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COMMONWEALTH OF AUSTRALIA

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DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES,  
GEOLOGY AND GEOPHYSICS.

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RECORDS

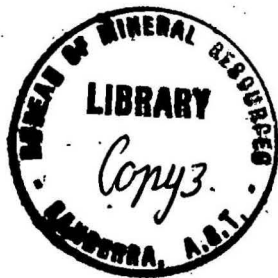
1956, No.128



SEISMIC REFRACTION SURVEY AT THE  
LOWER REPULSE DAM SITE,  
DERWENT RIVER, TASMANIA.

by

William A. Wiebenga, D. F. Dyson  
and M.J. O'Connor



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## CONTENTS

	<u>Page</u>
ABSTRACT	(iii)
1. INTRODUCTION	1
2. GEOLOGY	1
3. METHODS	1
4. RESULTS	2
5. CONCLUSIONS	2

## ILLUSTRATIONS

- Plate 1. Plan of traverses  
2. Seismic cross-sections

### ABSTRACT

This report gives the results of a seismic refraction survey of the Lower Repulse dam site on the Derwent River, Tasmania.

The geological and geophysical results indicate a thick overburden of weathered dolerite and sandstone in the dam site and spill-way areas respectively. The location is therefore unsuitable for use as a dam site.

The recorded seismic velocities in ft/sec. were: fresh dolerite 14,000-19,000, weathered dolerite, 5,400-6,300, sand 2,000 and weathered sandstone 8,500.

## 1. INTRODUCTION

The proposed Lower Repulse dam on the Derwent River is part of the Tasmanian Hydro-Electric Commission's Derwent-Dee power development scheme. Two alternative sites were chosen by the Commission, one between 400 to 800 ft. above the junction of the Repulse and Derwent Rivers and the other 900 ft. below the junction. In the time allotted it was possible to carry out a survey of the "Lower" site only, because of inclement weather and other commitments. A survey of the "Upper" site was carried out at a later date and is the subject of a separate report.

The approximate co-ordinates of the surveyed dam site are N76682/E458150 yards, referred to the local Tasmanian grid, as marked on the aerial photo-map of the Derwent-Dee development scheme.

Before the seismic survey was completed, the preliminary information from the seismic work and the geological testing of the spill-way site near Traverse GG' (see Plate 1) indicated that the chosen site was unsuitable. The proposal to use this location as a dam site was therefore abandoned before the geophysical survey was completed.

The geophysical survey was made during May 1955, while the party was based at Wayatinah. The geophysical party consisted of D. F. Dyson (party leader) and M. J. O'Connor, geophysicists, and J. P. Figgott field assistant. The topographical survey parties and field hands were provided by the Commission.

It is desired to acknowledge the co-operation of the staff of the Resident Engineer's Office at Wayatinah.

## 2. GEOLOGY.

The geology of the area was investigated by R. P. Mather, the Commission's geologist, and his findings are given in an internal report to the Commission's Senior Geologist dated 3rd May, 1955.

The main rock in the area is a medium-grained to fine-grained Jurassic dolerite, with steep irregular jointing, the main joints striking 250°-270° and 330°-360°. The dolerite is covered by talus or scree.

Along the southern (right) bank of the river the dolerite is covered by alluvium. In the southern part of the dam site, near Traverse GG' (Plate 1), the geological map indicates the presence of sandy terrace material. Three exploration pits of about 9 feet depth in this terrace material showed a loosely packed, or weathered, sandstone. About 1,500 to 2,000 feet down stream from the dam site, isolated "islands" of Triassic sandstone are exposed in the dolerite on both banks of the Derwent River.

## 3. METHODS.

The seismic refraction technique was employed, using the method of differences (reciprocal method). A portable seismic refraction 12-channel equipment, Century model 506, was used.

On the northern (left) bank (see Plate 1), normal spreads were used with geophone intervals of 40 feet and shot distances of 40 feet and 200 feet. On the southern bank, the

~~geophone~~ interval was reduced to 20 feet and the shot distances to 20 feet and 100 feet, to allow for the effects of rapidly changing topographical features. Four weathering spreads were shot.

