

0007



1407 West North Temple  
P.O. Box 899  
Salt Lake City, Utah 84110

October 1, 1985

RECEIVED

OCT 1 1985

DIVISION OF OIL  
GAS & MINING

Mr. Lowell P. Braxton, Administrator  
Mineral Resource Development & Reclamation Program  
State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
355 West North Temple  
3 Triad Center, Suite 350  
Salt Lake City, Utah 84180-1203

Re: Response to DOGM Letter September 12, 1985  
Condition #4, Des-Bee-Dove Mine Permit,  
ACT/015/017 Folder #2, Emery County, Utah

Dear Mr. Braxton:

Enclosed are two copies of an updated report concerning the stability analysis of the cut slope at station 125+00. This report includes the data and results of the stability analysis with Dr. Rollins' professional engineer certificate as required by the Division.

If you have any further questions concerning this matter, please call.

Sincerely,

A handwritten signature in cursive script that reads "C. E. Shingleton".

C. E. Shingleton  
Director of Permitting,  
Compliance & Services  
Mining and Exploration

CES:SMC:bb:5072  
Enclosure

cc: Larry Guymon (EMC)



**ROLLINS,  
BROWN AND  
GUNNELL,  
INC.**

1435 WEST 820 NORTH  
PROVO, UTAH 84601  
(801) 374-5771

**RECEIVED**

OCT 01 1985

DIVISION OF OIL  
GAS & MINING

August 12, 1985

Utah Power & Light Company  
1407 West North Temple  
Salt Lake City, Utah 84116

Attn: Chris Shingleton

Gentlemen:

In accordance with your request, we have completed a slope stability investigation for a highway cut leading to the Des-Bee-Dove Coal Mine near Orangeville, Utah. The location of the critical cut along the access road is presented in Figure No. 1. In evaluating the stability of the existing slope, consideration has been given to (1) Comparing the cut slope along the highway with various natural slopes throughout the area, (2) Performing a slope stability analysis using representative shearing strengths of the shale material throughout the area.

The results of the investigation are outlined in the following sections of this report.

**1. EXISTING SITE CONDITIONS**

The cut slope along the access road, as shown in Figure No. 1, is approximately 160 feet high and has side slopes of 1 horizontal to 1.2 vertical. The bedrock in the cut slope consists of shale. At the present time, the shale has not experienced any serious erosion. In the general area of the Wilberg Mine and the Des-Bee-Dove Coal Mine, the geological profile consists of alternating layers of sandstone and shale. Both the

sandstone and the shale will stand nearly vertical immediately after excavation. Sandstone is relatively resistant to weathering and tends to maintain its near vertical slope over an extended period of time, while the shale weathers to a stable slope. The area where the slope exists is in an isolated region and no damage can occur at the site other than to block the existing roadway. The area is located in Seismic Zone 2 according to the Uniform Building Code and the site has a horizontal acceleration with a 90 percent probability of not being exceeded in 50 years of about 0.1 g.

## 2. STABILITY CONSIDERATIONS

### A. Comparison of Typical Slopes in the Area with the Cut Slope Along the Roadway

As indicated earlier in this report, the location of the existing cut slope along the highway is shown in Figure No. 1. Five additional slope sections designated from 2 through 6 are also shown in this figure. The profile of these slopes along with the profile for the cut slope is presented in Figure No. 2. It should be recognized that the slopes associated with Section Nos. 2 through 6 represent equilibrium slopes in the shale which have occurred over a period many times the expected life of the existing roadway. It will be noted that the existing natural slopes vary from about .75 vertical to 1 horizontal to 2.4 vertical to 1 horizontal. In general, the existing natural slopes throughout the area compare reasonably well with the cut slopes along the roadway. Since the natural slopes appear to be comparable to the existing cut slopes, it is not anticipated that dramatic changes in the slope, due to weathering, will occur throughout the life of the roadway.

