from the trommel screen operation. See waste rock disposal plan in the Operation Plan.

Preliminary data from an ongoing stability study of the mine area fill structure by a consultant (Rollins) indicates the fill itself is stable and meets the static safety factor of the regulations. However, the steep slope facing the access road by analysis is determined to be about 1.3 (see Appendix).

Company has interpreted the regulations for this type of fill as being within the stated parameters of the regulations and said structure requires no modification to meet the performance standards of Subchapter "K".

Major facilities supported on the structure are:

1. 150 x 90 foot warehouse shop building
2. 55 x 85 foot warehouse building
3. 70 x 100 foot electrical substation
4. Parking lot
5. Material storage area
6. Railroad trackage
7. Storage bins

All these structures are supported by slabs or shallow foundations which can be readily removed by front-end loaders or bulldozers and are suitable for use as riprap when broken up and placed as channel lining or coarse fill beneath backfilled areas.

Bathhouse/Office Building and Structure

A 75 x 170 foot precast, two-story building constructed in 1978 is situated on the west portion of the developed Deer

Creek Mine area. Its structure was excavated from original premining lands and is unaffected by the parking lot fill.

Coal Handling Facilities and Structures

Coal is delivered about 1300 feet from the mine by a conveyor belt which discharges to a surge pile. The coal is fed to the crusher through a feeder installed in the base of the 50 foot diameter storage structure. Crushed coal is moved by belt through weighing and transfer structures to a delivery belt to the Huntington Power Plant.

Coal crusher station, transfer tower, weigh bin and trommel screen structures are all grouped together near the mouth of Elk Canyon. All have pedestal type footings placed in undisturbed soils. No deep fills were required for final grading. All structures are stable, compacted and hydrologically protected. No modifications are needed to meet provisions of Subchapter "K".

Main Ventilation Fan and Structures

A 500 M CFM fan situated behind the office and bathhouse building occupies a 150 x 200 foot pad excavated from the side of the steep slopes that form Deer Creek Canyon.

The fan sits over a vertical shaft that connects to the main entries of the mine.

Stability has not been measured. The fan and electrical service facilities are located on the cut portion of the pad.

Hydrological provisions include collection, diversion and sediment control through a sedimentation pond.

A small spring diversion is located near the fan (see Map DS202E, Surface Facilities Map). This diversion is only functional from late spring to fall due to severe winter conditions and low spring flow. Some thawing of the winter ice build-up could potentially flow into the disturbed area drainage system during the early spring. However, in recent years observed flows have not been substantial enough to enter disturbed areas. This potential low flow to the sediment pond would not effect the pond's designed capacity.

Auxiliary Fan, ROM Conveyor and Structure

Located adjacent to the south of the ROM conveyor belt, this facility measures about 150 x 50 feet.

Constructed on a rock terrace that was excavated for the conveyor belt line.

Drainage from the pad flows into surface drainage system and into the sediment pond as does the conveyor structure.

Overland Conveyor and Structure

As shown on the mine facilities, the overland conveyor is constructed on steel supports with concrete footings, for the most part, no earthen structures are associated with this facility and requires no hydrological or stability discussion.

Access Road

Access to the mine involves use of a paved county road between State Highway No. 31 and the entrance to the mine area which is marked by a sign posted alongside of the road.

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identifying the mine.

The county road was upgraded in 1989. The project was designed for Emery County by Jones & DeMille Engineering and constructed by Nielson Construction. Plan and profile drawings of the portion of the county road within the mine permit area are found in Volume 7, Map Packets 3-18 and 3-19.

The access road is included in the Emery County road system and is therefore maintained by Emery County. Sediment control (silt fence) was installed, as indicated on said

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drawings, by the mine operator. These will be maintained by the operator until vegetation has been reestablished.

Post-mining land use includes grazing, wildlife habitat and recreation. Therefore, the access road will not be reclaimed other than as discussed in Volume 2 and indicated on Map CM-10545-DR, Packet 4-1.

Historically, the road has been upgraded each time land use or mining activities were implemented. Stability has been proven by its many years of service. The inside and outside edges of the road above the crusher area are protected by conventional corrugated guard rails. Drainage from the road above the crusher area is drained to the sedimentation pond.

Fan Access

A steep unsurfaced road runs up Deer Creek from the changehouse area to a fan and water tank and continues up to the diversion channel inlet. This road also provides access to the south slope terrace areas.

The fan is located upon a platform bulldozed in the north slope of Deer Creek on an area 100 feet by 70 feet. The water tank is situated on a flattened area of 48 by 125 feet at a slightly higher elevation.

Other than visual inspection of the major structures associated with the Deer Creek Mine no specific monitoring is planned.

Company contends that all existing structures meet the performance standards of Subchapter "K" and require no modification.

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At any time a slide occurs which may have a potential adverse effect on health, safety or the environment, the applicant will notify the DOGM immediately by the fastest available means.

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Signs and Markers

Signs and markers shall be designed, installed and maintained to meet the requirements of UMC 817.11. Signs and markers shall be made of durable material, shall conform to local laws and regulations and shall be of uniform design throughout the areas of activity.

A mine permit identification sign, displaying the information required by 817.11(c)(2), shall be posted at each point of access from public roads to areas of surface operations and facilities on the permit area.

Perimeter markers shall be posted to clearly mark the perimeter of all areas affected by surface operations or facilities.

Buffer zone markers shall be posted along streams as required in Section UMC 817.57.

When surface blasting is conducted, blasting signs will be conspicuously placed within the immediate vicinity of the blasting activities.

Topsoil markers shall be placed to clearly identify topsoil or other vegetation-supporting material which has been segregated and stockpiled as required under UMC 817.23.

UNDERGROUND DEVELOPMENT WASTE (784.19)

Introduction

Potential sources of waste rock at Deer Creek Mine are (1) rock slopes and raise construction, (2) entry rehabilitation, and (3) trommel screen reject from the breaker station. Chemical characteristics of waste rock from these sources are similar since rock is taken from roof, floor, or splits of Blind Canyon or Hiawatha Coal Seams during mining. Representative sample analysis of the waste rock is shown in Table 7.

The chemical and physical characteristics of the strata present in the lower Blackhawk Formation which includes rocks immediately above and below the Blind Canyon Seam has been identified by the analyses of over 130 samples (see the original Deer Creek Mine permit application under Overburden - Chemical Composition). These analyses have identified that the floor of the Blind Canyon Seam has a potentially high sodium absorption ratio and the Blind Canyon Seam roof is potentially high in pyrite/marcasite. No other abnormally high readings were identified.

A review of the data concerning the sodium absorption ratio of the Blind Canyon floor reveals that three out of four samples which were taken of that zone, have values less than 5.0 (4.8, 1.5 and 1.3). One sample has a value of 60.4 which raised the sample mean to 17.36 and created a high standard deviation of 25.14. This indicates that in general

