or final reclamation.

VII. MONITORING

Contemporaneous Reclamation

All areas that have undergone temporary revegetation will be monitored on a reconnaissance or qualitative basis. Though casual observations will undoubtedly occur periodically during the growing season when problems may be noted, these areas will be formally monitored once per year during July when the following observations will be noted:

- species composition and survivability
- utilization of vegetation (by species) by wildlife or livestock
- erosion and problem areas (e.g. insect damage, weeds, poor plant development and potential need for fertilization and/or supplemental seeding)
- special conditions

Results obtained from these qualitative observations will be submitted in an annual monitoring report to DOGM during ongoing mining activities and will be used to evaluate contemporaneous reclamation success and make any necessary amendments.

Final Reclamation (UMC 784.13 (b)(5)(vi), UMC 817.116, UMC 817.117)

All permanently reclaimed/revegetated areas will be qualitatively assessed on an annual basis during July of each year after the first fall planting. Observations noted as per contemporaneous reclamation monitoring will be noted during the yearly qualitative monitoring of final revegetated areas. The reference area will also be qualitatively assessed each year during the 10 year bond release period.

In addition to the yearly qualitative assessment, final revegetation will also be accomplished quantitatively on a periodic basis as indicated in Table 4. Quantitative monitoring will be conducted during mid-July of each year as indicated.

TABLE 4 FINAL RECLAMATION - QUANTITATIVE MONITORING SCHEDULE

	Year									
Reclaimed Area	1	2	3	4	5	6	7	8	9	10
Cover		X	X		X				X	X
Frequency		X	X		X				X	X
Shrub Density		X	X		X				X	X
Transplant Survival	X*	X	X							
Productivity									X	X
Reference Area										
Cover					X				X	X
Frequency					X				X	X
Shrub Density					X				X	X
Productivity									X	X

* This assessment will be made the first fall after the spring planting (late September) and in July thereafter, concurrent with other quantitative assessments.

Monitoring methodology will be as follows:

- During Year 2, sample points will be randomly located along transects designed for even coverage of the reclaimed area. These will be permanently marked using rebar stakes and survey flagging and their locations mapped. After establishment, the same sample points will be utilized thereafter during the bond release period. Sample points within the reference area will be randomly located during Year 5 and marked as per sample points in the reclaimed area.

- Cover will be determined utilizing 1m2 square quadrats. Cover by species, major life form group and total vegetation cover will be recorded, as will cover by major ground surface category (rock, litter, bareground).

- Frequency will be determined from cover data species encountered within each quadrat.

- Shrub density will be determined by use of the point centered quarter method (utilizing the center of each 1m2 quadrat).

- Transplant survivability will be quantitated by permanently tagging every 10th shrub seedling planted. These will be tagged when planted and a wooden stake will be driven next to each plant. Survival of each marked shrub will then be recorded during Years 1, 2 and 3 of the bond release period.

- Productivity will be quantitated during Years 9 and 10 by clipping each 1m2 quadrat after cover data have been recorded. This will be accomplished as outlined in Appendix 1 of the DOGM Vegetation Information Guidelines for Permanent Program Submissions for Coal Mines.

Data from each year's qualitative and quantitative assessments will be formulated into an annual report for submittal to the regulatory authority. Following Year 3 data collection and interpretation, it will be determined in consultation with DOGM if augmented seeding or additional shrub transplants are necessary. (See Contingency and Maintenance Plans.)

Though statistically adequate sampling may be achieved prior to Year 9 (meeting a 90% statistical confidence level), this will not be a goal until Years 9 and 10. At that time, a statisti-

cally adequate number of samples will be taken regarding cover, density and productivity in both the reclaimed and reference areas. It is the goal of this sampling, and subsequent bond release, to demonstrate that the reclaimed area is at least 90% of the reference area standard with regards to cover and productivity, with 90% confidence, and that the shrub density standard of at least 2000 viable shrubs per acre has been achieved.

VIII. CONTINGENCY AND MAINTENANCE PLANS

Contemporaneous Reclamation

Through yearly monitoring of all areas revegetated under interim reclamation, problems will be identified and corrected. As indicated in Section VII, Monitoring, several observations will be noted annually. Correction of problems related to erosion (rills and gullies), weed control, disease/pest control and lack of vegetation establishment will occur on contemporaneously reclaimed areas and are further discussed in the following section.

