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ROAD CUTTINGS ON THE SOUTH-EASTERN FREEWAY CALLINGTON-WHITE HILLS DISTRICT: SEISMIC REFRACTION SURVEY

by

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Department of Mines
South Australia —

73/189

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ROAD CUTTINGS ON THE SOUTH-EASTERN FREEWAY 17-8-73
CALLINGTON-WHITE HILLS DISTRICT: SEISMIC REFRACTION SURVEY
by R.G.NELSON

72-819 S.E.Freeway
Petwood-White Hills Section

73-554 Seismic Refraction Traverses
Cuttings 365 + 20 to 431 + 50

73-555 Seismic Refraction Traverses
Cuttings 438 + 00 to 566 + 00

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
EXPLORATION SERVICES DIVISION

ROAD CUTTINGS ON THE SOUTH-EASTERN FREEWAY, CALLINGTON-WHITE HILLS DISTRICT: SEISMIC REFRACTION SURVEY

by

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EXPLORATION GEOPHYSICS SECTION

Rept.Bk.No.73/189
G.S. No. 5194
DM. No. 1397/70

17th August, 1973

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Plan No.	Title	Scale
72-819	S.E. Freeway Petwood-White Hills Section.	As shown
73-554	Seismic refraction traverses Cuttings 365 + 20 to 431 + 50	As shown
73-555	Seismic refraction traverses Cuttings 438 + 00 to 566 + 00	As shown

DEPARTMENT OF MINES
SOUTH AUSTRALIA

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ABSTRACT

Continuing previous work (Nelson, 1973) the author made a number of seismic refraction traverses over proposed road cuttings on the South-Eastern Freeway. Most cuttings should require blasting in parts to loosen rock material. However, where extensive weathering has occurred (as indicated by low seismic velocities) most of the material should be rippable. This is particularly so over the low rounded hills lying in the Bremer River valley.

INTRODUCTION

The reader is referred to the previous report (Nelson, 1973) dealing with seismic refraction traverses in the Petwood - Callington district.

This report deals with seismic refraction investigations made over the following proposed cuttings:

(a) 365 + 20 to 382 + 90 (east-west road)

(b) 397 + 70 to 405 + 00 (east-west road)

(c) 411 + 40 to 431 + 50 (east-west road)

(d) 438 + 00 to 465 + 00 (west-east road)

(e) 512 + 00 to 570 + 00 (centre-line)

GEOLOGY

The dominant rock types are schists, metasandstones and metasiltstones belonging to the Kanmantoo Group of Cambrian age. Overburden is thin and consists of silty topsoil derived from the Kanmantoo Group rocks. Alluvial silt soil and gravel occur in creek channels and in the Bremer River valley.

The Bremer Fault is a prominent feature, rising immediately to the east of Callington and running in a north-south direction.

SURVEY PROCEDURES

Seismic traverses were made using spreads of 24 geophones spaced at 30 ft. intervals in line. Shots were fired:

(a) at the spread centre;

(b) midway between geophones 6 and 7;

(c) " " " 18 and 19;

(d) at the ends of the spread;

(e) as bracketing shots located 100 ft. from each end of the spread.

In addition weathering spreads using 24 geophones at 5 ft. spacing were used to give more information on near-surface layers.

Shots were placed at a depth of 1½ ft. to 2½ ft. below ground level in holes made by a power-driven auger. The explosive used was AN60 blasting gelignite: this was detonated electrically using a capacitance blaster.

Recordings were made of the geophone response by a Texas Instrument Co. 7000B recording seismograph.

See Nelson (1973) for interpretation procedures and comments on the degree of rippability of rocks as inferred from their seismic velocities.

RESULTS

Refer to Plan Nos. 73-554 and 73-555.

(a) Cutting: 365 + 20 to 382 + 90

Dominant velocities within the depth of cut are of the order of 3 500 to 5 500 ft./sec. Hence, the cutting should be rippable over its entire length with the possible exception of a hard ridge located at depth near station 369 + 00.