TABLE 7

DEER CREEK MINE - WASTE ROCK ANALYSIS

Lithology	Number of Samples: Chemical Tests	Number of Samples: Physical Tests		Chemical Tests: Ca Meq/L	Mg Meq/L	Na Meq/L	SAR[1]	Fe ppm	Zn ppm	SO_4-S ppm	Mo ppm	B ppm	pH (Paste)	E.C.[2] mmhos/cm	Sat. %	Physical Tests: Pyrite FeS2	Sand %	Silt %	Clay %	Te
Blind Canyon Roof	3	Mean		4.10	1.20	0.87	0.50	5,025	64.42	205.27	<0.1	0.33	7.7	0.83	32.27	8.15	--	--	--	
		S.D.		1.30	0.56	0.21	0.17	2,520	56.32	61.31	0.00	0.20	0.25	0.25	5.17	10.82	--	--	--	
Blind Canyon Split	1	Mean											8.9				--	--	--	
		S.D.		0.8	0.1	9.2	14.3	5,905	40.69	145.0	<0.1	0.94		1.1	20.9	0.2	--	--	--	
Blind Canyon Floor	5	Mean		3.90	1.86	18.54	17.36	10,342	55.38	593.58	<0.1	0.55	8.34	2.22	26.46	1.50	--	--	--	
		S.D.		4.02	1.72	25.43	25.14	4,263	43.90	454.96	0.00	0.60	0.64	2.11	6.57	1.41	--	--	--	
Hiawatha Roof	3	Mean		4.57	4.30	3.43	1.03	10,925	184.93	198.07	<0.1	0.11	7.80	1.07	32.17	3.3	--	--	--	
		S.D.		2.54	3.20	3.96	2.14	7,110	203.10	153.48	0.00	0.10	0.17	0.31	7.18	0.00	--	--	--	
Hiawatha Split	1	Mean		4.9	2.3	1.3	0.7	7,841	69.88	246.1	<0.1	0.26	7.70	0.8	37.3	NA*	--	--	--	
		S.D.															--	--	--	
Hiawatha Floor	3	Mean		10.23	16.23	1.27	0.47	3,873	16.32	777.23	<0.1	0.04	5.87	3.03	29.07	NA*	--	--	--	
		S.D.		1.50	12.53	0.70	0.21	1,394	14.08	313.16	0.00	0.05	2.24	0.90	4.48		--	--	--	

*NA = Not Available

the Blind Canyon floor rock will not pose a problem from its sodium absorption ratio but from time to time high concentrations will be encountered. These concentrations will be diluted by other rocks with low SAR values. Also the waste rock disposal fill is designed to bury leachable and acid forming substances.

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

Present mine plans could generate as much as 100,000 yd^3 throughout the life of Deer Creek Mine. Waste rock generated during mining will be gobbed until available space is depleted. Rock which cannot be gobbed will be transported outside for disposal in the approved site.

In December 1983, planned construction of the 2,062 foot rock slope tunnel in Main West across the Pleasant Valley Fault in the Deer Creek Mine, will generate an

approximate 18,000 yds^3 of waste rock (in-place). The majority of this waste rock will be transported outside for disposal.

Using a swell index of 150%, an approximate area of 27,000 yds^3 will be required for disposal of this waste rock.

Entry rehabilitation will generate an undetermined amount of waste rock during mine life. Waste rock from entry rehabilitation will be gobbed until available space is exhausted. Excess waste rock will be transported from the mine and disposed of accordingly.

Maximum extraction of coal reserves by conventional methods includes unwanted rock in the run-of-mine product. Deer Creek Coal Handling System is designed to extract +6" waste rock from the product stream. A negligible amount of coal is incorporated in the waste rock. Approximately 50 tons of waste rock are taken from the product stream each week and less than 10% of reject is carbonaceous. However, waste rock from the product stream poses no serious threat, as all coal waste along with any potential pyritic material diluted with rock material of a low sulfer value will be buried and compacted with at least a 4-foot coal free cover.

No extemporaneous waste materials such as brattice cloth, wood, or metal trash will be dumped in this site.

All waste rock will be transported and disposed of in a controlled manner as outlined in the plan which follows:

Disposal Location

The waste rock disposal area will be an extension of the existing fill embankment located between the materials storage area and the truck loadout as shown on (Map 3-17). Cross sections of the fill are also shown in the drawing. This waste rock disposal site is designed to contain approximately 90,000 cubic yards of waste rock and will be utilized until mine life ends or the site is filled, in which case applicant will seek approval of an additional site if disposal capacity proves insufficient.

Estimated Waste Rock Volumes

(1) Main West Rock Slope:

(2062' x 18' wide x 10' high) ÷ 27 = 13,746.7 cy

Assume 31% overbreak = 4,253.3

Total 18,000 cy

Use 150% swell factor

Total equals 27,000 cy

(2) Entry Rehabilitation:

100,000 c.y. x 21%

*Assume approximately 21% will require surface disposal. 21,000 cy

(3) Trommel Reject:

35 years x 5 ton/day x 240 day/year = 42,000 tons

42,000 tons x 2,000 lbs/ton ÷ 92 lbs/ft^3 = 913,043 ft^3

913,043 ft^3 ÷ 27 ft^3/c.y. = 33,816 cy

TOTAL VOLUME 81,816 cy

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Design

Design of the disposal site and fill was under the direction of a registered professional engineer and is certified. The existing fill is constructed of material taken from the south slope of Deer Creek Canyon and from the sediment pond excavation. A stability analysis has been performed on the existing fill and has shown it to be stable and a factor of safety of 1.5 was obtained. The analysis was performed under the direction of Rollins, Brown and Gunnell, Inc., a professional engineering consultant firm. This study is enclosed.

In August of 1978, Utah Power & Light Company contracted Dames & Moore to perform a geotechnical study in evaluating soils of the area now occupied by the Deer Creek Mine sedimentation pond. Four test holes were drilled.

The pond was constructed in 1979 and is located within 600 feet directly east of the proposed waste rock disposal site.

The applicant states that due to the close proximity of the geotechnical study to the waste rock site, data obtained from this study is applicable.

The sedimentation pond and the waste rock disposal site are separated in elevation by approximately 100 feet.

The sedimentation pond is situated at approximately 7,250 feet above sea level and is stratigraphically located

near the base of the Starpoint Sandstone where it interfingers with the Masuk Shale. Bedrock at this location is found to be at or near the sandstone which is comprised of a fine grained sandstone interfingered with small amounts of mudstone.

The waste rock disposal site is situated at approximately 7,350 feet above sea level which places it stratigraphically in the middle of the Starpoint Sandstone. Bedrock in this area is at or near the surface which is also comprised of a fine grained sandstone.

No springs or seeps exist in the area of the waste rock disposal site because of the lack of any recharge in the Starpoint Sandstone formation.

Natural drainages which existed prior to mining activities have been diverted as required. A description of mine site diversions is in the Operation Plan. A summary of hydrologic information concerning the East Mountain area is included in the "UP&L Annual Hydrologic Report" submitted to the Division each year.

Map 3-17 shows the present slope and the anticipated final slope. Selected cross-sections also show present and anticipated slopes. Finished slopes will be 2h:1v.

Runoff from areas above and adjacent to the fill is collected in open ditches and directed away from the outslope of the fill to the drainage system in the mine yard. Grade of the fill is sloped back from the outslope of the fill.

Runoff from the top surface, therefore, will drain back from the outslope and collect in the "disturbed" drainage system. Runoff from the outslope of the fill drains to a catch basin near the truck loadout where it is collected and conveyed to the sediment pond. This drainage collection system meets the requirements of a 10-year/24-hour storm event. The location of these drainage ditches and catch basins are found on Map 3-13.

Construction and Operation

Waste rock from slope construction and entry rehabilitation will be transported from the mine to the disposal area and placed in horizontal lifts and in a controlled manner by rubber-tired end-dumping vehicles. Equipment will vary depending on contractor employed to do the work.

Safety measures prescribed by MSHA will be maintained throughout the life of the disposal site.

Rock from the trommel screen will be hauled by truck from the reject pile and placed with the other waste rock from entry rehabilitation and slope construction sites.

All waste rock will be compacted in 4-foot lifts at the base of the existing fill, providing a working surface and a buttress for stability for the existing fill. A crawler or rubber-tired dozer will be used in the continuous dump-spread compaction fill method.

Maintenance

Maintenance of the disposal site includes inspections and adequate drainage. Inspections for fill stability will be performed quarterly by a registered professional engineer in addition to periodic observations of fill placement compaction, and revegetation. The inspecting engineer will submit a certified report of approved design compliance to the Division within two weeks of each inspection. A copy of each inspection report will be retained at the mine site. Drainage systems will be inspected and cleaned yearly to ensure adequate drainage of the fill.

