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SUPPLEMENT B - ADDENDUM
SLOPE STABILIZATION PLAN
PORTAL AREAS - BLACK HAWK MINE
SUMMIT COUNTY, UTAH

INTRODUCTION

This document is an addendum to the SLOPE STABILIZATION PLAN(SUPPLEMENT B) of the mining and reclamation plan for the Black Hawk Mine, Summit County, Utah. SUPPLEMENT B was submitted by Utah Coal and Energy Inc.(U.C.&E.) to the Oil, Gas and Mining Board, Division of Oil, Gas and Mining, Department of Natural Resources, State of Utah(referred to hereinafter as the Board) in November, 1980. After reviewing SUPPLEMENT B the Board asked Mr. C. Cafarelli, President, U.C.&E. for certain additional information relative to the proposed water diversion above the portal area. This addendum addresses the water diversion above the portal areas and seeks to provide specific point-by-point information and answers to the enumerated items in paragraph 2 of the correspondence, Board to U.C.&E., dated February 11, 1981.

SPECIFIC INFORMATION—WATER DIVERSION

The following additional information is presented in the numerical order of the requested items of paragraph 2 of the above reference correspondence.

1.

a.) *Map of the watershed delineating the boundaries of the area for which peak run-off for the diversion above the portal is calculated:*
See Figure 1

Description of how diversion will meet the requirements of Section 817.43 of permanent performance standards.

A permanent diversion will be constructed to pass safely the peak runoff from a precipitation event with a 10 year recurrence interval.

The diversion will be constructed with sloping banks stabilized by vegetation.

The diversion ditch will be designed and constructed to prevent the removal of additional suspended solids from the permit areas.

The diversion ditch will not be located on a slide area and its presence will not increase the potential for slides.

The diversion ditch will be designated to the following specifications:

The lining will safely pass design velocities.

Riprap will consist of nondegradable, nonacid, nontoxic materials which will not slake, such as sandstone and quartzite cobbles and gravels which are abundant in the vicinity.

The freeboard will be designed in excess of 0.3 feet for maximum flow conditions.

Protection will be provided for transition of flow including protection for curves and swales.

Energy Dissipation will be provided for at discharge points.

No excess excavated materials will exist.

Topsoil disturbed by construction efforts will be stockpiled for redistribution in accordance with section UMC 817.23.

Water entering diversion ditch will be diverted from the portal area and none will enter underground workings.

b.) Methods utilized in computing the size of the overland flow diversion and the calculations:

Rainfall expected from a 10 year, 24 hour

precipitation event is 1.91 inches from data recorded at Echo Dam which has the nearest station.

The area of the watershed which is expected to feed the proposed drainage ditch is calculated to be 453,000 ft.^{2}

The maximum water flow expected from a 10 year, 24 hour event has been calculated as shown in the following paragraphs.

Channel cross sectional design is determined by the velocity desired and by the inflow rate determined. Area of the flow is found by the expression:

Sec 36

3N
6E

$$Q = VA_x$$

where Q = flow rate, in ft^3/sec
V = velocity of flow, in ft/sec
A_x = area of flow, in ft/sec

$$Q = CiA_L$$

Where Q = peak rate of runoff
C = weighted average runoff coefficient
i = average precipitation intensity for duration equal to watershed time of concentration and selected storm recurrence interval
A_L = watershed area tributary to point of interest

The calculation proceeds as follows:

C = 0.47 derived from table 6.20, page 6.121† for a 2.00 inch rainfall intensity under high runoff conditions where soils and heavy vegetation are sparse and terrain is hilly to steep.