(b) Cutting: 397 + 70 to 405 + 00

Apart from a fairly soft lens of 7 700 ft./sec. material lying between 400 + 25 and 402 + 00, most of this cutting will require blasting, as the dominant velocities are from 13 000 to 19 000 ft./sec.

(c) Cutting: 411 + 40 to 431 + 50

This cutting should prove rippable over its entire length. Some difficulties may occur over what are probably weathered metasiltstones and metasandstones (6 800 ft./sec. to 7 500 ft./sec.) and perhaps also over what is probably fresh schist (9 800 ft./sec.).

(d) Cutting: 438 + 00 to 465 + 00

Only small sections of this should prove unrippable as the general range of velocities within the depth of cut is about 2 000 ft./sec. to 5 000 ft./sec.

Difficulties may occur where the depth of cut exceeds the depth of weathering (between 446 + 60 and 454 + 25).

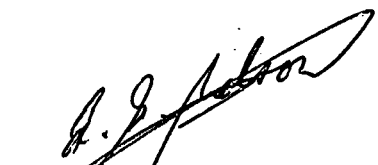
(e) Cutting: 512 + 00 to 570 + 00

About a third of this cutting will require blasting, particularly where it crosses over the top of the Bremer Fault Scarp.

CONCLUSIONS

The following table gives an approximate indication of rippability in each cutting.

Cutting	Comments
365 + 20 to 382 + 90	99% rippable
397 + 70 to 405 + 00	50% rippable
411 + 40 to 431 + 50	100 % rippable
438 + 00 to 465 + 00	95% rippable
512 + 00 to 570 + 00	60-70% rippable