Two additional intersecting weathering spreads were shot to obtain information in the spill-way area, located near Traverse GG' (Plate 1).

A total of 2,800 feet of seismic traverse was surveyed.

#### 4. RESULTS.

In general, two distinct velocity ranges were recorded, namely 5,400 to 6,300 ft/sec. and 14,000 to 19,000 ft/sec. The formations in which these velocities occur are interpreted as weathered dolerite and unweathered dolerite respectively.

Near the intersection of Traverses GG' and JJ', geological evidence indicates that the 2,000 ft/sec. layer can be interpreted only as sand or very weathered sandstone. The intermediate layer, of 8,500 ft/sec. velocity, is interpreted as weathered sandstone overlying unweathered dolerite.

The following points should be noted from the sections on Plate 2:-

(i) On the northern bank there is an increase in depth to fresh dolerite towards the upstream end of Traverses AA' and BB'.

(ii) The seismic velocity in the fresh dolerite on Traverse BB' is lower than that on Traverse AA', indicating a possible shear zone parallel to, and near, the northern bank of the river.

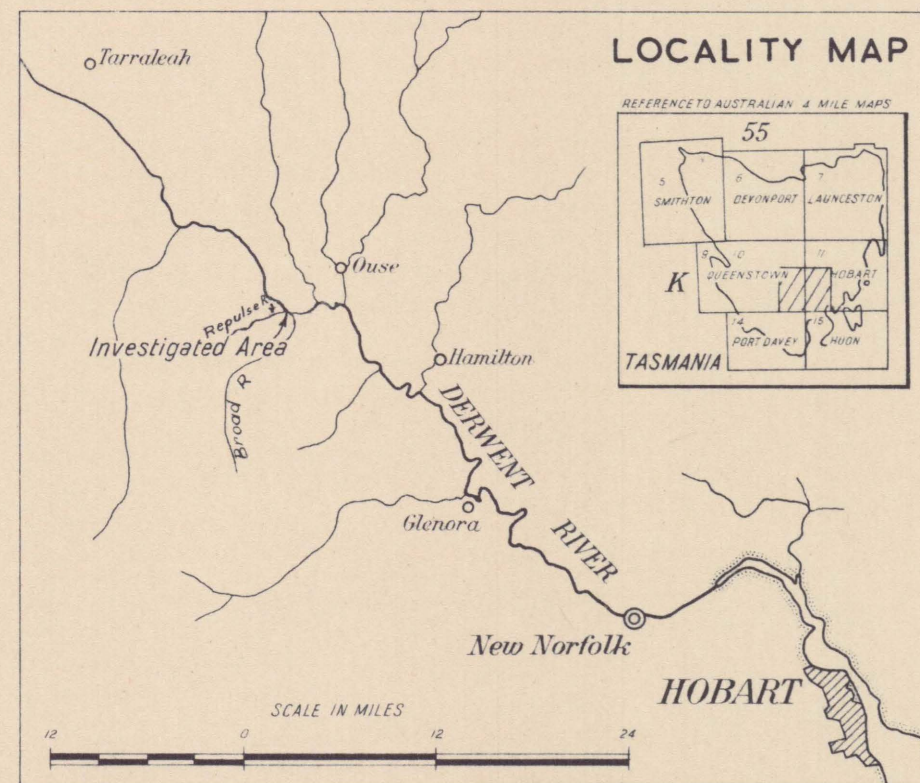
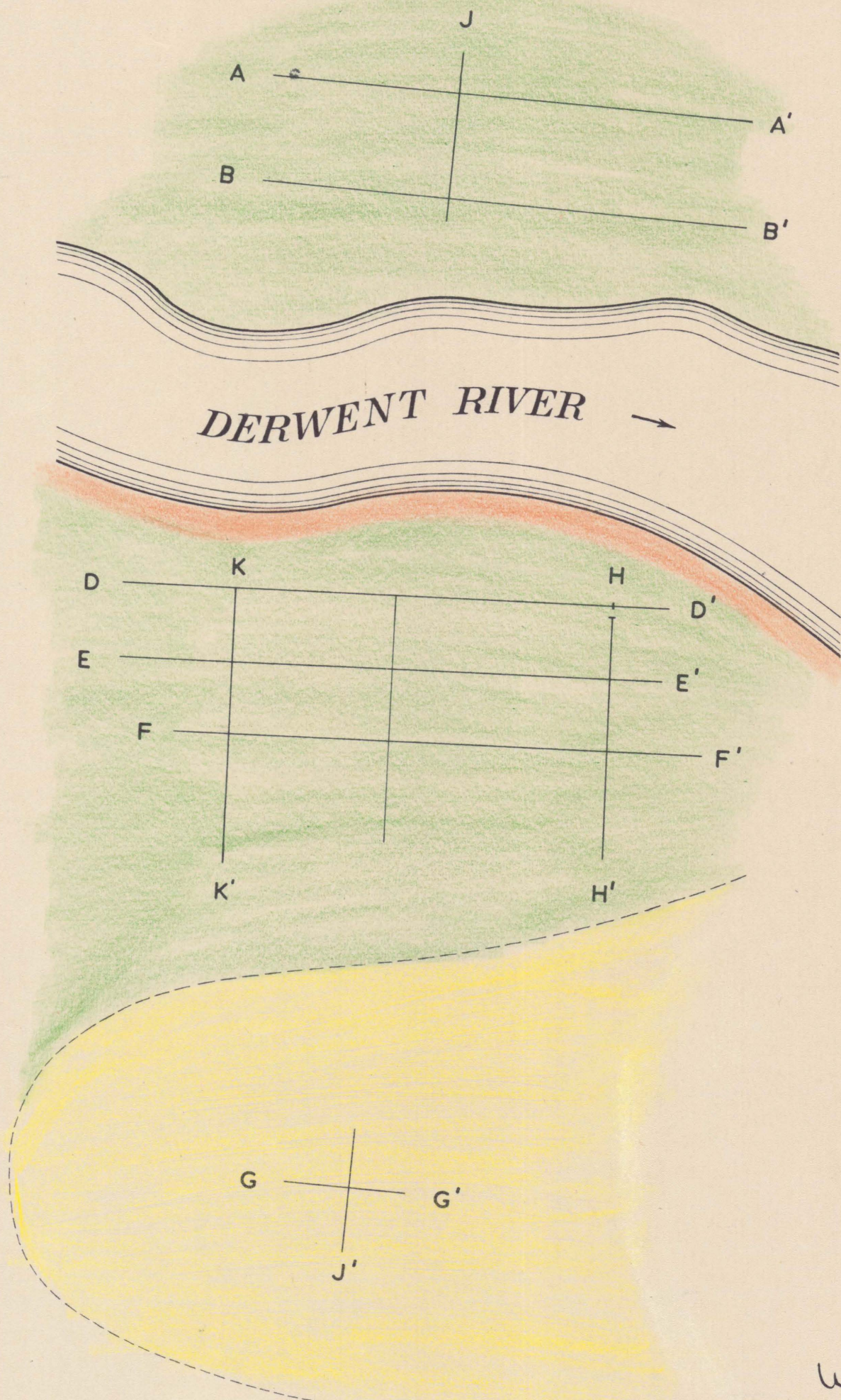
Although no drilling data are available to check the seismic results, it is considered that the depths estimated from the seismic survey are probably accurate to within  $\pm 15$  per cent.

#### 5. CONCLUSIONS.

The geophysical survey indicated that a large thickness of weathered dolerite occurs at the dam site. As a result, the Commission has decided that there would not be suitable abutments for a dam. The survey also indicated a considerable thickness of weathered sandstone in the spillway area; this would not be suitable from the engineer's viewpoint.