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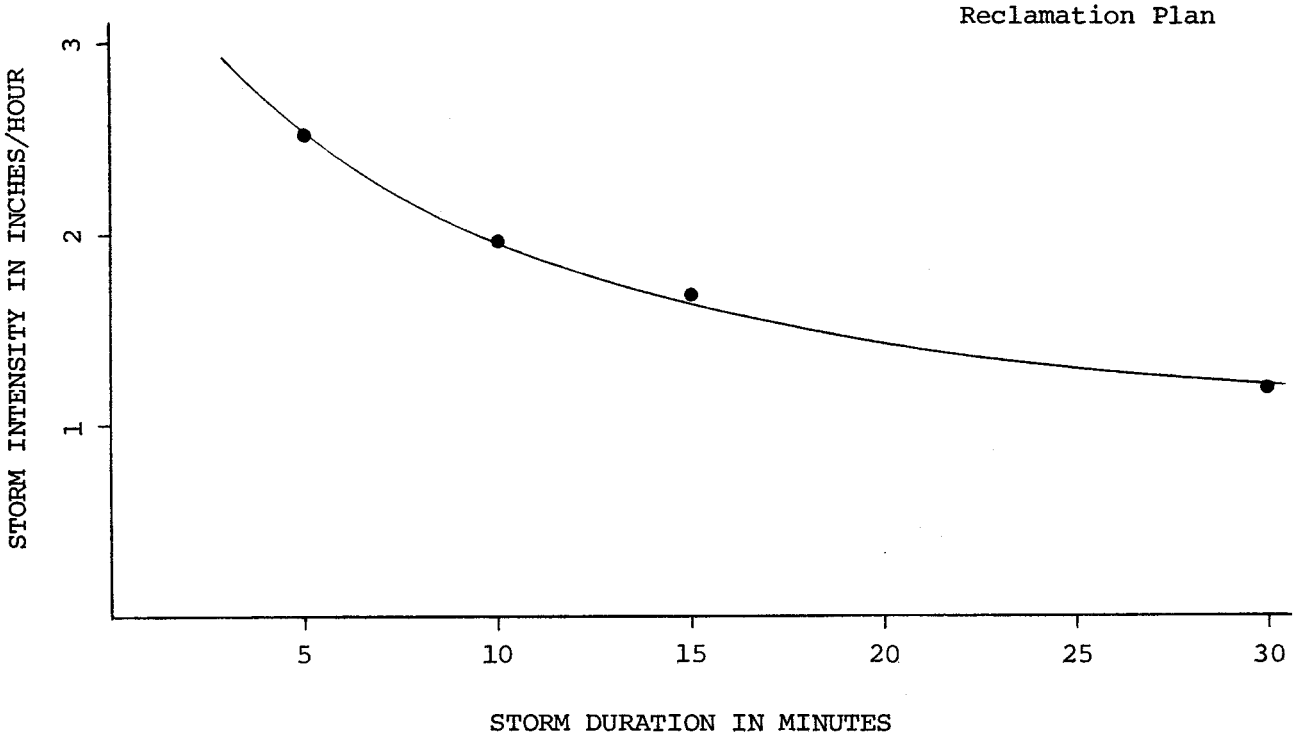
† Engineering and design manual, USDA, MESA, prepared by D'Appolonia

i = 2.52 inches. Based on a 5 minute duration, 10 year return (from curve of estimated return periods for short duration precipitation of Echo Dam), five minutes is the period required for entire drainage area to begin contributing to the runoff, defined as T_c. T_c was derived from Figure 6.23 on page 6.88† where L(length of longest watercourse)=1000 ft. and H(height of most remote point above outlet)=360 ft. T_c' thus derived was found to be 2.5 minutes. T_c corrected for overland grassed surfaces by a factor of 2 is 5 minutes.

The determination of i comes from the following:

ADAPTED FROM PRECIPITATION DATA RECORDED AT ECHO DAM: See Table 1, Mining & Reclamation Plan



A_L = 10.4 acres derived by measuring tributary area with planimeter on a 1" = 200' scale topographic map

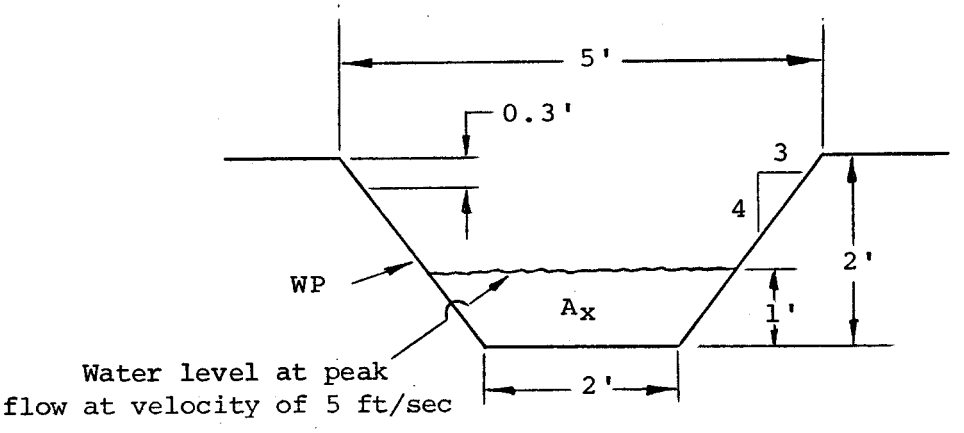
$Q = CiA_L = (0.47)(2.52)(10.4) = \underline{\underline{12.32 \text{ CFS}}}$