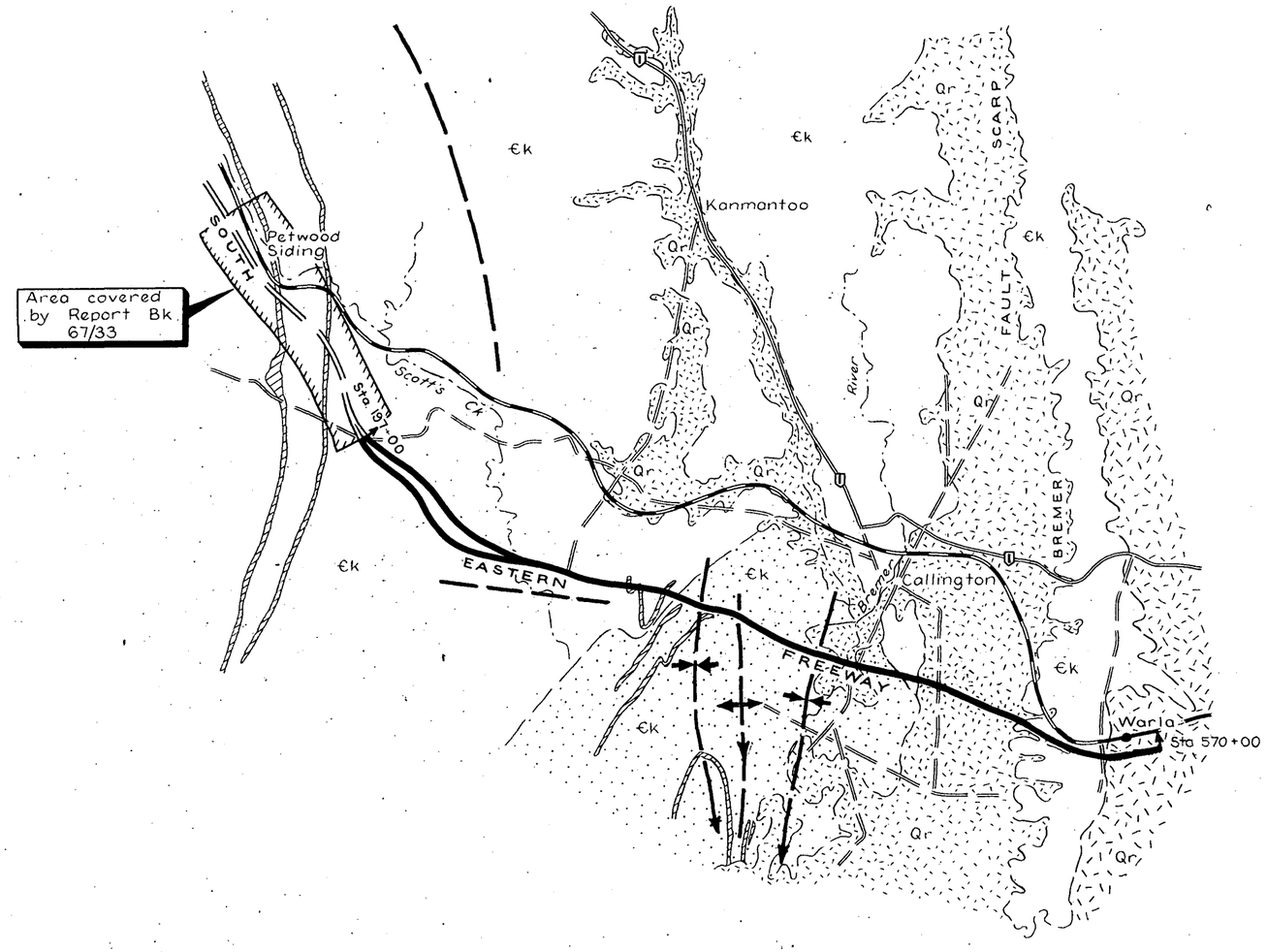


R.G. NELSON
GEOPHYSICIST
EXPLORATION GEOPHYSICS SECTION

RGN:FdeA
17.8.73

REFERENCE

Nelson, R.G., 1970. Road cuttings on the South-Eastern Freeway, Petwood-Callington district. S.A. Dept. of Mines unpublished report, RB.73/153.



SCALE IN KILOMETRES
0 1 2 3 4 5
SCALE IN MILES
0 1 2 3

LEGEND

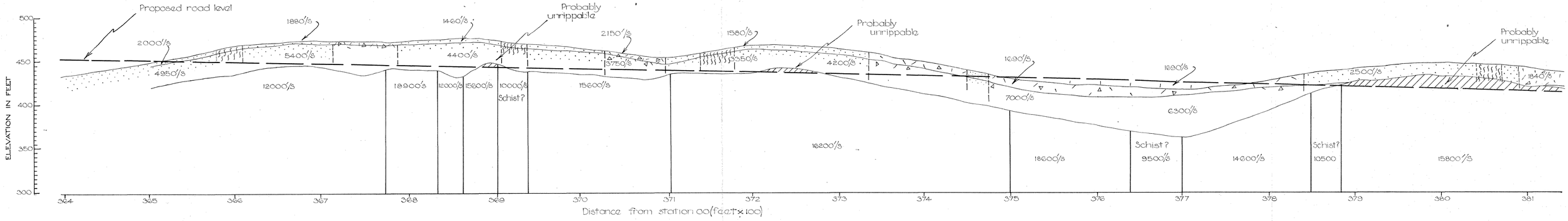
- Qr — RECENT — Alluvium.
- €k — CAMBRIAN KANMANTOO GP. — BRUKUNGA FORMATION: Interbedded phyllites and greywacke.
- €k — BROWN HILL GREYWACKE MEMBER.
- €k — NAIRNE PYRITE MEMBER.
- Geological boundary.
- Fault
- Syncline; Anticline, showing direction of plunge
- Section of Freeway investigated in this report.
- Major road.
- Minor road.
- Railway.
- Stream.

Note: Geology from 1:250,000 Barker Sheet.