### B. Stability Computations

In order to obtain an indication of the factor of safety of the existing slope with respect to shear failure, a stability analysis has been performed using a computer model of Spencer's Method. Spencer's Method satisfies both force and moment equilibrium and is considered to be a satisfactory method of solving limiting equilibrium stability problems. The results of a number of unconfined compressive strength tests performed on shales in the area indicate unconfined compressive strength values varying from about 1520 psi to 5200 psi. It should be recognized that the shale is jointed and that the strength of jointed rock masses is dramatically less than that of intact rock material. Research has shown that block fractures in jointed rock masses are initiated at stress levels of somewhat greater than 10 percent of the unconfined compressive strength of the

Chris Shingleton  
August 12, 1985  
Page 3

intact material. Using the minimum value for the unconfined compressive strength of about 1500 psi, gives a cohesion of 750 psi. If an effective cohesion of 1/10 of this value or 75 psi is used for the shearing strength of the shale within the cut section along with an in-place unit weight of 130 pcf, a factor of safety of substantially greater than 1.5 is obtained. The actual cohesion required to provide a factor of safety of 1.5 is 38 psi. Based upon these computations, it is our opinion that the existing slope has a factor of safety against a shear failure of well above 1.5.

In summary, both a comparison of existing slopes throughout the area and the results of stability computations indicate that the deep cut along the approach road to the Des-Bee Dove Mine is stable with a factor of safety in excess of 1.5. Furthermore, it should be recognized that if a slope failure were to occur at this location a catastrophic consequence is unlikely since, at worst, a slope failure would block the road requiring removal of the slide material. The chance for loss of life or other sevier damage at the existing site appears to be only a remote possibility.

If there are any questions relative to the information contained in this letter, please advise us and we would be pleased to meet with you and discuss the results of the investigation further.

Yours truly,

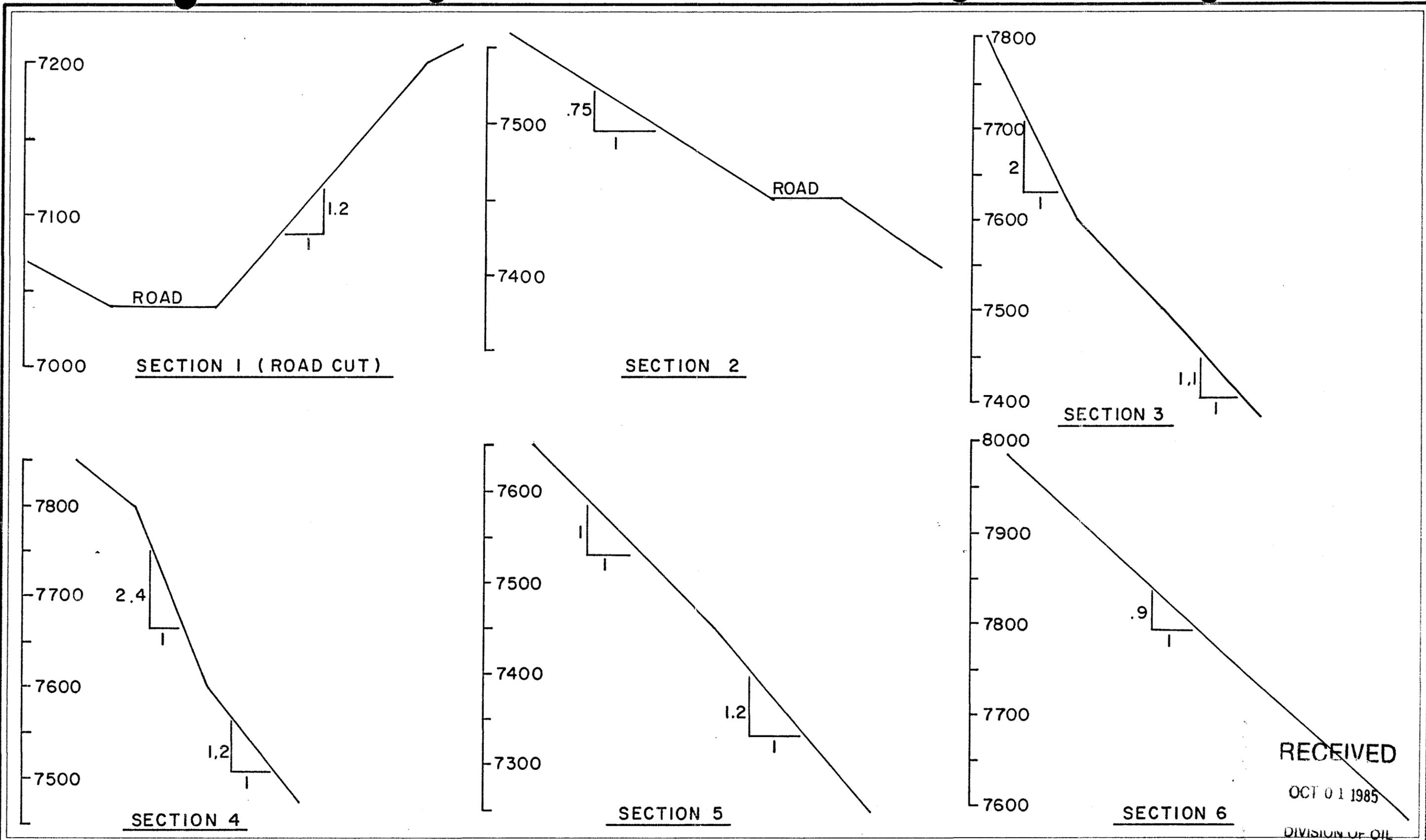
ROLLINS, BROWN AND GUNNELL, INC.