† D'Appolonia

For a velocity of 5 ft/sec

$$A_x = \frac{Q}{V} = \frac{12.32 \text{ ft}^3/\text{sec}}{5 \text{ ft/sec}} = 2.46 \text{ ft}^2$$

Trapezoidal design of the channel is selected. Channel has stable side slopes.



where WP = wetted perimeter = 6.0 ft.
A_E = maximum flow capacity = 6.0 ft.^{2}

The channel slope is determined by use of the Manning Equation:

$$Q = \frac{1.49}{n} A_x R^{.67} S^{.5}$$

or

$$V = \frac{1.49}{n} R^{.67} S^{.5}$$

where Q = flow rate, CFS
V = flow velocity, FPS
A_x = cross sectional area of flow(ft^2)
S = slope of channel
n = Mannings coefficient of channel roughness
R = hydraulic radius = $\frac{A_E}{WP}$

Variables of the Manning Equation were assigned values as follows:

question this value as possibly a little low

n = 0.033 average for straight and uniform rock channels. (from table 6.22, page 6.145).†

V = 3 ft/sec of 5 ft/sec variable design limits

$$R = \frac{A_E}{WP} = \frac{6.0 \text{ ft}^2}{6.0 \text{ ft}} = 1.0 \text{ ft.}$$

The channel slope required based on the peak rate of runoff(Q) is calculated as follows:

For V = 3 ft/sec:

$$S = \left(\frac{nQ}{1.49A_xR^{.67}}\right)^2 = \left(\frac{(0.033)(12.32)}{(1.49)(4.10)(1)^{.67}}\right)^2 = \underline{\underline{0.0044}}$$

For V = 5 ft/sec:

$$S = \left(\frac{nQ}{1.49A_xR^{.67}}\right)^2 = \left(\frac{(0.033)(12.32)}{(1.49)(2.46)(1)^{.67}}\right)^2 = \underline{\underline{0.0123}}$$

The channel slope required based on the peak rate of flow velocity(V) is calculated as follows:

For V = 3 ft/sec:

$$S = \left(\frac{nV}{1.49R^{.67}}\right)^2 = \left(\frac{(0.033)(3)}{(1.49)(1)^{.67}}\right)^2 = \underline{\underline{0.0044}} \simeq 0.4\% \text{ slope}$$

For V = 5 ft/sec:

$$S = \left(\frac{nV}{1.49R^{.67}}\right)^2 = \left(\frac{(0.033)(5)}{(1.49)(1)^{.67}}\right)^2 = \underline{\underline{0.0123}} \simeq 1\% \text{ slope}$$

† D'Appolonia

The maximum volume of runoff for diversion expected from a 10 year, 24 hour event is computed as follows:

$$1.91 \text{ inches} \times \frac{1 \text{ ft}}{12 \text{ inches}} \times 453{,}000 \text{ ft}^2 = 72{,}100 \text{ ft}^3$$

Runoff waters from the drainage ditch will be discharged into fluvial conglomerates forming a ridge adjacent to the proposed portal Number 3 area as shown in Figure 1. There will be only one outlet.

Note that the diversion has been changed from the original design in SUPPLEMENT B in that there is only one outlet now and it is as shown in Figure 1.

The ditch will flatten and fan out into the conglomerate to dissipate flow velocity.

Composition of fluvial gravels where flow dissipation will occur are of various clastic sizes of almost exclusively quartzite and chert, which are poorly sorted and poorly cemented. Composition by clastic sizes is as follows: less than 5% boulders; about 20% cobbles; 60 percent pebbles and approximately 15% coarse to fine-grained sand.

The soils at the discharge point have a low runoff potential (see page 6.91, D'Appolonia) because of their gravelly composition and will be an excellent medium for dissipation of flow velocity and for dispersion of surface runoff water due to the high infiltration rate.

Water discharged onto fluvial gravels will flow northeasterly into the adjacent ephemeral stream and eventually into Chalk Creek.