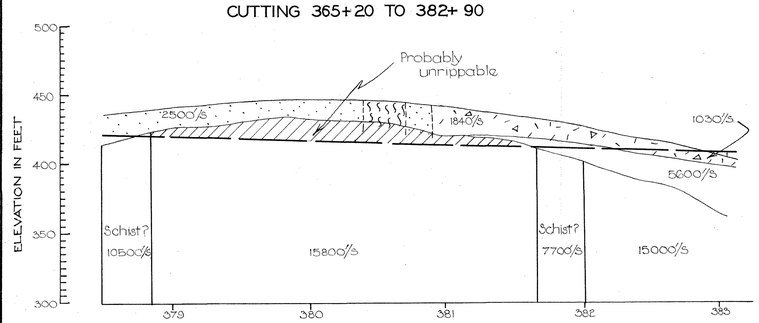
FIG. 1

ENGINEERING GEOLOGY SECTION	DEPARTMENT OF MINES – SOUTH AUSTRALIA	Scale: As shown
Compiled: P. Rogers	SOUTH EASTERN FREEWAY	Date: 15th Sept 1972
Drn. M.A.S. Ckd. PAR.	PETWOOD – WHITE HILL SECTION	Drg. No. 72-819 Hbc
	LOCALITY PLAN SHOWING REGIONAL GEOLOGY	

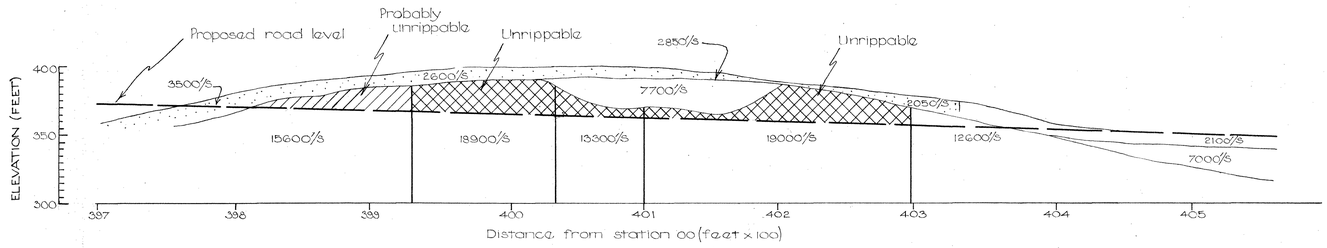
CUTTING 365+20 TO 382+90



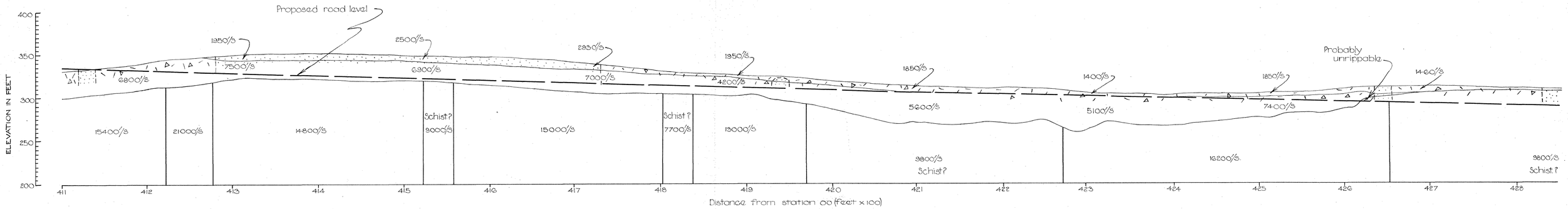
CUTTING 365+20 TO 382+90



CUTTING 397+70 TO 405+00



CUTTING 411+40 TO 431+50



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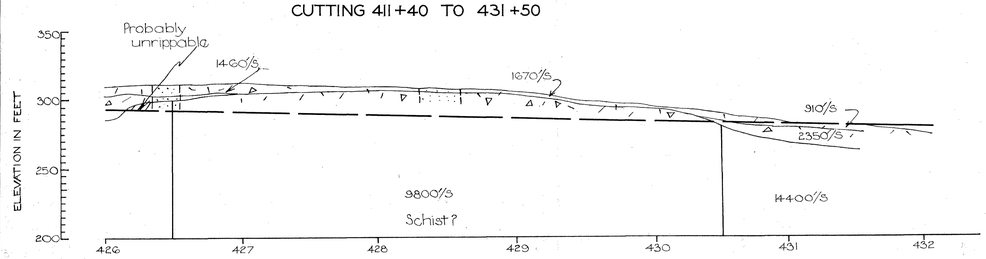


