COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1962/170

BELL BAY SEISMIC INVESTIGATION, TASMANIA 1961

by

E.J. Polak

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ILLUSTRATIONS

SUMMARY

This Record describes a seismic refraction survey on the site of some proposed new buildings for the Aluminium Production Corporation, at Bell Bay, Tasmania.

Overburden on the site is up to 54 feet thick. The bedrock consists of basalt in which the velocity is between 7000 and 17,000 ft/sec.

1. INTRODUCTION

The Aluminium Production Corporation proposes to extend its plant at Bell Bay, Tasmania. New buildings will be added north of the present factory site. A plan of the area is given on Plate 1.

As the near-surface strata, which consist of soil, peat, and clay, will be unable to support the new buildings, it has been proposed to support them on piles resting on solid bedrock. The Corporation requested the Bureau of Mineral Resources to assist with the site investigation; the main problems were to measure the depth to foundation rock (basalt) and to determine the lateral extension of good foundation rock.

The approximate coordinates of the centre of the site are 482934 on the Devonport sheet of the Australian 4-mile series.

The field work was carried out between 11th and 18th May 1961. The party consisted of E.J. Polak, (party leader), D.J. Harwood (geophysicist), and J.P. Pigott (geophysical assistant).

2. GEOLOGY

The area of the survey is covered with soil, peat, and clay. Clay extends to a considerable depth (greater than 200 ft) and the only suitable foundation rock is a basalt flow that occurs in the clay. The depth to the basalt varies from place to place, and flaws are known to occur in the basalt in adjacent areas.

3. METHODS AND EQUIPMENT

The seismic refraction method was used in the investigation. Detailed description of the method has been given by Polak and Moss (1959). The 'method of differences' was used for calculating the thickness of overburden (Heiland, 1946).

The equipment used in the survey was an SIE 12-channel refraction seismograph, with TIC geophones having a natural frequency of about 20 c/s.

Preliminary tests indicated that a magnetometer survey would be impracticable owing to magnetic interference from the factories in the area.

4. RESULTS

The results of the seismic survey are shown on Plate 1. Seismic velocities give a fair indication of rock types. In the surveyed area the recorded seismic velocities may be grouped as follows:

(a) low seismic velocities, 1000 to 4000 ft/sec. These velocities are indicative of soils, unconsolidated sediments, and very weathered rocks. All the rocks in this group may be classified as overburden.

(b) intermediate seismic velocities, 7000 to 8000 ft/sec. These velocities are indicative of consolidated sediments such as sandstones and mudstones, or weathered, jointed vesicular basalt. The rocks in this group may be classified as bedrock that is probably not very suitable as foundation rock.

(c) higher seismic velocities, 11,000 to 17,000 ft/sec. These velocities are indicative of basalts. The lower velocity probably represents vesicular or jointed basalt, slightly weathered on the joints. The higher velocity range represents solid, unweathered basalt. The rocks in this group may be classed as bedrock that is suitable as foundation rock.

The contours on Plate 1 indicate the thickness of overburden, and the figures in brackets indicate the seismic velocity in the bedrock. The bedrock velocities can be interpreted with the descriptions given in (b) and (c) above. The lower bedrock-velocities of (b) (7000 to 8000 ft/sec) are found in the zone with thicker overburden, i.e. south of 3600N (Traverse D) and east of 3500E. The bedrock in this zone may consist of weathered semi-consolidated sediments, or weathered jointed vesicular basalt.