Final Reclamation

Annual qualitative and periodic quantitative monitoring of the revegetated areas and notation of observations as indicated under the Monitoring Section will identify actual and potential problems. Both qualitative and quantitative monitoring will be conducted by a qualified biologist or range conservationist. Should problems such as those outlined below be identified, these will be repaired and/or controlled as appropriate, in consultation with the Division of Oil, Gas and Mining.

1. Rills and Gullies

   Erosion problems will be identified through qualitative monitoring and will be repaired by hand due to probable limited access by machinery. Repair will occur immediately following identification of the problem. Should severe erosion due to a catastrophic precipitation event occur, DOGM will be immediately contacted for consultation and the need for augmented seeding will be assessed.

2. Disease/Pest Control

   The need for such measures will be identified through yearly monitoring. Following consultation with DOGM, approved chemical control will be implemented and the need for augmented seeding will be assessed after the following year's monitoring period. No persistent pesticides will be employed without prior approval from the Division.

3. Weed Control

Currently, disturbed areas in the vicinity of the mine have been invaded by thistle (Cirsium spp.). It is anticipated that this may be a problem during revegetation. Should this be indicated through monitoring during Years 1 and 2, and following consultation with the Division, spot spraying with 2, 4-D will be conducted during the late summer of Years 1 and 2. Annual spot spraying will continue thereafter should the problem persist. The need for augmented seeding in treated areas will also be assessed after the following year's monitoring period.

4. Overgrazing and/or Animal Depredation

Currently, the only domestic livestock grazing in the vicinity of the mine is by trespass sheep. Should monitoring during Year 1 indicate that grazing is retarding vegetation establishment, the reclaimed area will be fenced. Fencing will remain in place through bond release or prior to that if vegetation has become sufficiently established to withstand grazing pressure.

Should monitoring indicate that wildlife depredation is adversely affecting establishment of vegetation, particularly shrubs, Summit Minerals, Inc. will immediately consult with the Divisions of Oil, Gas and Mining and Wildlife Resources to determine which methods of prevention are suitable and practical for the problem. Implementation of recommended methods (e.g. fencing, protection of individual shrubs with netting, baiting for small mammals, etc.) will follow.

5. Lack of Vegetation Establishment

Periodic monitoring of contemporaneously reclaimed areas will serve to detect those sites in need of additional seeding and/or fertilizing. This will be done during the first appropriate planting season following detection.

Following final revegetation, yearly monitoring may indicate the presence of areas where vegetation growth is appreciably retarded (not due to problems as indicated above). Should this be the case, augmented seeding, and/or shrub planting will be conducted during the first appropriate season after Year 3 monitoring data have been assessed, in consultation with DOGM. It is understood that this may necessitate additional soil testing and application of amendments.

As previously indicated, the reference area will be qualitatively assessed annually. Should this monitoring detect degradation of the reference area through animal depredation or overgrazing, the area will be fenced. In addition, should the reference area show deterioration due to other causes (e.g. disease, natural erosion, etc.), DOGM will be contacted for the appropriate course of action.

REFERENCES:

Harper, K. T., F. J. Wagstaff and L. M. Knuzler. 1985. Biology and mangement of the gambel oak vegetative type: a literature review. U.S.D.A. Forest Service, General Technical Report INT-179. 31pp.

Kunzler, L. M. 1980. The biology and management of gambel oak in Utah. Masters Thesis, Brigham Young University, Provo, Utah. 99pp.

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.

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.

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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. - settable Dissolved

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 dissolved 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. 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.

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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.

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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 ty, and it will be minimized as described in part (b) of this section.

It is 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 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. Because the Operator cannot affect the quantity of surface water flow, the monitoring of water quantity is not a part of this plan. 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.

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. Results of this water monitoring program will be provided to the Division annually.

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.

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. Underground mine workings, done by a previous owner/operator, were excavated in the late 1970's. To date there has been no known discharge from the abandoned mine openings, and therefore hydraulic heads are not anticipated.

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:

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

TABLE 784.14-1

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

TABLE 784.14-1

SURFACE WATER BASELINE QUALITY PARAMETER
Monitoring Frequency: Four Times Per Ye

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

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:

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 (FT) (4)	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.