*Ralph L. Rollins*  
Ralph L. Rollins

RLR/dcp

Enclosures





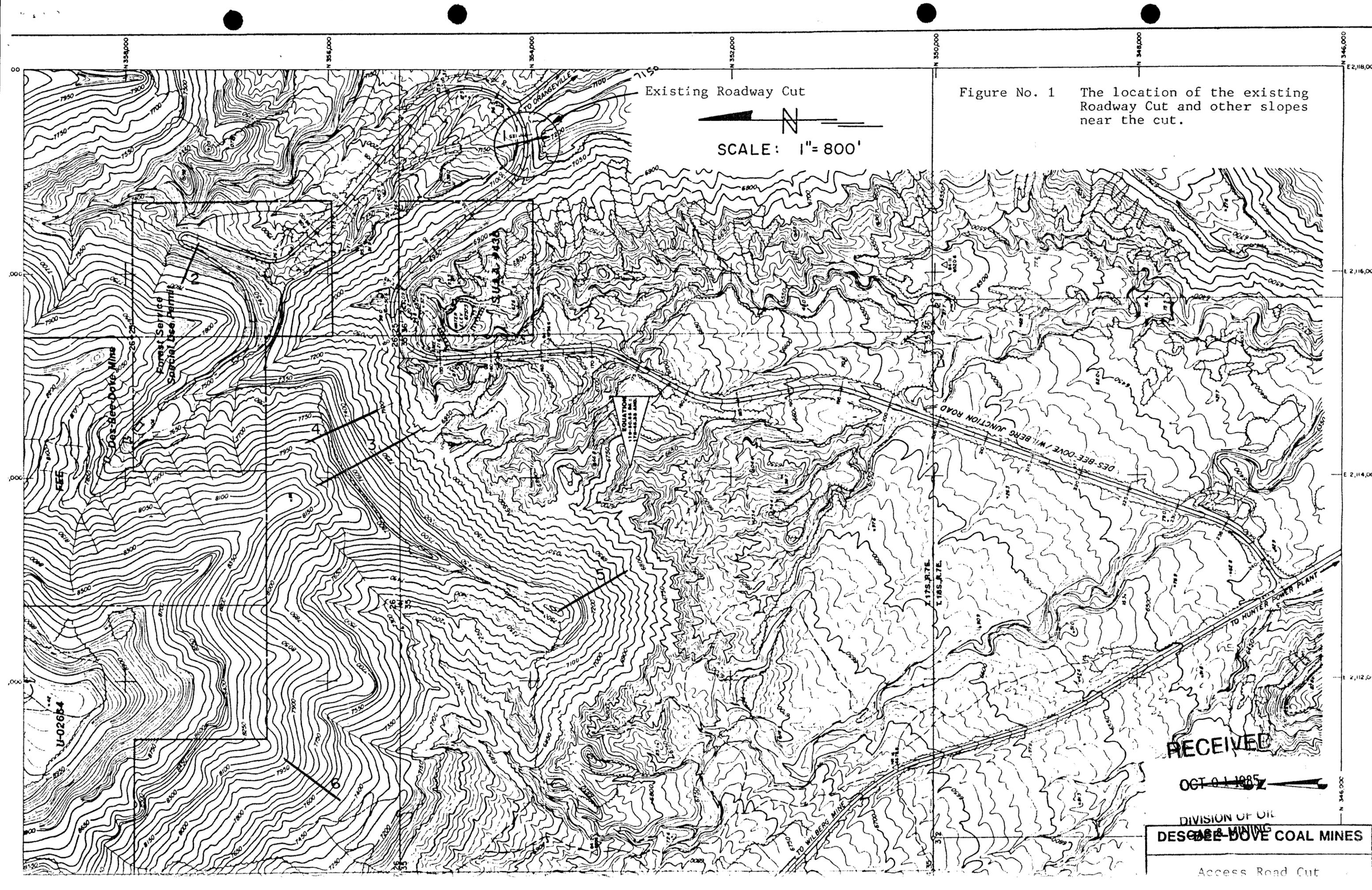
RECEIVED  
OCT 01 1985

DIVISION OF OIL  
GAS & MINING

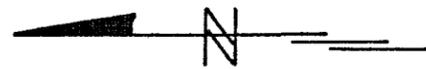
Des-Bee-Dove Mine Access  
Road Slope Stability  
Utah Power & Light Co.

THE ROADWAY PROFILE AND THE PROFILE OF  
TYPICAL SLOPES IN THE AREA

FIGURE  
NO. 2



Existing Roadway Cut



SCALE: 1" = 800'

Figure No. 1 The location of the existing Roadway Cut and other slopes near the cut.

Forest Service  
Sarcina Lee, Mining

EQUATION  
175.00  
175.00  
175.00

DES-BEE-DOVE / WILBERG JUNCTION ROAD

RECEIVED

OCT 01 1985

DIVISION OF OIL  
DES-BEE-DOVE COAL MINES

Access Road Cut

U-026B4

WILBERG MINE

175.00  
175.00

0 BISHOP MODIFIED AND/OR ORDINARY METHOD OF SLICES  