As stated in the Introduction, the proposal to use this location as a dam site was already abandoned before the geophysical survey was completed.





## LEGEND

A — A' SEISMIC REFRACTION TRAVERSE

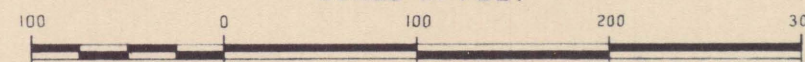
ALLUVIUM

SANDY SOIL

DOLERITE COVERED WITH SCREE

Geology from Mather, R.P., 1955.

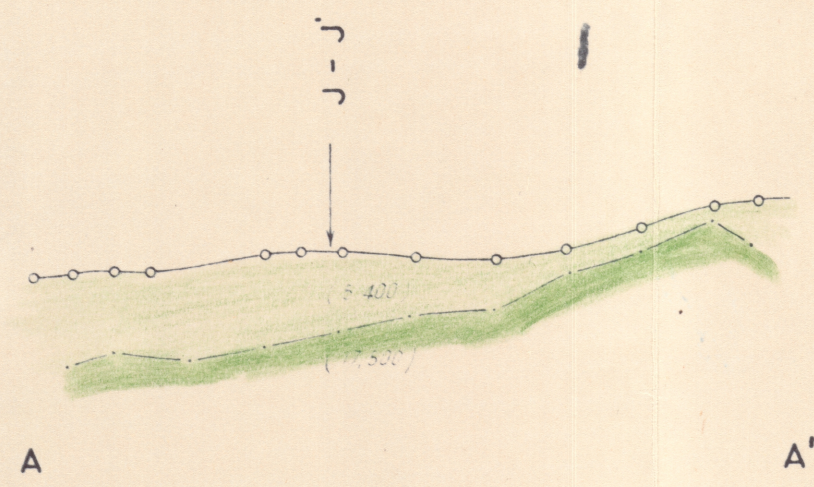
SCALE IN FEET



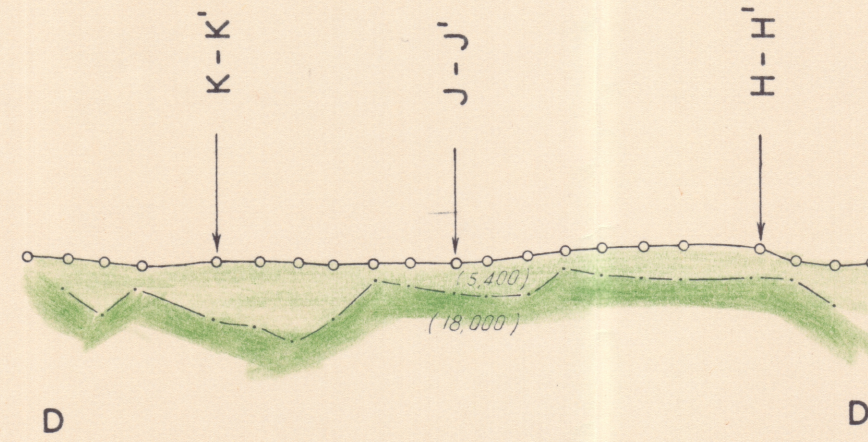
## SEISMIC REFRACTION SURVEY AT THE LOWER REPULSE DAM SITE, DERWENT RIVER, TASMANIA PLAN OF TRAVERSES