WATER-SHED (4)	AREA (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		5.6 (6)	90	0.178 (10)	9.59 @ 12.53	13.31 @ 12.53

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

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

(9) WEIGHTED CURVE NUMBER:

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

(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 ($S = \frac{1000}{CN} - 10$)	$Q_{10\text{-}24}$ (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	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, C.T. 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: $\frac{(467.45\ T/YR)(3\ YR)(2000\ LB/T)}{100\ LB/FT^3\ (18)} = 28047\ CU\ FT$

$\frac{28047\ CU\ FT}{(43560\ CF/AC)(12.87\ AC)} = 0.050\ A\text{-}F/AC$ $\frac{OH}{817.46(6)(2)}$ 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) $\lambda_A = 725$, $\chi_A = \sin\left(\tan^{-1}\frac{61.1}{100}\right)$; $\lambda_{C\text{-}C'} \tilde{=} 1039$, $\chi_{C\text{-}C'} \tilde{=} \sin\left(\tan^{-1}\left(\frac{6420-6255}{1039}\right)\right)$
↑ SLOPE OF $\lambda_{C\text{-}C'}$

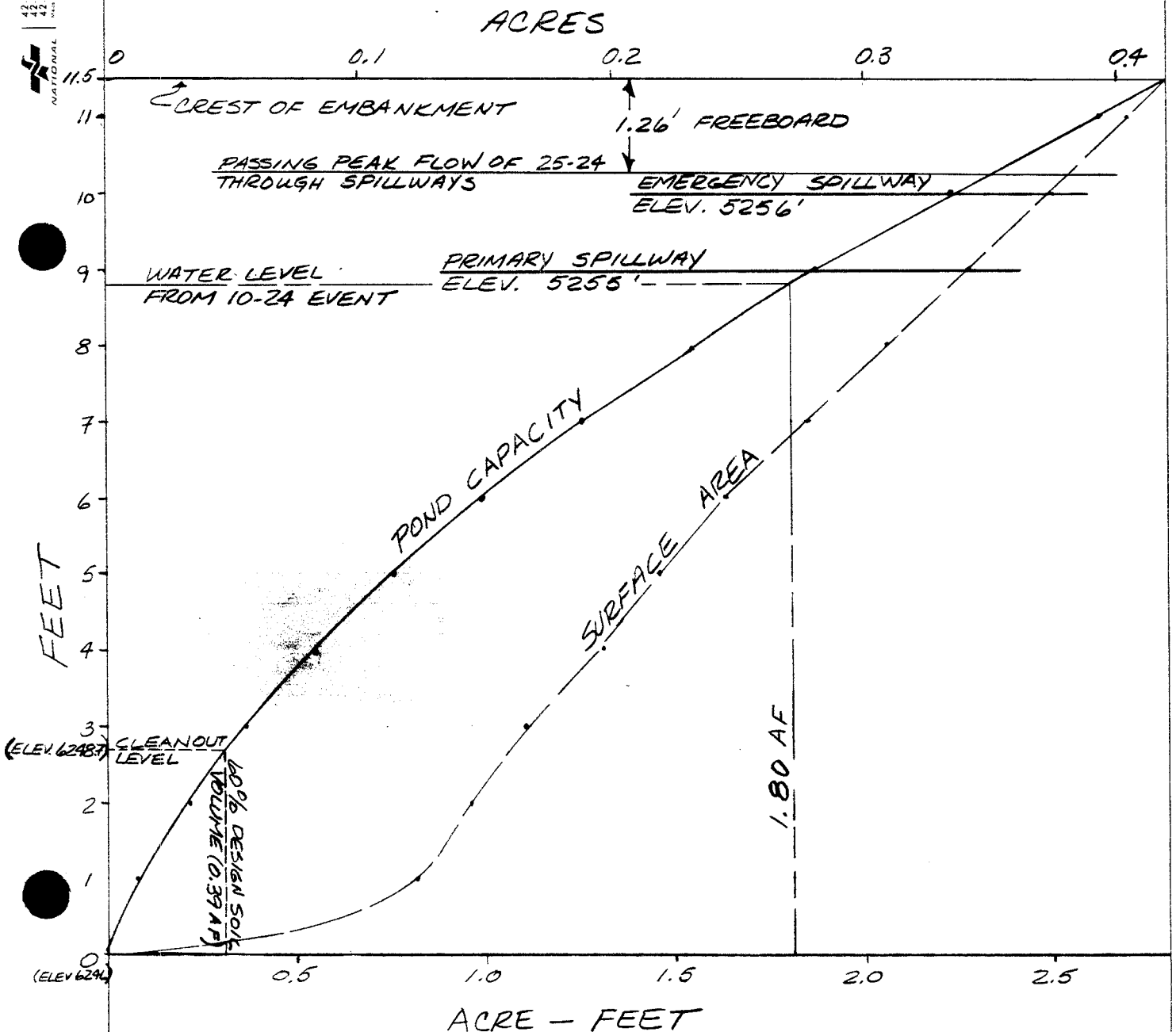
SEDIMENTATION POND ADEQUACY

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 ADEQUATELY 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, RC WARNER AND CT HAAN, 1981, CHAPTERS 3 AND 4. FIGURES, TABLES, AND PAGE NUMBERS CITED IN THIS SECTION ARE FOUND IN THIS REFERENCE — UNLESS OTHERWISE NOTED.

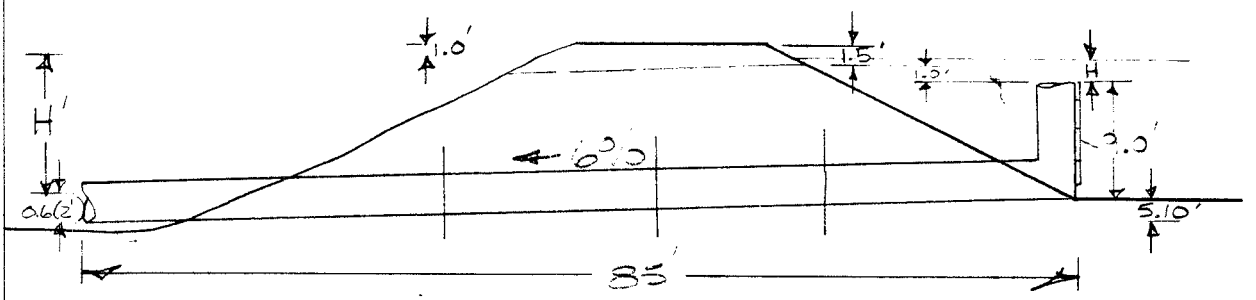
(18) SURFACE MINING, E.P. PFLEIDER, ED, 1968, TABLE 8.3-1, P. 466 FOR "WET LOAM".

CREST ELEV. = 5257.5' BOTTOM ELEV. = 5246.0'

EMERGENCY SPILLWAY ELEV. = 5256.0'

PRINCIPAL SPILLWAY ELEV. = 5255.0'

MAX. WATER ELEV. = 5256.5'



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)

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

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 : $Q = \frac{A(2gH')^{1/2}}{(1+K_e+K_b+K_c L)^{1/2}}$ (p 232, EQ^N 4.4)

WHERE A = AREA = 1.77

g = GRAV. CONST. = 32.2

K_e = ENTRANCE LOSS = 1.0 (p. 232)

K_b = BEND LOSS = 0.5 (p 232)