Reclamation

The fill is deemed to be compatible with the natural surroundings and fulfill the post-mining land use. Drainage will be established to carry runoff from the fill into stabilized channels designed to adequately pass the 100 year/24-hour precipitation event. Vegetation will be established on the fill as outlined in the Reclamation Plan. Details of the final drainage channel locations are also included in the Reclamation Plan. Inactive side slope areas fall under the interim revegetation areas of the mine site and will be revegetated accordingly.

Sediment removal from Deer Creek's pond is marked by reaching a 60% design capacity for sediment in the pond. It is estimated by past experience (three years), it will require ten (10) years to reach this level.

Sediment will be analyzed for metals and pH prior to its placement at the base of the rock disposal fill in a special drying containment pond constructed from fine material segregated for this purpose. Once dried, material will be mixed with surrounding heavier rocks and compacted and covered with at least four feet of non-toxic covering.

Deer Creek Mine

Waste Rock Hydrologic Drainage Calculations

Given:

Area:	3.0 Acres
Slope:	50%
Slope Length:	300 Feet
Storm Event:	2 Year/24 Hour
Methodology:	Soil Conservation Service
CN	= 85 (see Table 6.4)
Precipitation	= 1.8 (N.O.A.A. 2 Yr/24 Hr)

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)} \qquad S = \frac{1000}{CN} - 10 = 1.76$$

$$Q = \frac{(1.8 - 0.2 \times 1.76)^2}{(1.8 + 0.8 \times 1.76)} = \frac{2.10}{3.21}$$

$$Q = .65 \text{ Inches}$$

$$tL = \frac{0.8_{(S+1)}{}^{0.7}}{1900\ Y^{0.5}} = \frac{300\ {}^{0.8}(1.76+1)^{0.7}}{1900\ (50^{0.5})} = \frac{194.5}{13433}$$

$$tL = .0145$$

$$tc = \frac{tL}{tc} = \frac{tL}{0.6} = \frac{.0145}{0.6} \quad \text{(see Exhibit VII)}$$

$$tc = .024$$

$$qp = 1000 \frac{csm}{Inch} \times \frac{3.0 \text{ Acres}}{640 \text{ Acre/Mile}^2} \times .65 \text{ Inches}$$

$$qp = 3.05 \text{ C.F.S.}$$

By inspection, the existing 1.0' ditch is sufficient to handle the peak flow of a 2 Year/24 Hour storm event.

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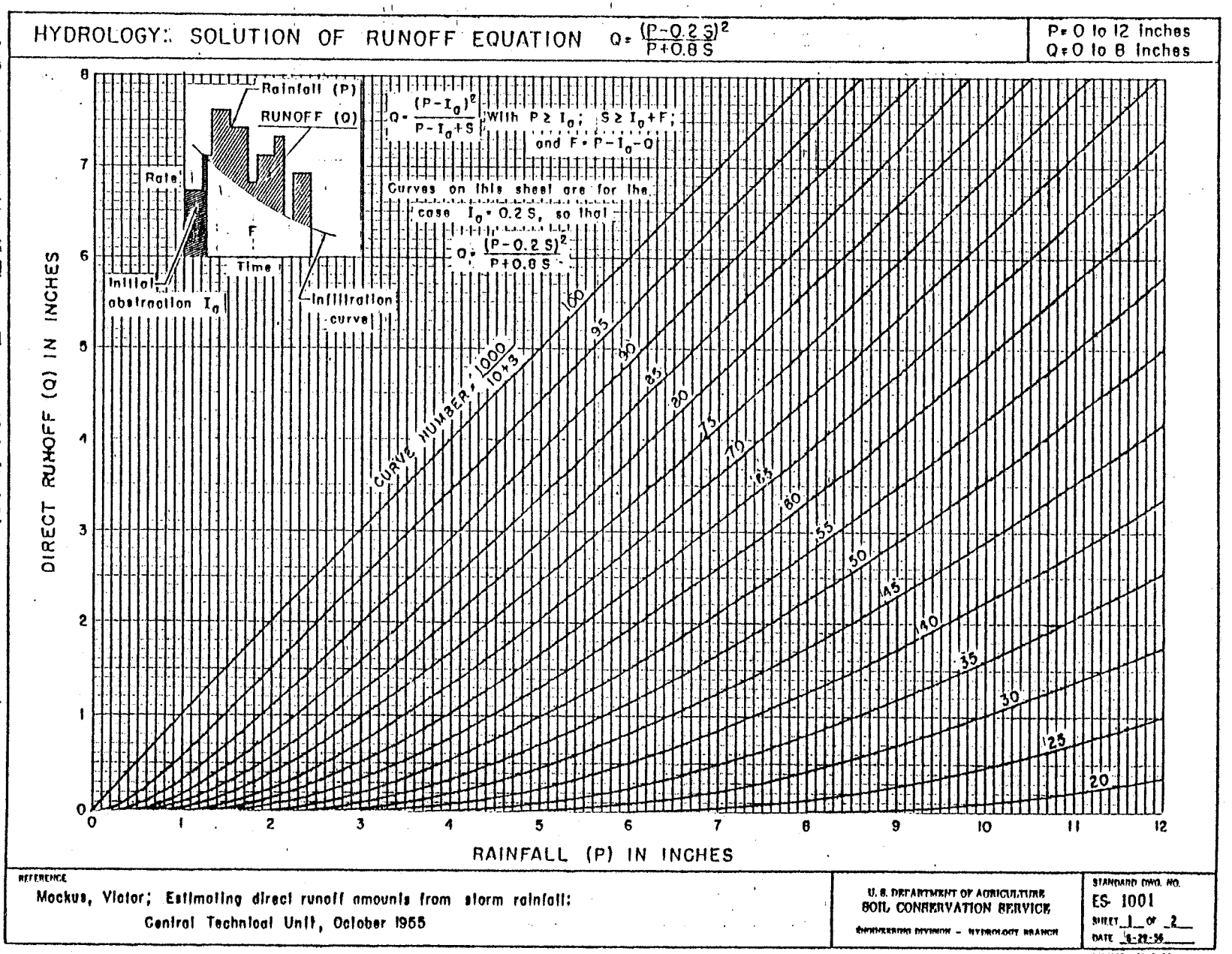

Figure - 10.1 (1 of 2)

REFERENCE

Mockus, Victor; Estimating direct runoff amounts from storm rainfall: Central Technical Unit, October 1955

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ENGINEERING DIVISION - HYDROLOGY BRANCH