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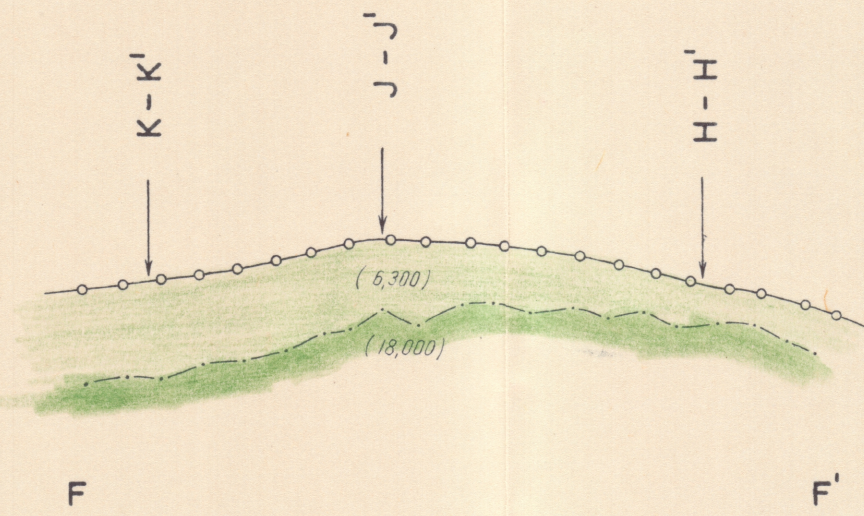