 0 Stability Analysis for DesBee Dove Mine Access  
 0 CONTROL DATA

NUMBER OF SPECIFIED CENTERS 0  
 NUMBER OF DEPTH LIMITING TANGENTS 5  
 NUMBER OF VERTICAL SECTIONS 5  
 NUMBER OF SOIL LAYER BOUNDARIES 2  
 NUMBER OF PORE PRESSURE LINES 0  
 NUMBER OF POINTS DEFINING COHESION PROFILE 0

0 SEISMIC COEFFICIENT S1,S2 = .00, .00  
 0 UNIT WEIGHT OF WATER = 62.40

0 SEARCH IS BASED ON BISHOP MODIFIED METHOD

SEARCH STARTS AT CENTER ( 380.0, -80.0) WITH FINAL GRID OF 5.0  
 0 ALL CIRCLES TANGENT TO DEPTH, 170.0, 175.0, 180.0, 185.0, 190.0,  
 0 GEOMETRY

0 SECTIONS .0 264.0 290.0 430.0 500.0

T. CRACKS .0 .0 9.0 174.0 174.0  
 W IN CRACK .0 .0 9.0 174.0 174.0  
 BOUNDARY 1 .0 .0 9.0 174.0 174.0  
 BOUNDARY 2 250.0 250.0 250.0 250.0 250.0