STANDARD DWG. NO.
ES- 1001
SHEET 1 OF 2
DATE 6-29-56
REVISED 10-1-64

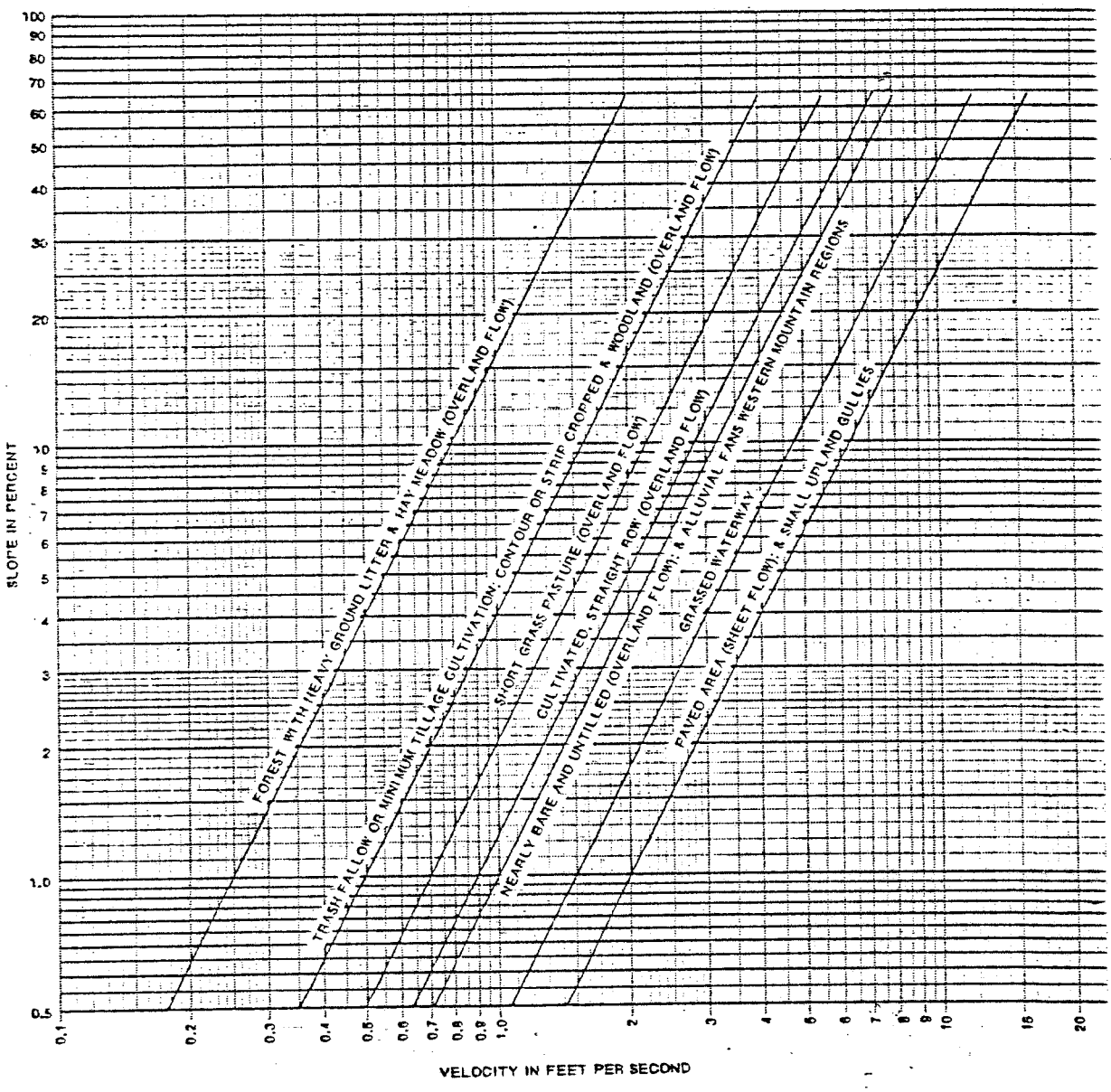

Figure 15.2.—Velocities for upland method of estimating T_c

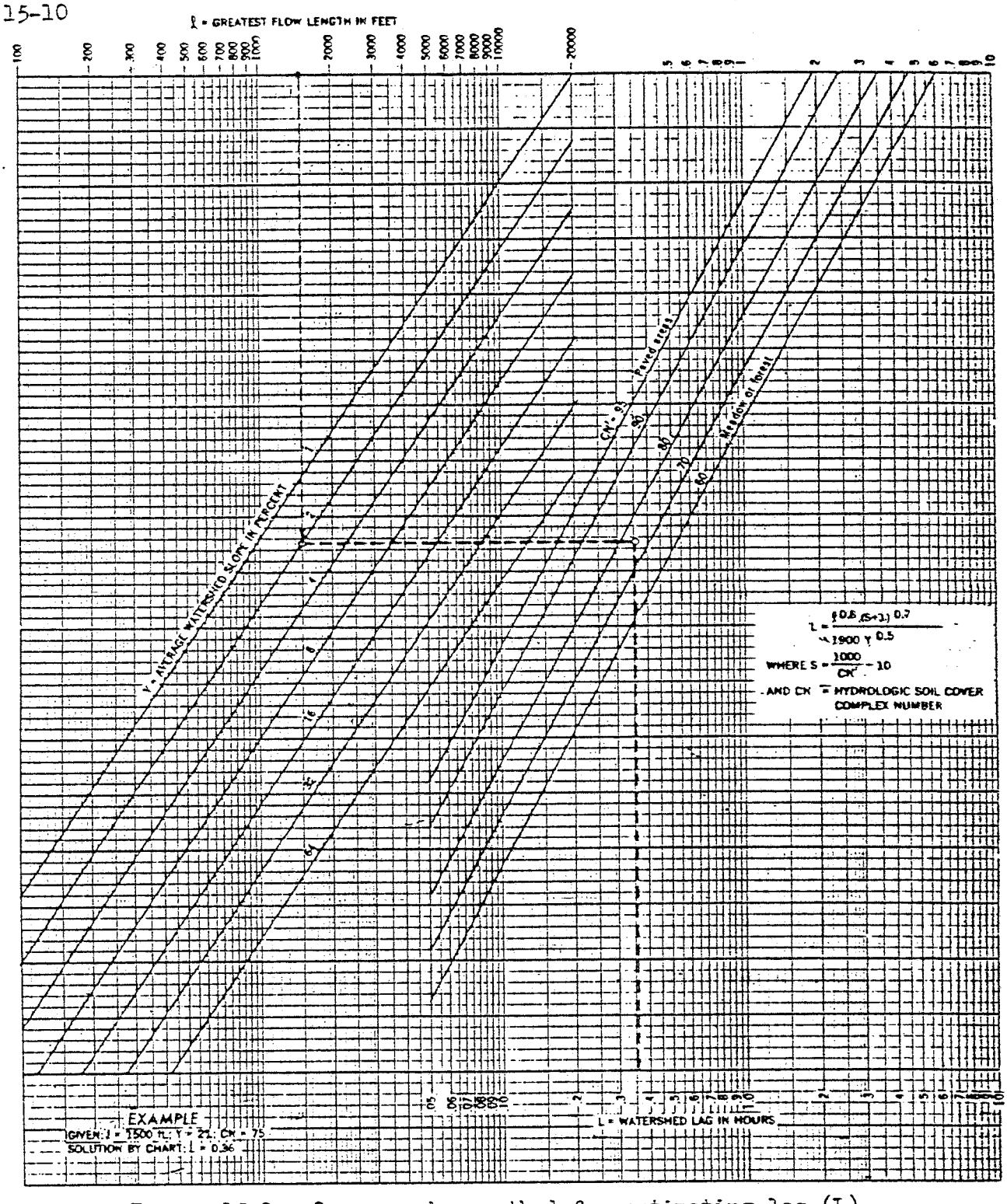

Figure 15.3.--Curve number method for estimating lag (L)

TABLE 6.4

SCS RUNOFF CURVE NUMBERS

Land Cover	Condition	Soil Group A	B	C	D
VIRGIN LANDS					
Forests	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Farmsteads	—	59	74	82	86
Meadow	Good	30	58	71	78
Pasture/Range	Fair	49	69	79	84
REGRADED - REVEGETATED					
Close Seeded Legumes (Contoured & Terraced)	Poor	63	73	80	83
	Good	51	67	76	80
Small Grains (Contoured & Terraced)	Poor	61	72	79	82
	Good	59	70	78	81
Row Crops (Contoured & Terraced)	Poor	66	74	80	82
	Good	62	71	78	81
Fallow	—	77	86	91	94
CLEARED UNVEGETATED					
Dirt Roads	—	72	82	87	89
Hard Surface Roads (or Pit)	—	74	84	90	92
Paved Surfaces	—	98	98	98	98

NOTE: For additional valves see any of a variety of SCS publications, including:

The National Engineering Handbook, Section 4-"Hydrology"

TR-55 "Urban Hydrology for Small Watersheds"

TP-149 "Methods for Estimating Volume and Rate of Runoff From Small Watersheds"