SCALE IN FEET

50 0 50 100 150 200 250

25 0 25 50 75

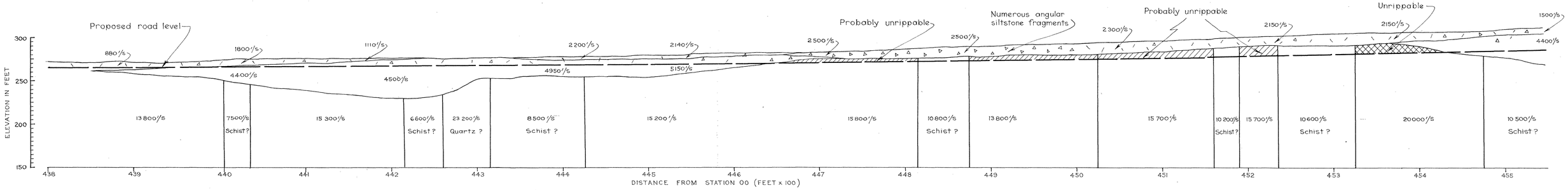
SCALE IN METRES

DEPARTMENT OF MINES — SOUTH AUSTRALIA

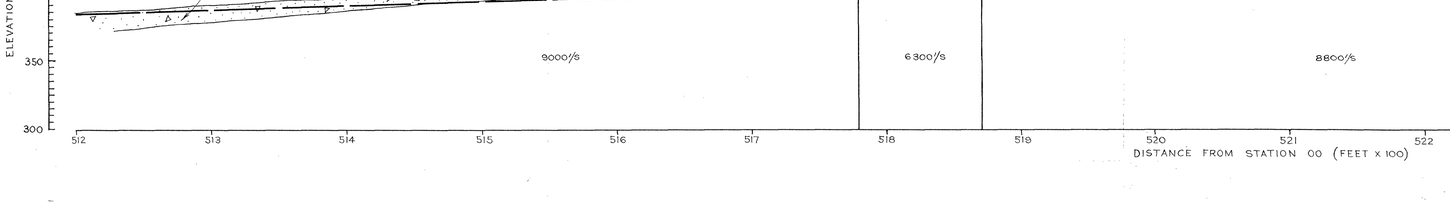
SOUTH EASTERN FREEWAY
PETWOOD — WHITE HILL SECTION
SEISMIC REFRACTION TRAVERSES
365+20 TO 431+50

EXPLORATION GEOPHYSICS SECTION	R. Nelson GEOPHYSICIST	Drn. R.N	SCALE: 1:600
		Tcd. R.B.	73-554
		Ckd. A.F.	Hb 84
Director of Mines		Exd.	DATE: 20 July 1973