0 SOIL PROPERTIES

0 LAYER COHESION FRICTION ANGLE DENSITY  
 0 1 10800.0 .0 140.0

0 BISHOP MODIFIED AND/OR ORDINARY METHOD OF SLICES  
 0 Stability Analysis for DesBee Dove Mine Access

0 NUMBER TANGENT RADIUS (X) CENTER (Y) CENTER FS(BISHOP) FS(OMS)

1	170.0	250.0	380.0	-80.0	2.647	2.647
2	170.0	250.0	370.0	-80.0	2.673	2.673
3	170.0	260.0	380.0	-90.0	2.646	2.646
4	170.0	250.0	390.0	-80.0	2.635	2.635
5	170.0	240.0	380.0	-70.0	2.650	2.650
6	170.0	250.0	385.0	-80.0	2.639	2.639
7	170.0	255.0	390.0	-85.0	2.634	2.634
8	170.0	250.0	395.0	-80.0	2.635	2.635
9	170.0	245.0	390.0	-75.0	2.638	2.638
10	170.0	255.0	385.0	-85.0	2.638	2.638
11	170.0	260.0	390.0	-90.0	2.632	2.632
12	170.0	255.0	395.0	-85.0	2.633	2.633
13	170.0	260.0	385.0	-90.0	2.638	2.638
14	170.0	265.0	390.0	-95.0	2.632	2.632
15	170.0	260.0	395.0	-90.0	2.631	2.631
16	170.0	265.0	395.0	-95.0	2.630	2.630
17	170.0	260.0	400.0	-90.0	2.633	2.633
18	170.0	255.0	395.0	-85.0	2.633	2.633
19	170.0	265.0	390.0	-95.0	2.632	2.632
20	170.0	270.0	395.0	-100.0	2.629	2.629
21	170.0	265.0	400.0	-95.0	2.631	2.631
22	170.0	270.0	390.0	-100.0	2.632	2.632
23	170.0	275.0	395.0	-105.0	2.630	2.630
24	170.0	270.0	400.0	-100.0	2.630	2.630
25	170.0	275.0	390.0	-105.0	2.633	2.633
26	170.0	275.0	400.0	-105.0	2.630	2.630
27	170.0	265.0	400.0	-95.0	2.631	2.631
28	170.0	265.0	390.0	-95.0	2.632	2.632

0 F.S. MINIMUM= 2.629 FOR THE CIRCLE OF CENTER ( 395.0, -100.0)

0 BISHOP MODIFIED AND/OR ORDINARY METHOD OF SLICES

0 Stability Analysis for DesBee Dove Mine Access

ONUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	FS(BISHOP)	FS(OMS)
1	175.0	270.0	390.0	-95.0	2.559	2.559
2	175.0	270.0	380.0	-95.0	2.577	2.577
3	175.0	280.0	390.0	-105.0	2.560	2.560
4	175.0	270.0	400.0	-95.0	2.555	2.555
5	175.0	260.0	390.0	-85.0	2.561	2.561
6	175.0	270.0	395.0	-95.0	2.555	2.555
7	175.0	275.0	400.0	-100.0	2.554	2.554
8	175.0	270.0	405.0	-95.0	2.558	2.558
9	175.0	265.0	400.0	-90.0	2.556	2.556
10	175.0	275.0	395.0	-100.0	2.555	2.555
11	175.0	280.0	400.0	-105.0	2.554	2.554
12	175.0	275.0	405.0	-100.0	2.556	2.556
13	175.0	280.0	395.0	-105.0	2.555	2.555
14	175.0	285.0	400.0	-110.0	2.554	2.554
15	175.0	280.0	405.0	-105.0	2.555	2.555
16	175.0	285.0	395.0	-110.0	2.556	2.556
17	175.0	285.0	405.0	-110.0	2.554	2.554
18	175.0	275.0	405.0	-100.0	2.556	2.556
19	175.0	275.0	395.0	-100.0	2.555	2.555

OF.S. MINIMUM= 2.554 FOR THE CIRCLE OF CENTER ( 400.0,-105.0)