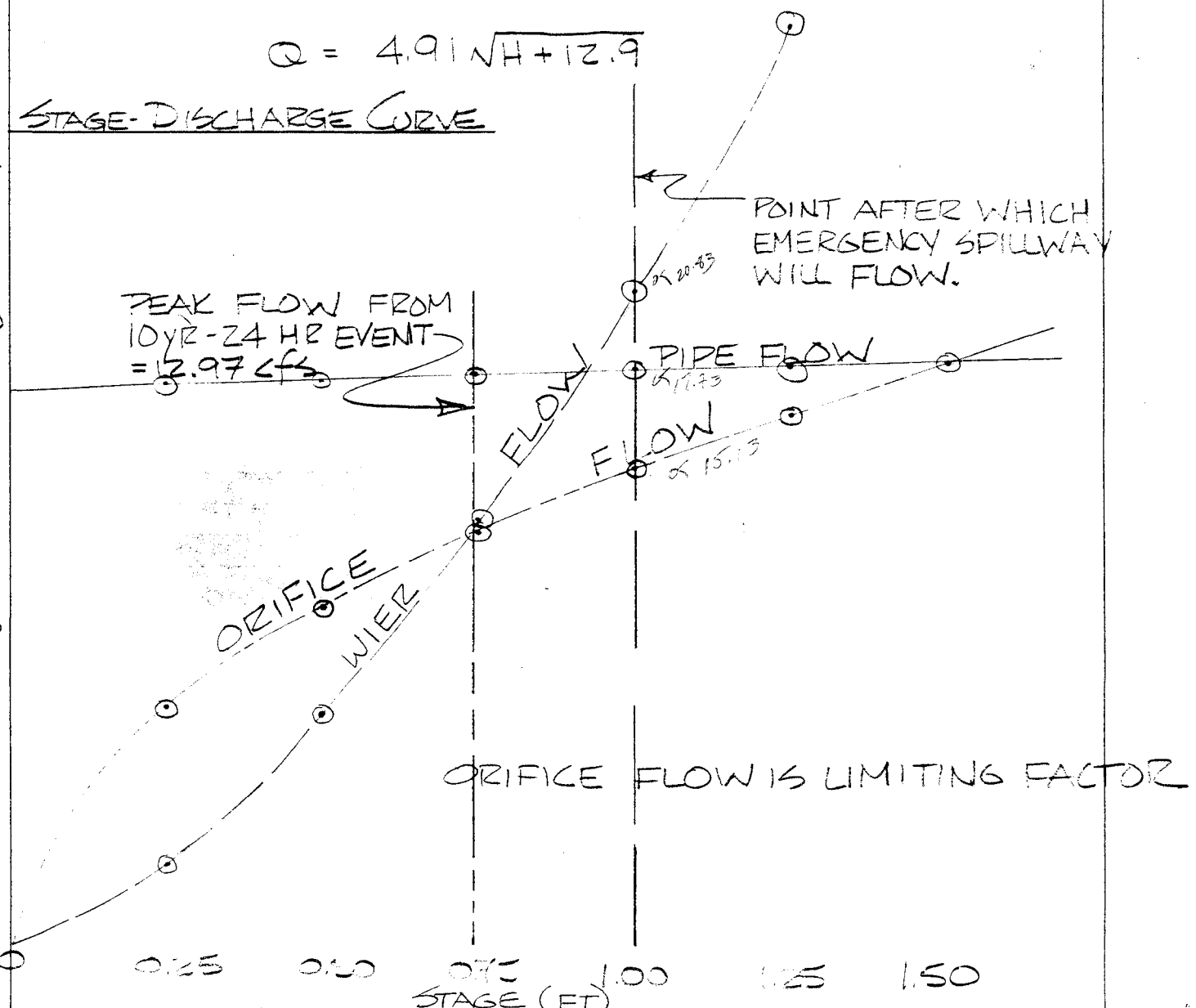
K_c = FRICTION LOSS = 0.0621 (TAB 4.1, AT 18" Ø PIPE & η = 0.024)

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

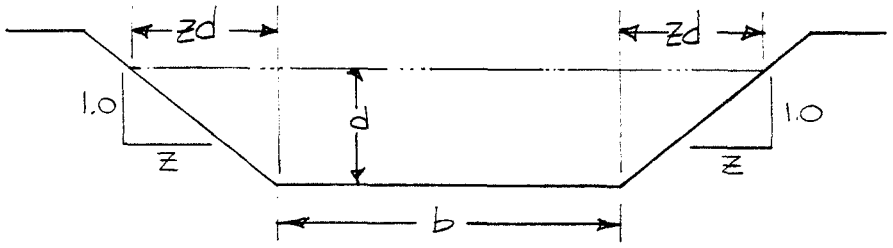
EMERGENCY SPILLWAY WILL BEGIN TO FLOW AT H = 1.0 FT.

MANNING 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%)
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 → $Q_{25\text{-}24\ PEAK}$ = 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. 784.234 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 PEAK = 1.10 cfs (10-24)

(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: $b = 2.0$
$z = 2.0$
$S = 0.015$
$n = 0.0314$ (21)

$Q_{PEAK\ 10\text{-}24} = 9.59$ 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 FORDED 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.

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

incorrect but 1" less capacity of 9.1 cfs

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

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	0.034 [21]	0.025 [22]	0.034 [21]

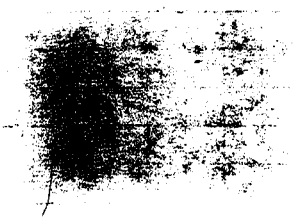
$Q_{PEAK\ 10\text{-}24}$ = 3.38 cfs (SEE p. 4 OF THIS APPENDIX.)