5. CONCLUSIONS

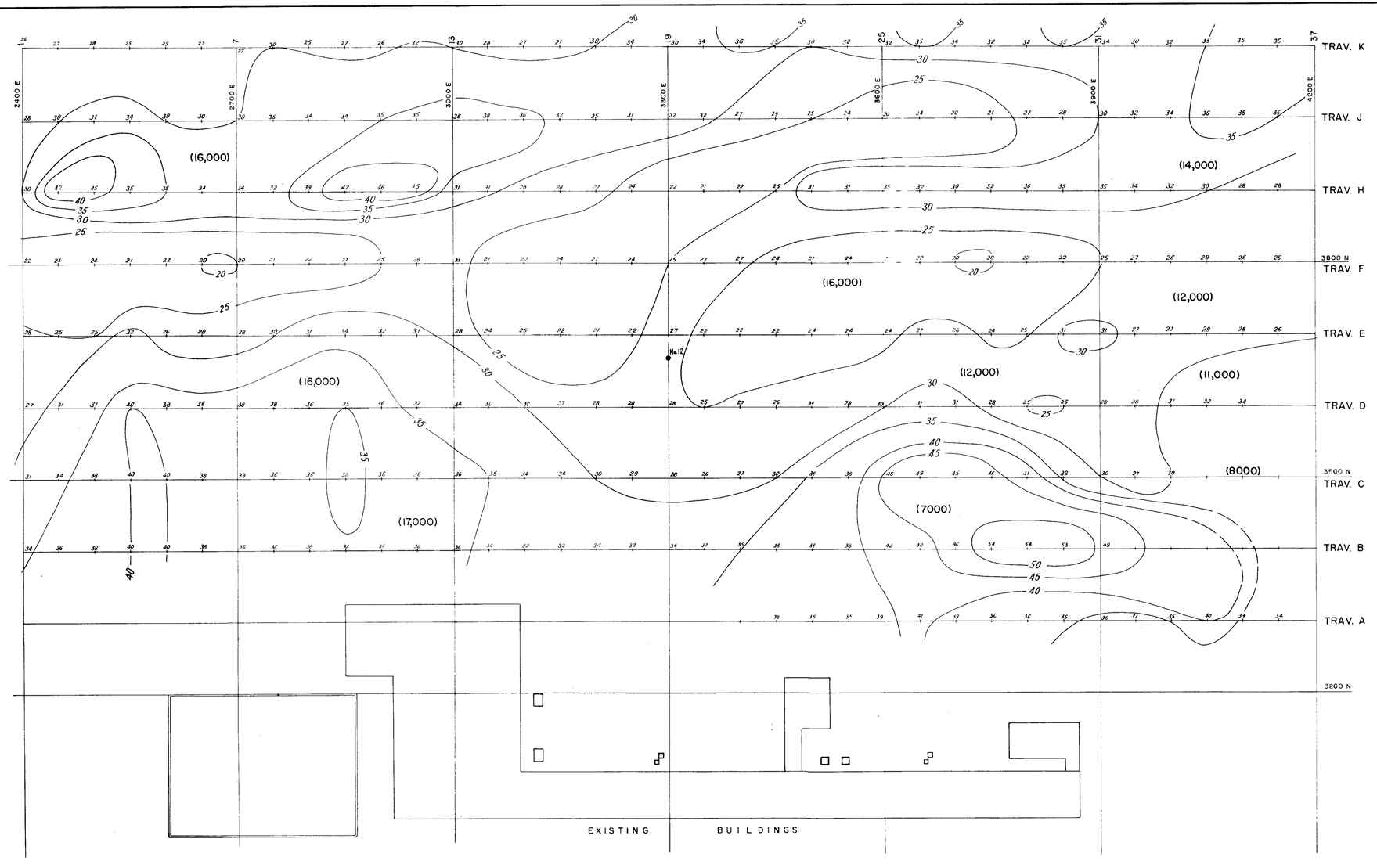
The depth to suitable foundation rock is about 30 ft over most of the area. In some localities however it increases to 40 or 50 ft, and these localities would appear to be less suitable for the location of piles.

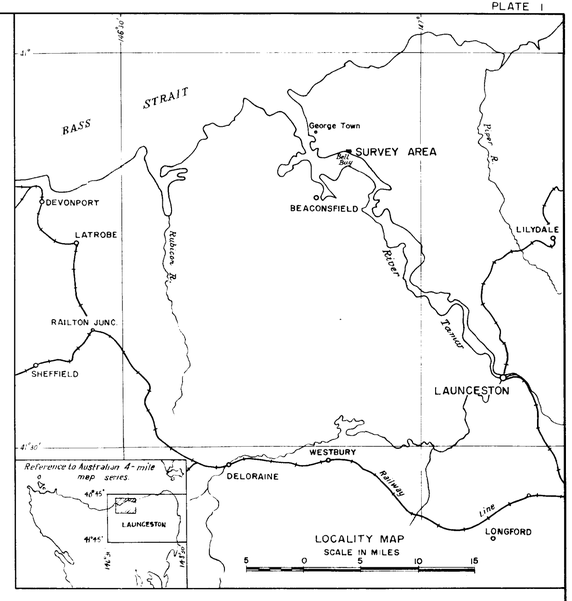
6. REFERENCES

HEILAND, C.A. 1946 GEOPHYSICAL EXPLORATION. New York Prentice-Hall Inc.

POLAK, E.J. and MOSS, F.J. 1959 Geophysical survey at the Cluny dam site, Derwent River, Tasmania. Bur. Min. Resour. Aust. Rec. 1959/87.

PLATE 1





LEGEND

- TRAVERSE WITH STATION NUMBERS
- DEPTH TO REFRACTOR BELOW SURFACE (FEET)
- CONTOURS OF THICKNESS OF OVERBURDEN (FEET)
- (8000) SEISMIC VELOCITY IN BEDROCK (FT/SEC)
- ● No.12 DIAMOND DRILL HOLE

BELL BAY, TAS.
SEISMIC REFRACTION SURVEY 1961
ALUMINIUM PRODUCTION CORPORATION LTD
CONTOURS OF THICKNESS OF OVERBURDEN

SCALE IN FEET
100 0 100 200 300
CONTOUR INTERVAL 5FT

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. G 390 - 1
To Accompany Record No. 1962/170