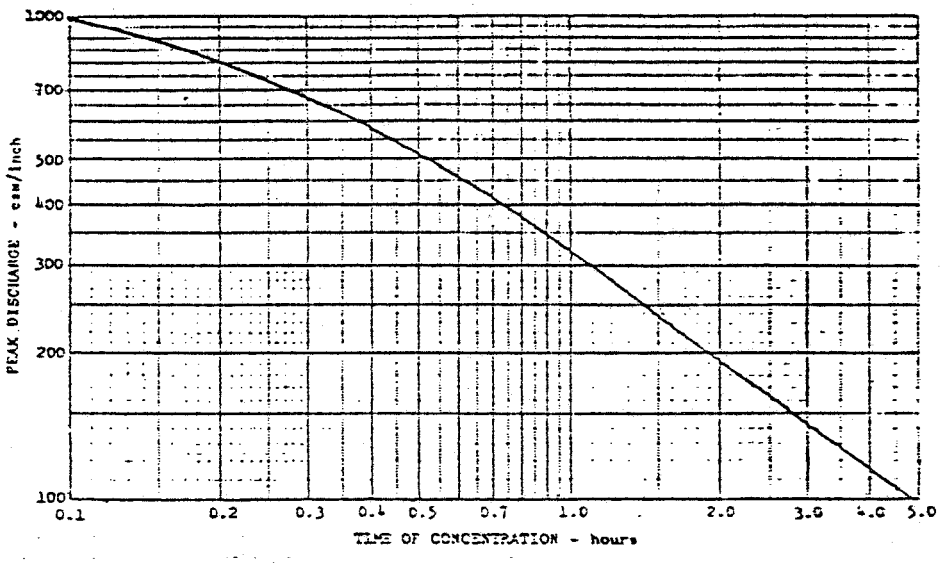

Figure 2.40. Peak discharge in csm per inch of runoff versus time of concentration (t_c) for 24-hour, type II storm distribution.

UMC 784.19: UNDERGROUND DEVELOPMENT WASTE - ELK CANYON STORAGE UPGRADE

This project will enhance the usefulness of the Elk Canyon storage area. Approximately 24,500 cubic yards of underground development waste and trommel screen rejects will be used as backfill to construct a storage pad with an active storage area of approximately 19,500 ft². This area will be used for additional coal and mine material storage. Approximately 17,000 additional tons of coal storage will be available.

The construction activities of the backfill and the subsequent use for storage of the area will be confined within the existing disturbed area of the canyon. Minor modifications to the undisturbed drainage structure will be required.

Final reclamation of the material can be done within the immediate area of the canyon.

The following maps are used to describe the details of this project:

Map 17A - DWG. No. CM-10774-DR, Sheet 1 of 2 "Elk Canyon Site Plan", March 4, 1988
Map 17B - DWG. No. CM-10774-DR, Sheet 1 of 2 "Hydrological Area Map"
Map 17C - DWG. No. CM-10774-DR, Sheet 2 of 2 "Elk Canyon Cross Sections", Feb. 18, 1988

Construction Plan

Regulation 817.71 allows underground development waste and spoil to be used as backfill on the disturbed area of the mine site. The area where the fill is to be placed has

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by Tom Munson date 11/29/88

been previously disturbed and no topsoil or vegetation exists.

The upgrading of the fill structure using waste rock will be inspected for stability by a registered professional engineer at least quarterly and during the following specific activities: (1) installation of the surface drainage ditch, (2) modifications to the side canyon drainage inlet and construction of the silt fence at the main Elk Canyon drainage, (3) and during the revegetation of the slope above the main inlet. The placement and compaction of the fill material is a continual activity and will be inspected during construction and certified in writing as part of the quarterly report. A certified report for each of these activities will be submitted to the Division in writing within two weeks following the inspection.

Slope Stability

The fill will be placed in horizontal lifts 18 inches thick or less and compacted as necessary to insure mass stability. The fill slope will be built on lv:1.5h and will meet a long-term static safety factor of 1.5. The engineering analysis to show this is provided on pages 3-69 to 3-73 dated 11/14/88.

The area where the fill is to be built is dry and the need for an under-drainage system is not required. There is an existing culvert system which bypasses the canyon drainage past the disturbed area.

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Surface Runoff

A hydrologic drainage analysis and ditch design is attached. As stated in the analysis the road will be sloped at 1% into the hillside and will serve as a surface ditch. The velocity of the run-off doesn't require doesn't require rip-rap protection.

The Division will be notified prior to the installation of the silt fence. The concern for sediment volume behind the silt fence is noted and will be included as part of the installation.

The fill structure will be located in an area that is already in use as a storage area. All drainage from this area flows along the road to the tipple area and into the sediment pond. The surface area of the fill will be sloped at 3% on the upper section.

The concrete inlet structure on the second side canyon drainage will be modified to protect the undisturbed drainage in this area. A wing shaped structure will be added to the existing inlet and will extend 12" above the final grade of the fill material. (refer to DWG DS-998-B, page 3-77 dated 11/14/88.

The main Elk Canyon undisturbed inlet structure will be protected with a silt fence structure along the toe of the fill. The new fill surface to be serviced by the silt fence is approximately 1,500 ft'. Once the fill has been completed this area will be revegetated with the interim seeding contained in the permit.

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by Tom Munson date 11/29/88

Chemical Analysis

The underground development waste and trommel reject is of the same origin and character as that previously sampled. Refer to permit application Waste Rock Site, page 3 - 56 & 57.

Final Reclamation

Once the need for this storage area no longer exists the material will be pushed against the west canyon wall and the pad area will be backfilled. Refer to final cross-sections for detail. See page 3-78 for reclamation cost analysis.

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by [signature] date 4/29/88

SLOPE STABILITY ANALYSIS

ELK CANYON STORAGE PAD

The size of the storage pad in Elk Canyon will be increased by building up the slope on the west side of the canyon. The material that will be used to construct the slope consists of underground development waste and trommel reject. This material was sampled and tested to determine its suitability as fill for the proposed slope (see attached soils report by Rollins, Brown, and Gunnell on pages 3-70 to 3-73 dated 11/14/88.

The method used to determine the stability is Bishop's Simplified Method of Slices, T. William Lambe and Robert V. Whitman, Soil Mechanics, 1969, John Wiley and Sons, New York. The slope will be 1.5 horizontal to 1 vertical during the operating period. The maximum height of the slope is 50 feet. The soil density is 98.2 pounds per cubic feet, the angle of internal friction is 40.5 degrees and the cohesion value is Ø. The slope is well drained with no ground water anticipated during the life of the project. The resulting safety factor is determined to be 1.5, which is adequate.

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by Tom Munson date 11/29/88

11/14/88
3-69

ROLLINS, BROWN and GUNNELL, INC. professional engineers

March 15, 1988

Tom Faucheux
Utah Power and Light Company
Mining Division
P.O. Box 310
Huntington, Utah 84528

Dear Mr. Faucheux:

We have completed the requested laboratory testing for the soil sample submitted to our office as per P.O. JS-301606. The results are enclosed herein on the appropriate figures. The soil moisture density relationship resulted in a maximum density of 98.2 pcf at an optimum moisture content of 10.7 percent. The results of the grain-size analysis indicate the following:

Sieve Size	% Passing
3"	100
2"	89.9
1"	78.9
3/4"	71.6
1/2"	66.0
3/8"	61.9
No. 4	53.3
No. 10	39.4
No. 20	32.1
No. 50	23.6
No. 100	19.8
No. 200	16.4

The triaxial shear test envelope indicates a friction angle of 40.5 degrees and a cohesion of 0 psi.

If you have any further questions, please notify us.

Yours truly,

ROLLINS, BROWN AND GUNNELL, INC.