MANNING EQ^N:

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)
No1-STEEP	5.22	4" (23)
No1-TRANS	3.75	2" (23)
No1-FLAT	2.36	— (24)
No. 2	3.61	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 784.23-2, 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 784.164, SEC 784.16). THIS ROAD HAS BEEN IN THIS LOCATION FOR MANY YEARS AND APPEARS TO BE WELL STABILIZED. PONDS FOR CONTAINING RUNOFF FIZOM THESE AREAS WOUUD 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, WAIZNER & 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:

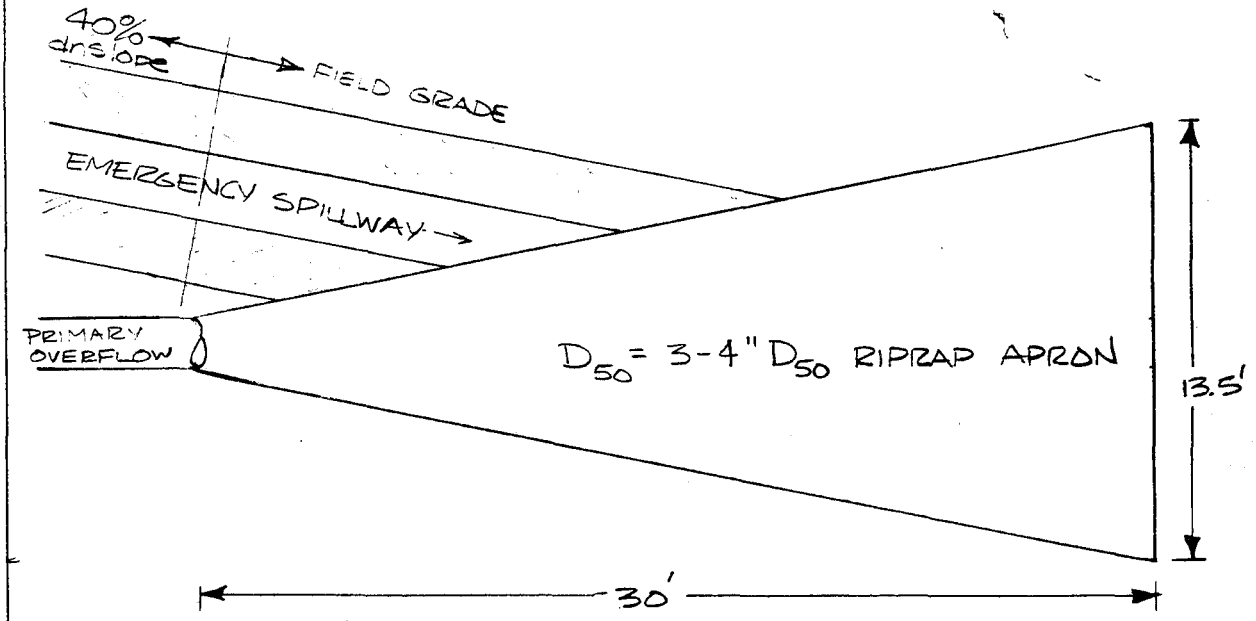
b = BOTTOM WIDTH = 2.0 FT
z = SIDE SLOPE = 2:1
S = SLOPE = 0.40
η = 0.0352 (AT 6" = D_{50} RIPRAP (19))

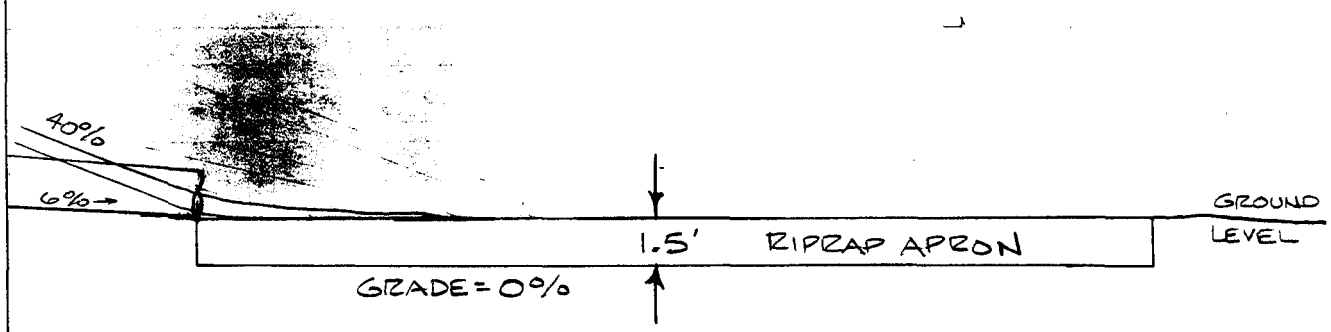
Q = 2.32 cfs WHEN $d \cong 0.15$ FT AND $V \cong 6.84$ fps