The drainage ditch will widen from 5 ft. to 20 ft (Figure 2) at which point the level of water will be less than 0.2 feet high and will eventually dissipate to zero height.

Velocity of diverted water will approach zero at the outlet due to the widening of the channel and energy dissipation created by the implacement of cobbles and boulders.

Rutting will not occur due to the reduction of flow energy and the high infiltration rate of gravels over which diverted water will be dispersed.

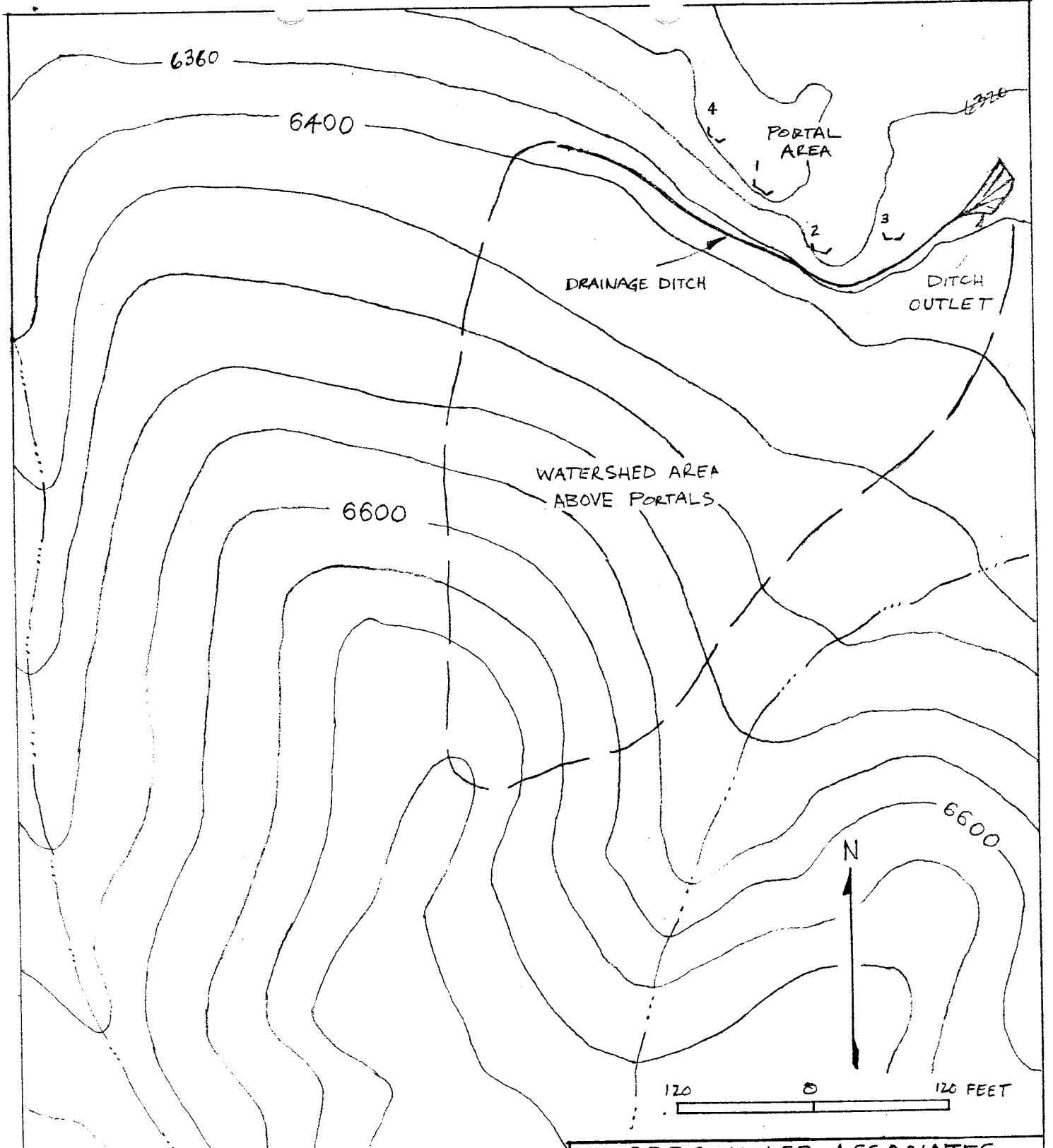
c.) *Full extent of the diversion and discharges into natural drainage channels and designs for transitions or energy dissipation:* See Figure 2.

d.) *Delineation on a map of the boundaries of the surface lands to be affected by the construction:* See Figure 3.