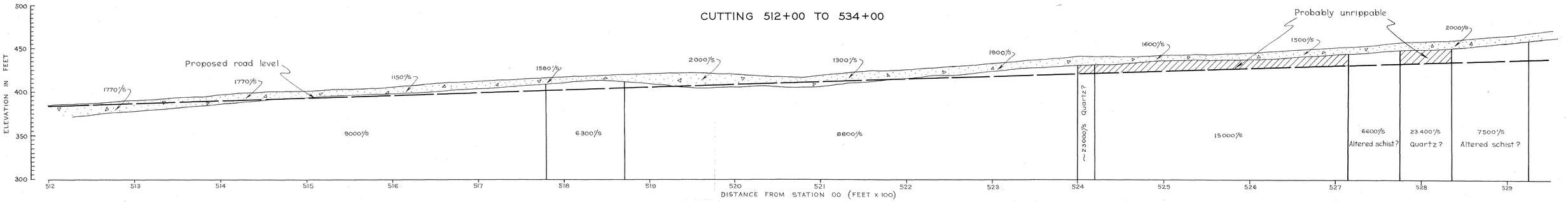
CUTTING 438+00 TO 465+00



CUTTING 438+00 TO 465+00



CUTTING 512+00 TO 534+00



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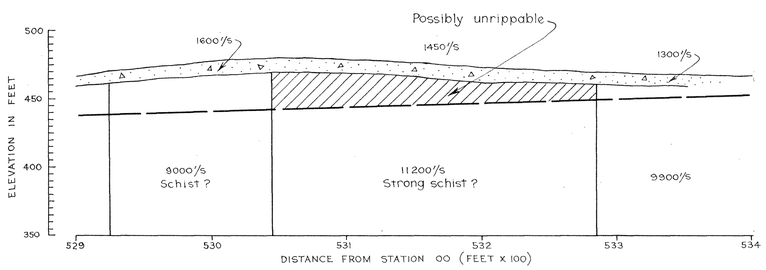
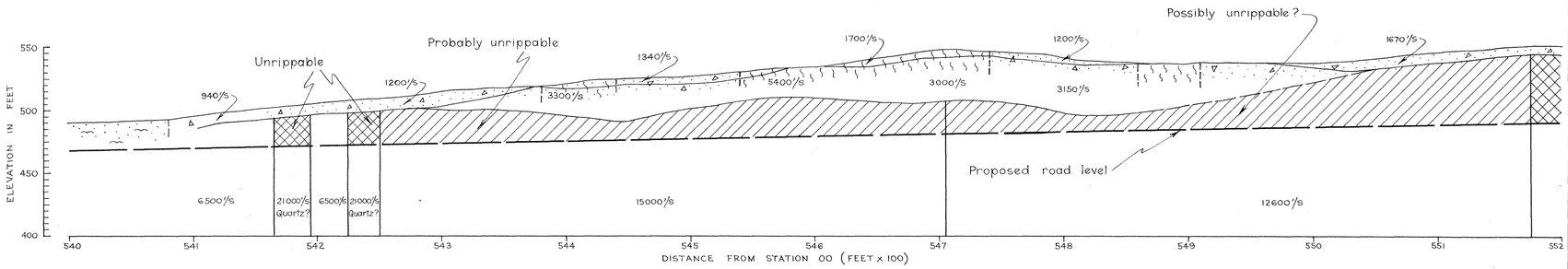
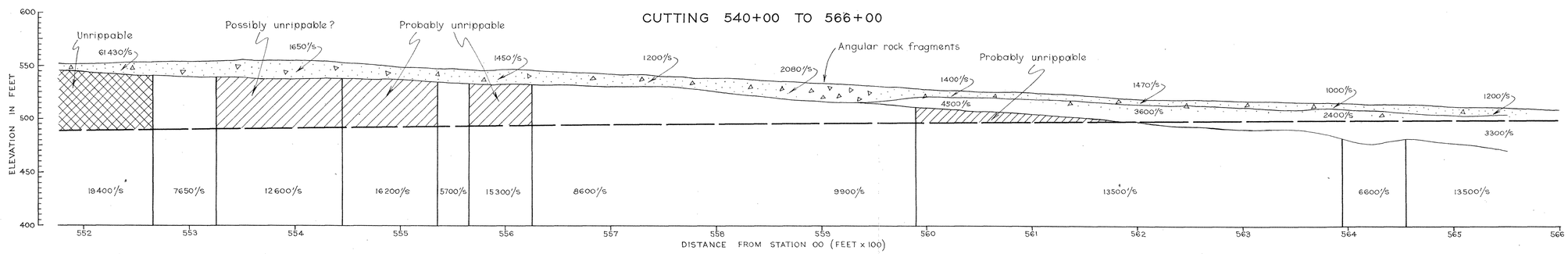
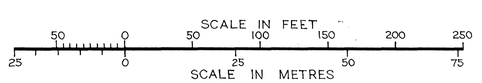


CUTTING 540+00 TO 566+00



CUTTING 540+00 TO 566+00





DEPARTMENT OF MINES — SOUTH AUSTRALIA

SOUTH EASTERN FREEWAY
PETWOOD — WHITE HILL SECTION
SEISMIC REFRACTION TRAVERSES
438+00 TO 566+00

EXPLORATION GEOPHYSICS SECTION	R Nelson GEOPHYSICIST	Drn. R.N	SCALE: 1:600
		Tcd. A.S.F.	73-555
Director of Mines		Ckd. A.F.	Hb 6/7
		Exd.	DATE: 20 July 1973