TRAVERSE A

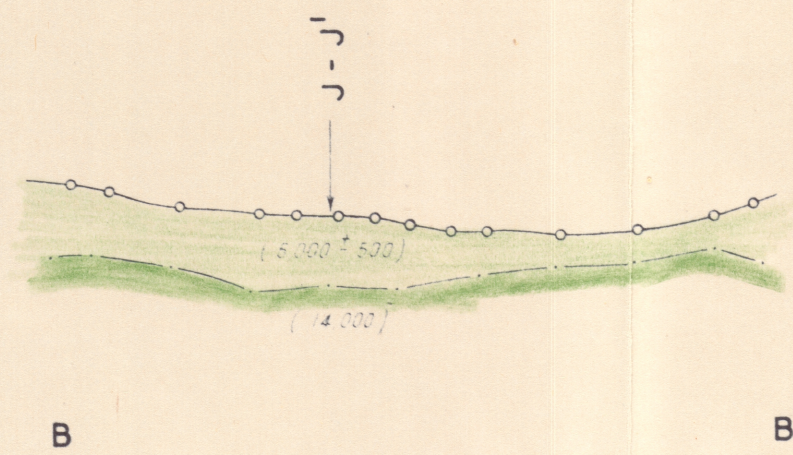


TRAVERSE D

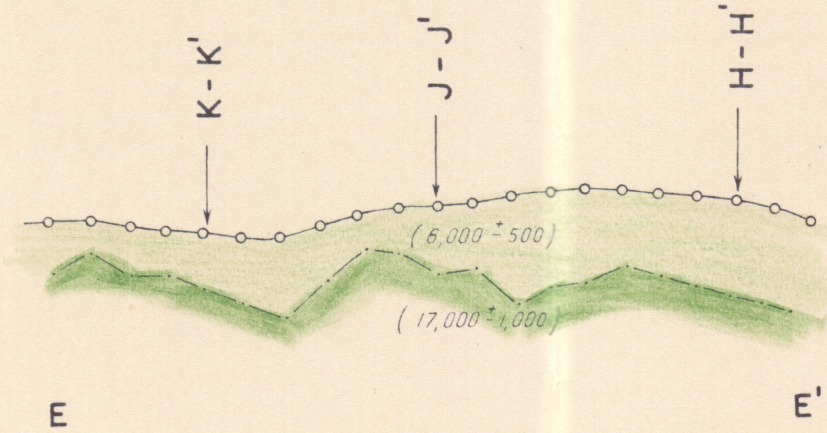


TRAVERSE F

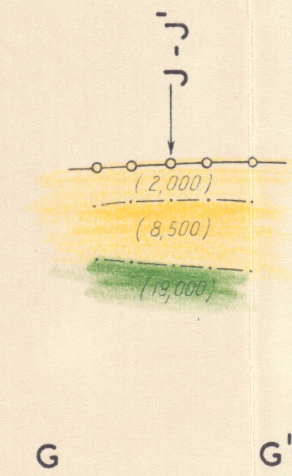
DATUM S.L. 100										DATUM S.L. 100										DATUM S.L. 100										STATION NUMBER	
19	18	17	15	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13
41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
15	28	9	28	31	39	25	6	3	3 1/2	4	17	17	20	8	16	18	19	15	7	27	49	49	54	45	51	49	43	44	44	31	30
15	28	9	28	31	39	25	6	3	3 1/2	4	17	17	20	8	16	18	19	15	7	27	49	49	54	45	51	49	43	44	44	31	30
15	28	9	28	31	39	25	6	3	3 1/2	4	17	17	20	8	16	18	19	15	7	27	49	49	54	45	51	49	43	44	44	31	30



TRAVERSE B



TRAVERSE E



TRAVERSE G

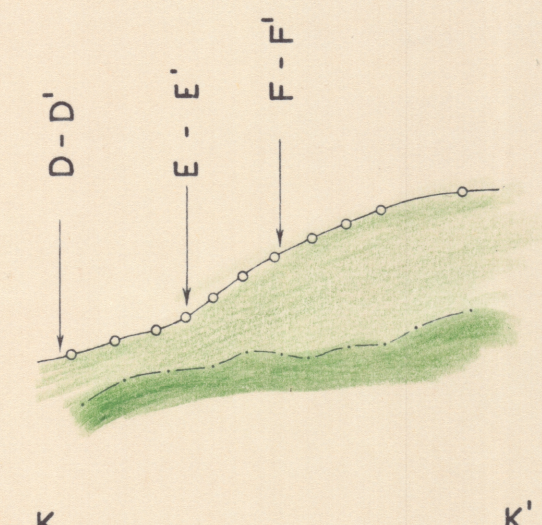
DATUM S.L. 100										DATUM S.L. 100										DATUM S.L. 100										STATION NUMBER	
STATION NUMBER	T 701	T 69	T 61	T 65	T 64	T 64	T 64	T 64	T 64	H 466	H 465	H 464	H 463	H 462	H 461	H 460	H 459	H 458	H 457	H 454	H 471	H 472	H 473	H 474	H 475	H 476	H 477	H 478	H 479	H 480	J 542
THICKNESS SURFACE LAYER				4	5	5	5	4	3																					20	J 543
DEPTH TO UNWEATHERED DOLERITE	31	11	28	38	14	14	31	22	14	25	20	24	20	27	35	45	31	16	25	32	32	57	50	50	40	44	47	50	50	51	49
																														51	53
																														55	57
																															20
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TRAVERSE H



TRAVERSE J



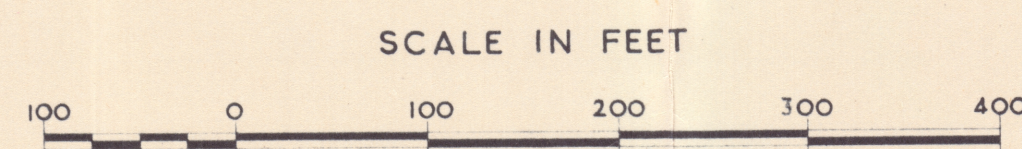
TRAVERSE K

DATUM S.L. 100										DATUM S.L. 100										DATUM S.L. 100										STATION NUMBER	
430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430	430
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32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32

# LEGEND

- WEATHERED DOLERITE
- WEATHERED SANDSTONE
- UNWEATHERED DOLERITE
- SEISMIC STATIONS
- SEISMIC VELOCITY IN FEET PER SECOND
- THICKNESSES INDICATED ARE IN FEET

NOTE: THE SEISMIC VELOCITIES ALONG TRAVERSES HH', JJ', KK' COULD NOT BE ACCURATELY MEASURED AND ARE THEREFORE OMITTED FROM THE SECTION.



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## SEISMIC REFRACTION SURVEY AT THE LOWER REPULSE DAM SITE, DERWENT RIVER, TASMANIA SEISMIC CROSS SECTIONS