APPROVAL

The foregoing have been prepared under the direction of a qualified professional engineer, registered in the State of Utah.

Ben L. Seegmiller, P.E. #3485 3/5/81



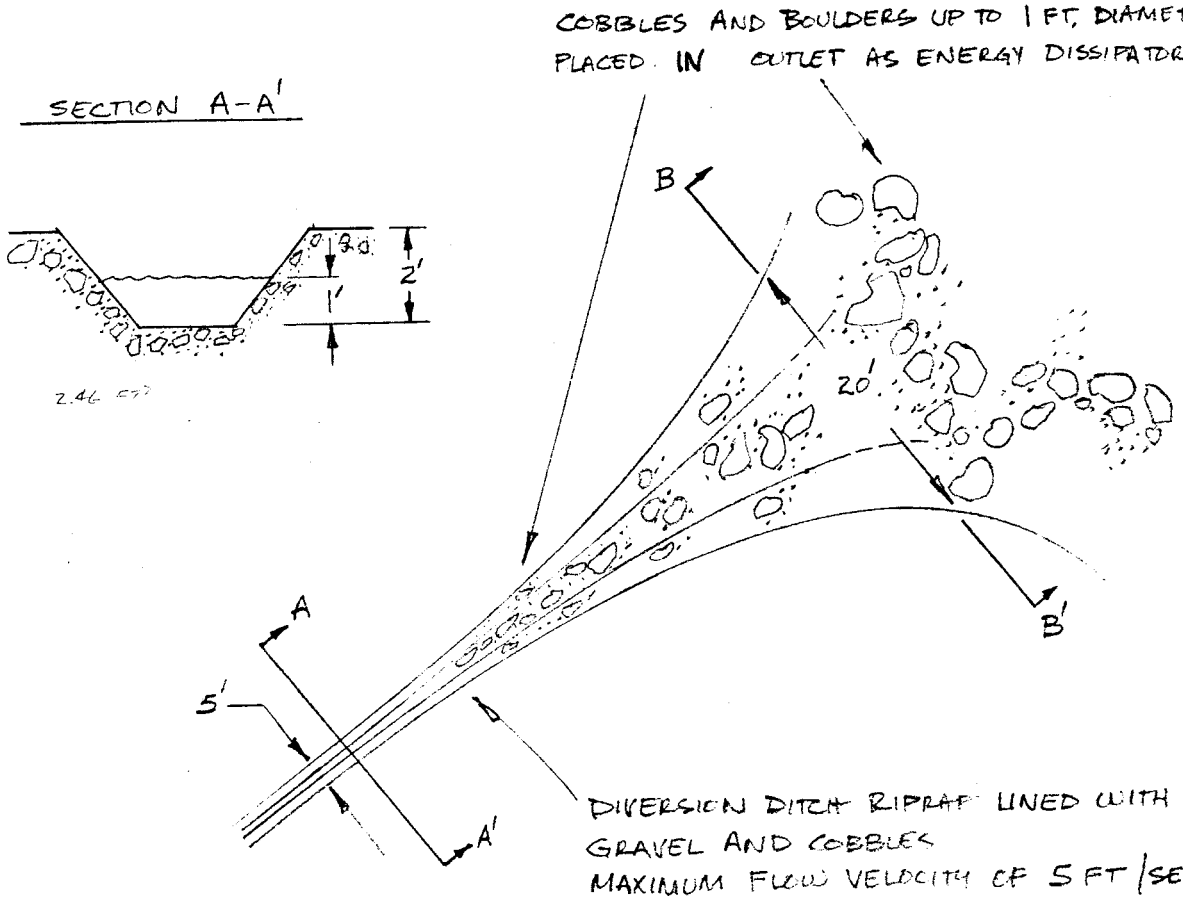
SEEGMILLER ASSOCIATES

FIGURE 1

MAP SHOWING ENTIRE WATERSHED AREA TO CONTRIBUTE RUNOFF TO PROPOSED DRAINAGE DITCH AND SHOWING LOCATION AND TOTAL EXTENT OF PROPOSED DITCH.