Ralph L. Rollins

Ralph L. Rollins

SLS/sly

AMENDMENT TO
APPROVED Mining & Reclamation Plan
Approved, Division of Oil, Gas & Mining
by Tom Munson date 11/29/88

1435 WEST 820 NORTH
POST OFFICE BOX 711
PROVO, UTAH 84603
PROVO 374-5771
SALT LAKE CITY 521-5771
AREA CODE 801

[redacted]

11/14/88
3-70

ROLLINS, BROWN and GUNNELL, INC. professional engineers

1435 WEST 820 NORTH
POST OFFICE BOX 711
PROVO, UTAH 84603
(801) 374-5771 Provo
(801) 521-5771 SLC

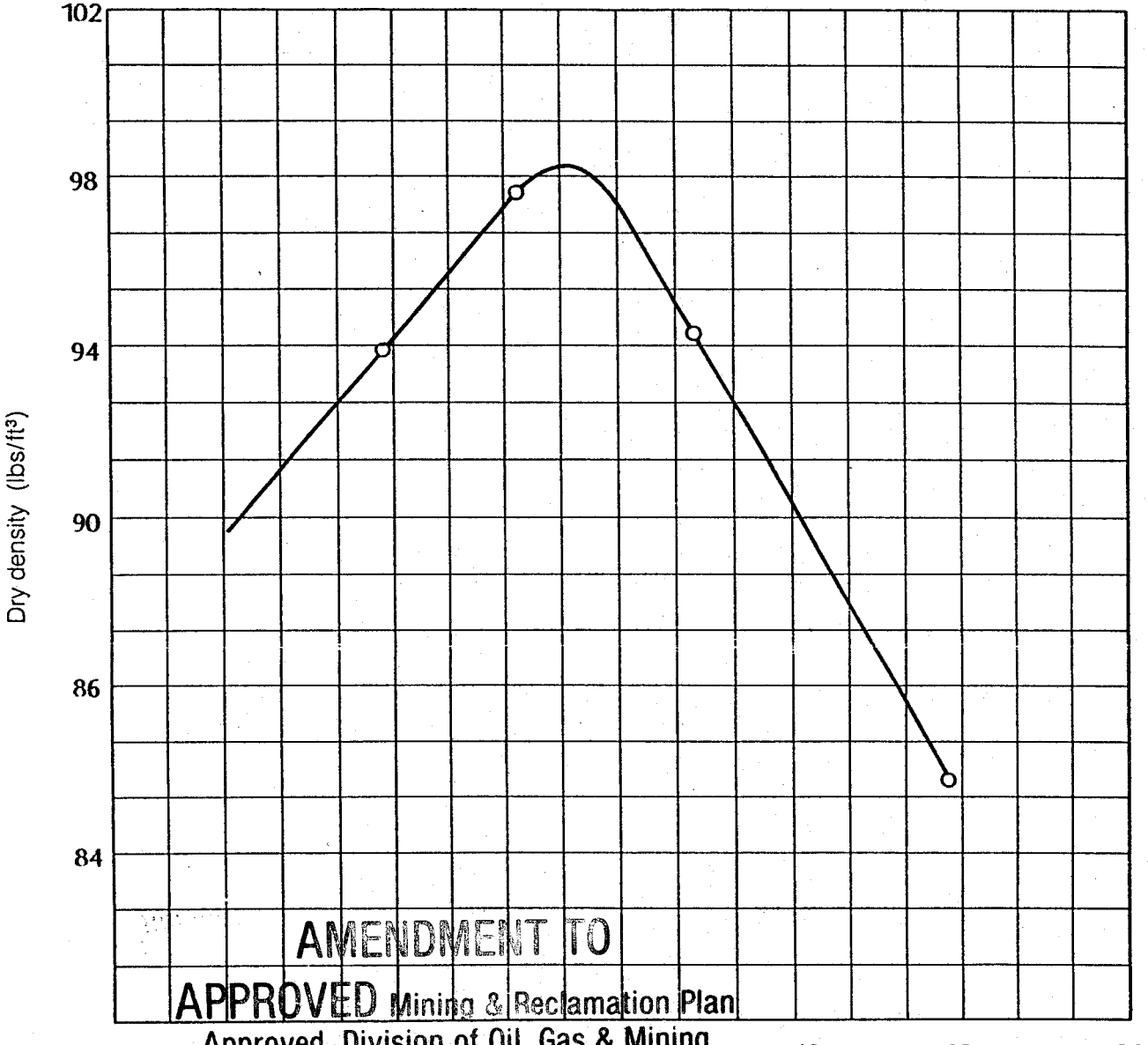
SOIL MOISTURE DENSITY RELATIONSHIP

Project Utah Power and Light
Project no.
Feature
Test date March 4, 1988
Job technician S. Ahmad
Mailing date March 11, 1988

ASTM D 1557-78

Maximum dry density = 98.2 lbs/ft³

Optimum moisture = 10.7 %



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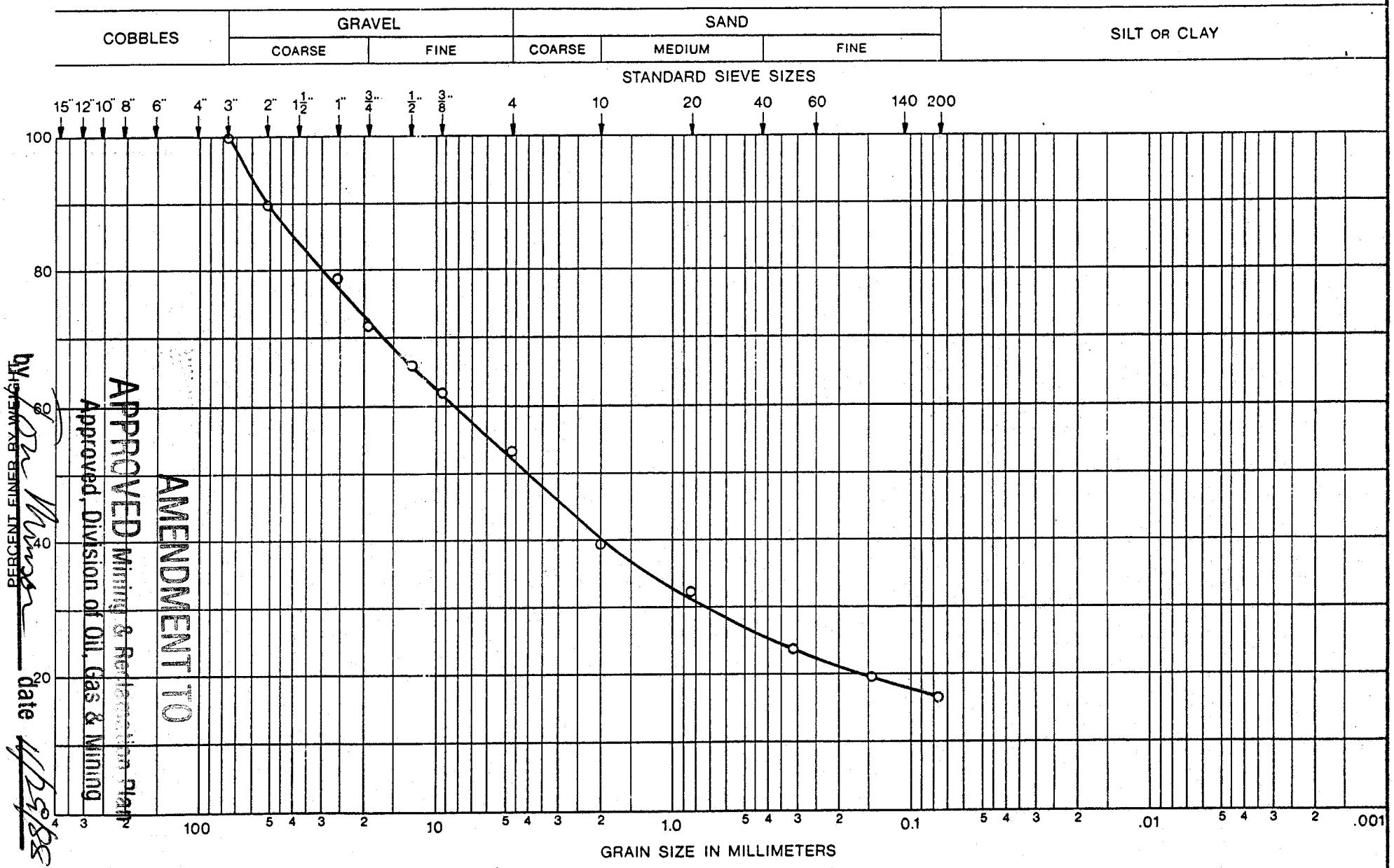
by [signature] date 11/29/88



ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

GRAIN SIZE DISTRIBUTION CURVE

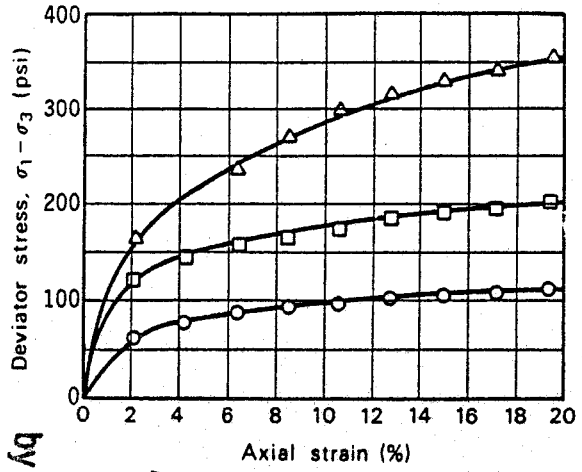
Project: Utah Power & Light

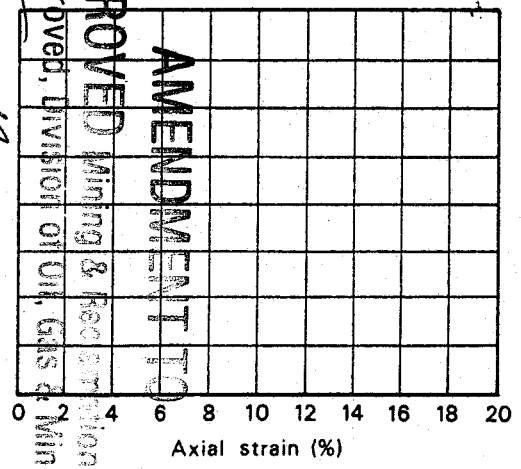
Location:

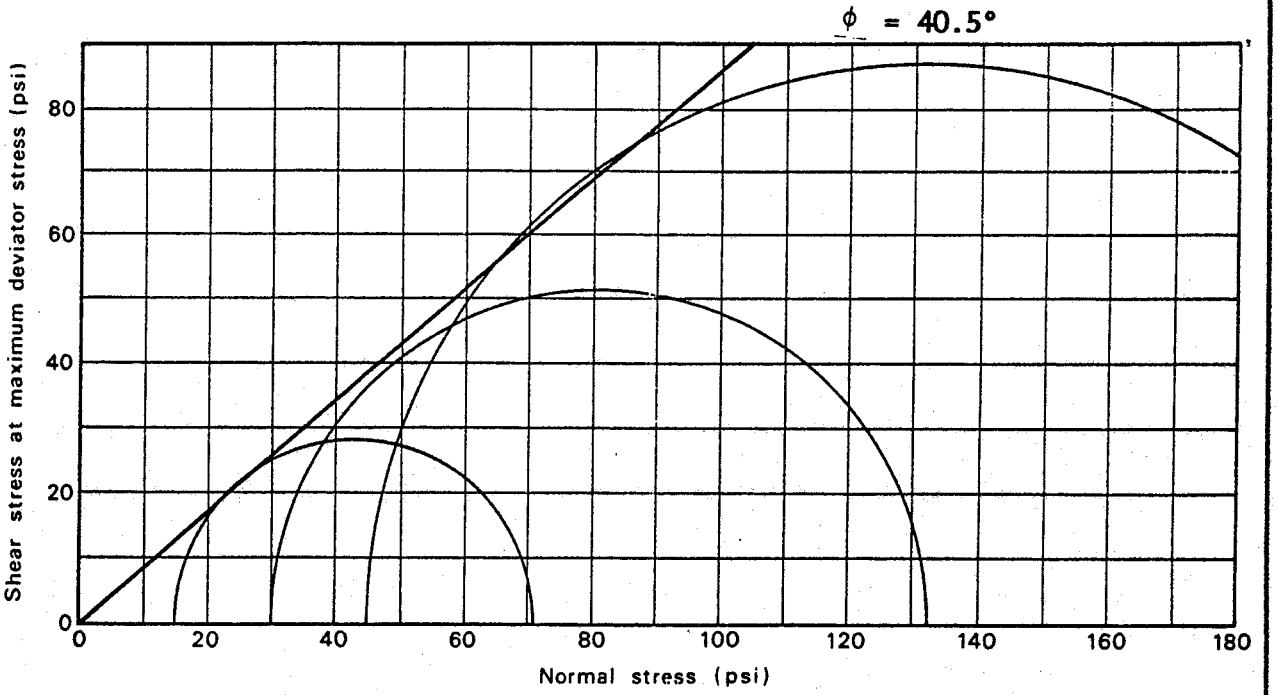
Sample No. 1

FIGURE NO.

11/14/83
3-72







Test no. or symbol	Boring no. or depth	Sample data: Dry density (pcf)	Sample data: Moisture content (%)	Degree of saturation (%)	Confining pressure (psi)	Maximum deviator stress (psi)	Strength values at failure: Friction angle ϕ (degrees)	Strength values at failure: Cohesion (c/psi)	Sample size, L/D (inches)	Strain rate (inches/minute)
○		98	10.7		30	111				
□		97.7	10.7		60	205	40.5	0	2.8/1.32	.0024
△		98.1	10.7		90					

by [signature] date 11/25/88

APPROVED Mining & Reclamation Plan
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11/14/86
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TRIAXIAL SHEAR TEST
Project: Utah Power and Light

HOLE NO.
DEPTH:

FIGURE NO.

ELK CANYON STORAGE PAD DRAINAGE DITCH

HYDROLOGICAL ANALYSIS AND DITCH DESIGN

SCOPE:

The construction of the storage pad at Elk Canyon will change the drainage characteristics of the area and an analysis and design of the drainage structures is required. This report will detail the procedures used to design the ditch which will convey the disturbed area runoff into the surface collection system.

PROCEDURES:

The areas which will contribute runoff to the disturbed area where marked on drawing number CM-10774-DR, Elk Canyon Site Plan. These areas have not increased in size because of the construction of the storage pad but were necessary to determine the flow rate for the ditch design. The peak flow for a 10 year, 24 hour storm event was determined using a computer program, "Storm Hydrograh Program", by Richard H. Hawkins and Kim A. Marshall, Utah State University Foundation, Logan, Utah. The data used for input are tabulated below:

DRAINAGE AREA #	AREA ACRES	CURVE NUMBER	TIME OF CONCENTRATION
I	2.481	83	3 MIN.
II	.597	77	1
III	.398	83	1
IV	.723	83	1

TOTAL AREA 4.199 ACRES = 0.007 SQUARE MILES

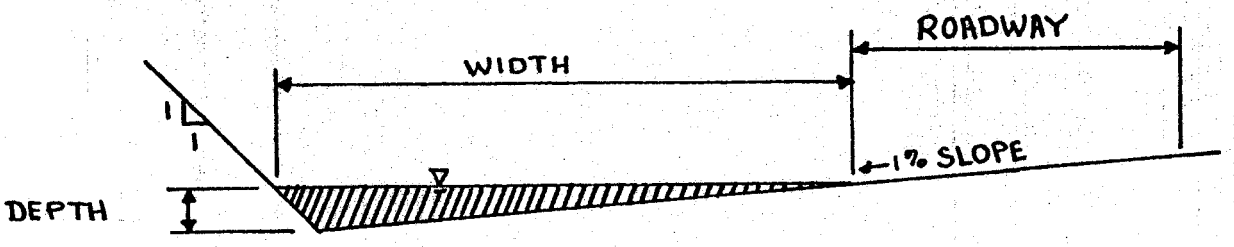
WEIGHTED AVERAGE CURVE NUMBER = 82

TIME OF CONCENTRATION = 4 MINUTES = 0.007 HOURS

RAINFALL DEPTH - 10 YEAR, 24 HOUR STORM EVENT = 2.2 INCHES

The peak flow rate from the program is 0.516 cubic feet per second for the entire 4.2 acres (see Exhibit A). The ditch is sized for the entire amount, although the total amount is not collected until it reaches the end of the new road at Station 0+78.8.