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

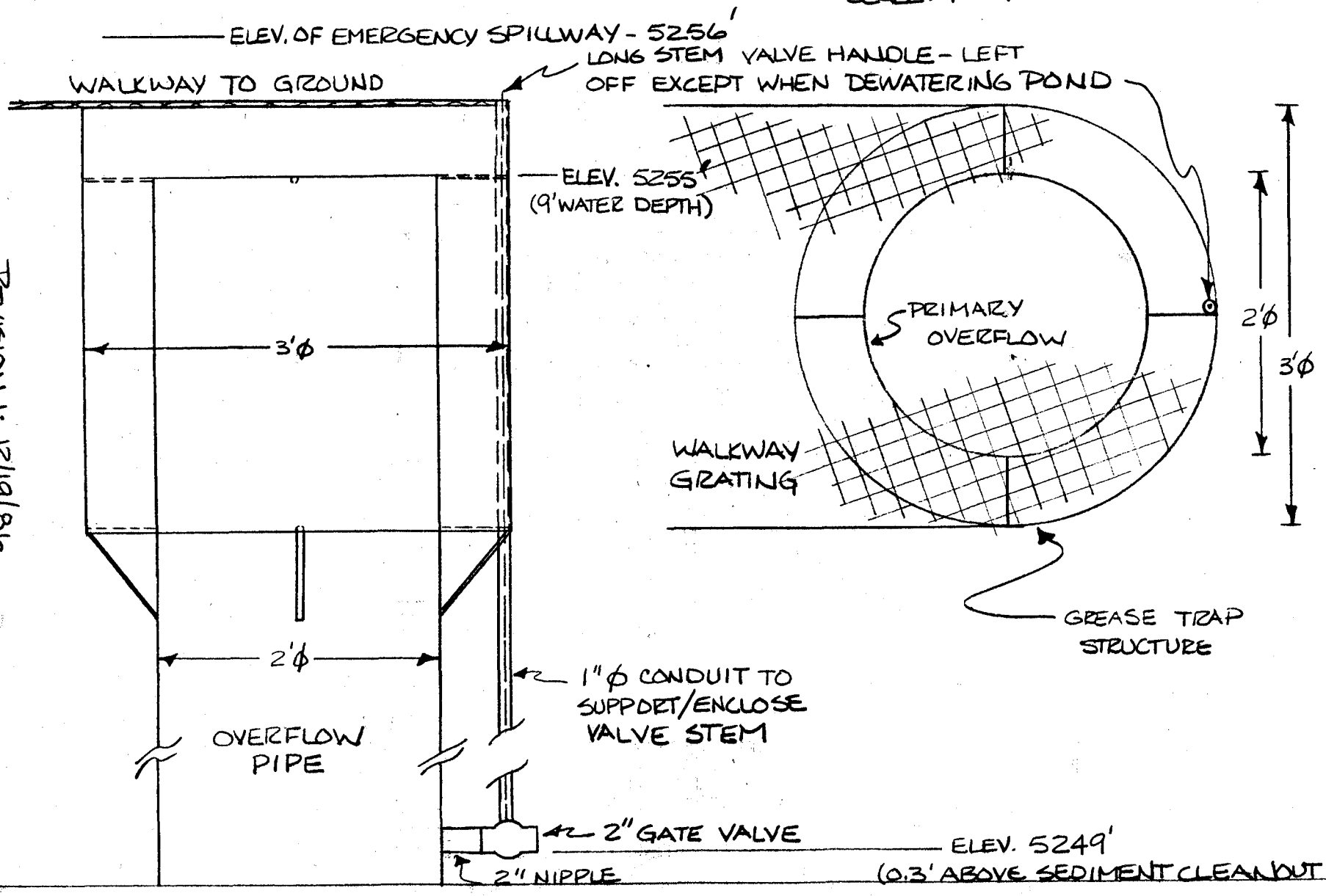
SCALE: 1" = 6'





GREASE TRAP/DECANT DETAIL

SCALE: 1" = 1'



REVISION 1: 12/19/86

SUMMIT MINERALS, INC. HYDROLOGIC EVALUATION
SUPPLEMENT TO DEWATERING STRUCTURE DRAWING, P. HE 9
BAF 12/22/86
HE-24

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.

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 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.