BLACKHAWK MINE, SUMMIT COUNTY

MARCH 4, 1981



SEEGMILLER ASSOCIATES

FIGURE 2

DETAIL OF DRAINAGE DITCH OUTLET

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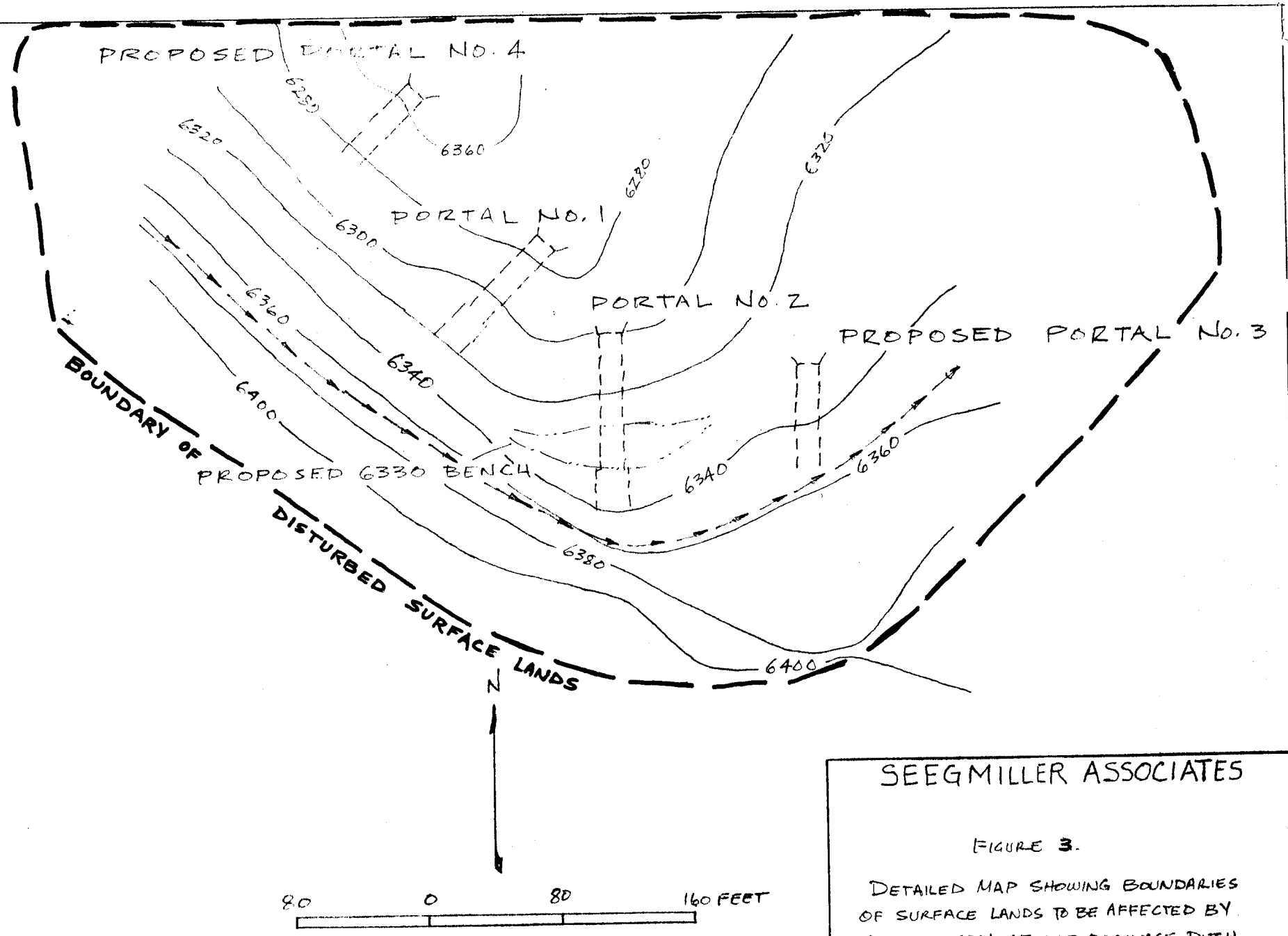

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FIGURE 3.

DETAILED MAP SHOWING BOUNDARIES OF SURFACE LANDS TO BE AFFECTED BY CONSTRUCTION OF THE DRAINAGE DITCH

BLACKHAWK MINE, SUMMIT COUNTY

MARCH 4, 1981