0 BISHOP MODIFIED AND/OR ORDINARY METHOD OF SLICES

0 Stability Analysis for DesBee Dove Mine Access

ONUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	FS(BISHOP)	FS(OMS)
1	180.0	280.0	395.0	-100.0	2.620	2.620
2	180.0	280.0	385.0	-100.0	2.573	2.573
3	180.0	290.0	395.0	-110.0	2.626	2.626
4	180.0	280.0	405.0	-100.0	2.684	2.684
5	180.0	270.0	395.0	-90.0	2.616	2.616
6	180.0	280.0	380.0	-100.0	2.555	2.555
7	180.0	285.0	385.0	-105.0	2.577	2.577
8	180.0	280.0	390.0	-100.0	2.595	2.595
9	180.0	275.0	385.0	-95.0	2.570	2.570
10	180.0	280.0	375.0	-100.0	2.541	2.541
11	180.0	285.0	380.0	-105.0	2.559	2.559
12	180.0	275.0	380.0	-95.0	2.551	2.551
13	180.0	280.0	370.0	-100.0	2.543	2.543
14	180.0	285.0	375.0	-105.0	2.545	2.545
15	180.0	275.0	375.0	-95.0	2.537	2.537
16	180.0	275.0	370.0	-95.0	2.541	2.541
17	180.0	275.0	380.0	-95.0	2.551	2.551
18	180.0	270.0	375.0	-90.0	2.533	2.533
19	180.0	270.0	370.0	-90.0	2.540	2.540
20	180.0	270.0	380.0	-90.0	2.548	2.548
21	180.0	265.0	375.0	-85.0	2.530	2.530
22	180.0	265.0	370.0	-85.0	2.540	2.540
23	180.0	265.0	380.0	-85.0	2.545	2.545
24	180.0	260.0	375.0	-80.0	2.527	2.527
25	180.0	260.0	370.0	-80.0	2.540	2.540
26	180.0	260.0	380.0	-80.0	2.543	2.543
27	180.0	255.0	375.0	-75.0	2.525	2.525
28	180.0	255.0	370.0	-75.0	2.541	2.541
29	180.0	255.0	380.0	-75.0	2.541	2.541
30	180.0	250.0	375.0	-70.0	2.527	2.527
31	180.0	260.0	370.0	-80.0	2.540	2.540
32	180.0	260.0	380.0	-80.0	2.543	2.543
33	180.0	250.0	380.0	-70.0	2.540	2.540
34	180.0	250.0	370.0	-70.0	2.542	2.542

OF.S. MINIMUM= 2.525 FOR THE CIRCLE OF CENTER ( 375.0, -75.0)

0 BISHOP MODIFIED AND/OR ORDINARY METHOD OF SLICES  
 0 Stability Analysis for DesBee Dove Mine Access

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	FS(BISHOP)	FS(OMS)
1	185.0	250.0	370.0	-70.0	2.558	2.558
2	185.0	255.0	360.0	-70.0	2.545	2.545
3	185.0	265.0	370.0	-80.0	2.563	2.563
4	185.0	255.0	380.0	-70.0	2.586	2.586
5	185.0	245.0	370.0	-60.0	2.556	2.556
6	185.0	255.0	355.0	-70.0	2.548	2.548
7	185.0	260.0	360.0	-75.0	2.547	2.547
8	185.0	255.0	365.0	-70.0	2.550	2.550
9	185.0	250.0	360.0	-65.0	2.543	2.543
10	185.0	250.0	355.0	-65.0	2.550	2.550
11	185.0	250.0	365.0	-65.0	2.548	2.548
12	185.0	245.0	360.0	-60.0	2.542	2.542
13	185.0	245.0	355.0	-60.0	2.553	2.553
14	185.0	245.0	365.0	-60.0	2.547	2.547
15	185.0	240.0	360.0	-55.0	2.541	2.541
16	185.0	240.0	355.0	-55.0	2.557	2.557
17	185.0	240.0	365.0	-55.0	2.547	2.547
18	185.0	235.0	360.0	-50.0	2.542	2.542
19	185.0	245.0	355.0	-60.0	2.553	2.553
20	185.0	245.0	365.0	-60.0	2.547	2.547
21	185.0	235.0	365.0	-50.0	2.547	2.547
22	185.0	235.0	355.0	-50.0	2.561	2.561

OF.S. MINIMUM= 2.541 FOR THE CIRCLE OF CENTER ( 360.0, -55.0)

0 BISHOP MODIFIED AND/OR ORDINARY METHOD OF SLICES  
 0 Stability Analysis for DesBee Dove Mine Access

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	FS(BISHOP)	FS(OMS)
1	190.0	240.0	355.0	-50.0	2.562	2.562
2	190.0	240.0	345.0	-50.0	2.571	2.571
3	190.0	250.0	355.0	-60.0	2.563	2.563
4	190.0	240.0	365.0	-50.0	2.569	2.569
5	190.0	230.0	355.0	-40.0	2.565	2.565
6	190.0	240.0	350.0	-50.0	2.565	2.565
7	190.0	235.0	355.0	-45.0	2.563	2.563
8	190.0	245.0	350.0	-55.0	2.564	2.564
9	190.0	245.0	360.0	-55.0	2.564	2.564
10	190.0	235.0	360.0	-45.0	2.564	2.564
11	190.0	235.0	350.0	-45.0	2.565	2.565

OF.S. MINIMUM= 2.562 FOR THE CIRCLE OF CENTER ( 355.0, -50.0)