The ditch that will convey this runoff will be incorporated into the road itself as shown in the following diagram.



FLOW RATE = 0.516 CFS

DITCH SLOPE	DEPTH	WIDTH	VELOCITY
3%	.086'	8.71'	1.38
10%	.069'	6.95'	2.15

Because of the low velocity of the runoff in the ditch, no special lining material is necessary to prevent erosion of the base material.

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ELK CANYON DISTURBED DRAINAGE

INPUT SUMMARY:

DISTRIBUTION = FARMER-FLETCHER	RUNOFF AREA = .007 SQ. MILES
RAINFALL DEPTH = 2.2 INCHES	RUNOFF CURVE NO. = 82
STORM DURATION = 24 HOURS	TIME OF CONCENTRATION = .07 HRS.

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .784 IN.	TIME TO PEAK = 4.794 HOURS
INITIAL ABSTRACTION = .439 IN.	RUNOFF VOLUME CHECK = .785 IN.
PEAK FLOW = .516 CFS	

24.14	2.20	0.7839	0.0000	0.0000	0.00

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by Tom Munson date 11/29/88

EXHIBIT A
COMPUTER PRINTOUT
"STORM HYDROGRAPH PROGRAM"

11/14/88
3-76

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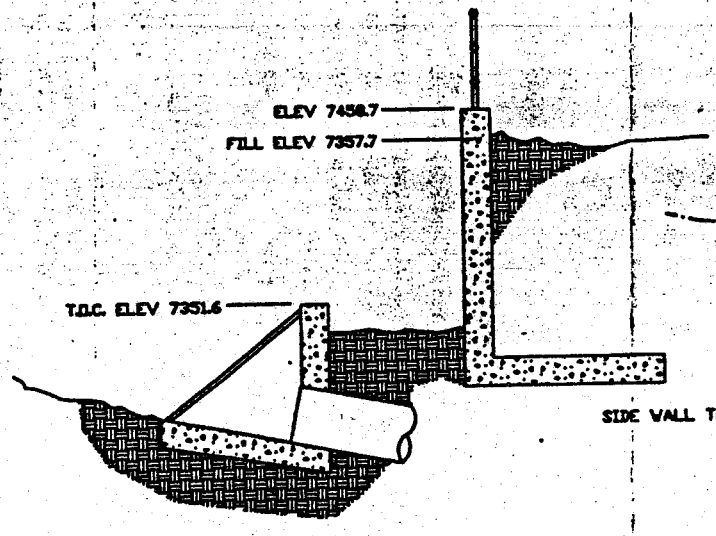
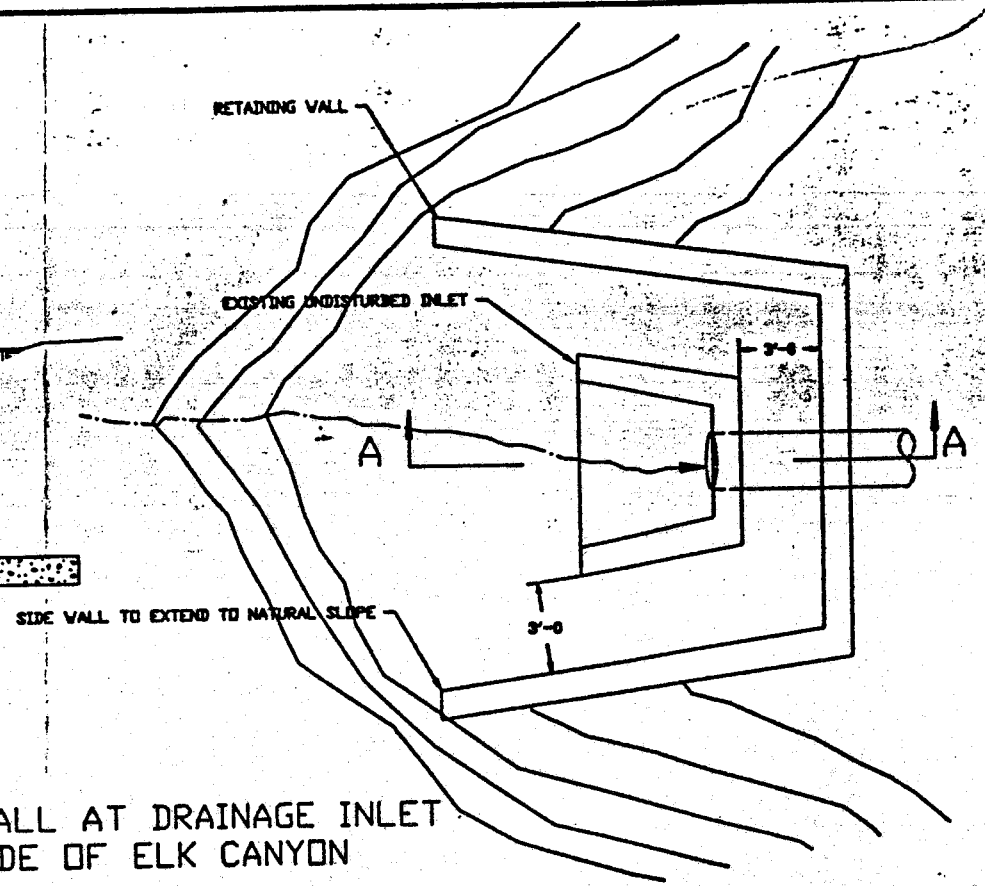
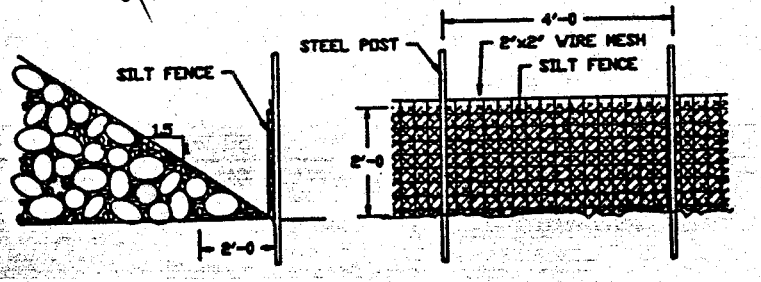
Approved, Division of Oil, Gas & Mining
by [signature]
date 4/29/88



SECTION A-A



RETAINING WALL AT DRAINAGE INLET
EAST SIDE OF ELK CANYON



SILT FENCE DETAIL

CAD FILE NAME/DISK# INCLUDE/LIVE

UTAH POWER & LIGHT MINING DIVISION P.O. BOX 310, HUNTINGTON, UTAH 84528	
DEER CREEK - ELK CANYON DRAINAGE DETAILS	
DRAWN BY TJF	DRAWING # DS998B
SCALE NONE	
DATE 3/2/88	SHEET __ OF __ REV. ___

11/14/88
3,17

E. Final Reclamation

The bond determinations have been based on Rental Rate Bluebook rates and are presented below:

EQUIPMENT

D 8 DOZER
$162.65/HR X 8 HRS. X 2 DOZERS = $2602.40

LABOR

EQUIPMENT OPERATORS
$31.50/HR X 8 HRS X 2 OPERATORS = 504.00

TOTAL $3106.40

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Approved, Division of Oil, Gas & Mining
by Tom Munson date 4/27/88

11/14/88
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