DEPARTMENT OF
MINERALS AND ENERGY

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1973/114

LAKE WINDERMERE SEISMIC REFRACTION SURVEY, A.C.T., 1969

by

F.J. Taylor and M. McDowell

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SUMMARY

A seismic refraction survey was carried out near Lake Windermere at Jervis Bay, A.C.T., during 1969. The work was done for the Engineering Geology group of the Bureau of Mineral Resources (BMR), to assist in their investigation of the coastal sand dunes around Jervis Bay.

The results indicate that the area is typified by four groups of velocities: 1000 ft/sec (unconsolidated dry sand), 4200 to 5700 ft/sec (water-saturated sands and clays), 7200 to 7300 ft/sec (weathered sandstone), and 10 000 to 12 000 ft/sec (fresh sandstone).

1. INTRODUCTION

The survey was requested by the BMR Engineering Geology group to assist in their investigation of the coastal sand dunes around Lake Windermere (Plate 1). Particular interest in this area was focused on the water seepage mechanism from the lake, as Lake Windermere was the proposed stand-by water supply for the planned atomic reactor at Jervis Bay.

The work was done by F.J. Taylor (Geophysicist and Party Leader), with field hands supplied by the Atomic Energy Commission, in 1969, during an extensive seismic refraction survey of the proposed power station site (Taylor, 1969). The surveying was performed by the Department of the Interior.

2. GEOLOGY

The Jervis Bay area consists of gently-dipping well jointed Permian Sandstone (Jervis Bay Sandstone) overlain in places by unconsolidated Quaternary beach and dune sands, which contain lagoonal marsh deposits in some areas. The Jervis Bay Sandstone is generally medium to coarse-grained light grey, massively bedded sandstone, but silty layers and conglomeratic horizons occur at many levels in the succession (Taylor, 1969).

3. METHODS AND EQUIPMENT

The traverse locations (Plate 2) were selected to verify geological concepts of bedrock configuration, and to provide evidence for subsurface drainage channels where these seemed probable.

The survey was performed using 24-channel SIE refraction equipment with TIC 20-Hz geophones. The method used was the well known 'reciprocal geophone method' (Heiland, 1946). The normal geophone spread consisted of 23 geophones spaced 50 ft apart.

4. RESULTS

The results are indicated in the form of seismic depth profiles in Plate 3. From these profiles it can be seen that there are three main layers in terms of seismic velocity: a 1000 ft/sec layer of unconsolidated dry sand, a 4200-5700 ft/sec layer of water saturated sand, and 10 000-12 000 ft/sec layer of fresh sandstone. There are also some localized seismic velocities of 7200-7300 ft/sec, which indicate weathered sandstone.

5. REFERENCES

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

TAYLOR, F.J., 1969 - Jervis Bay reconnaissance seismic survey, A.C.T. 1969. Bur. Miner. Resour. Aust. Rec. 1969/146.

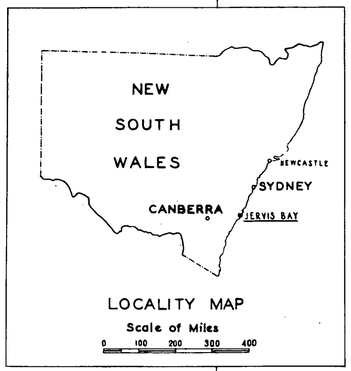
PLATE 1

SEISMIC TRAVERSES AND GEOLOGICAL MAP COMMONWEALTH TERRITORY

JERVIS BAY

SCALE OF MILES

1 1/2 0 1 2



LOCALITY MAP

Scale of Miles

0 100 200 300 400

Geology by W.J. Perry & J.M. Dickins

Topographic Base from Slotted Template Assembly by National Mapping Section

REFERENCE

CAINOZOIC QUATERNARY
- Q_a Alluvium
- Q_s Sand areas with vegetation / Sand drifts and beaches

TERTIARY
- T_d Dolerite

PALAEOZOIC PERMIAN
- P_w Wandrawandian Siltstone
- P_j Jervis Bay Sandstone

Established geological boundary position definite

Established geological boundary position approximate.

Buildings

Cliff

Areas probably underlain by ferruginous gravel

Swampy areas

Sand dune

Trav A Geophysical traverse

W.10 Weathering spread

3 → Prevailing dip.

10 Dip and strike.

Site JS1 / Site JS2 Proposed Atomic Reactor Sites

Sealed Road

Track

Macleans Pt

Redhead Pt

Bream Beach

HUSKISSON

St GEORGES BASIN

Kangaroo Pt

JEW FISH BAY

Cabbage Tree Pt

Lake Windermere Area

LAKE WINDERMERE

LAKE McKENZIE

Reservoir

Quarry

AERODROME

stripped area

clay and firebrick clay

Telegraph Pk

Sussex Inlet

"Christian Minder"

"Belmont"

Hyam Beach

Sandy beach

Black Rock Ck

BREAKWATER

Captains Pt

Jervis Bay

JERVIS BAY

NORTHERN BOUNDARY OF COMMONWEALTH TERRITORY

DARLING ROAD

Sandy beach

Hole in the Wall

Bristol Pt

Scottish Rocks

SITE JS1

SITE JS2

Murrays Beach

BOWEN ISLAND

Governor Head

Green Rock

35°05'

35°09'

150°35'

150°40'

150°45'

Based on B.M.R. Geological Branch Drawing No. 156/A13/ACT-18-4

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PLATE 2

JERVIS BAY 1969

LAKE WINDERMERE SEISMIC TRAVERSES AND GEOPHONES POSITIONS

Geophysical traverses

1 (Spread 1) 23 Geophone positions

W - 7 Weathering spread

Road and track

N

After Department of the Interior, Plan of Commonwealth Territory, Jervis Bay, 1:4800 Sheet 5
Co-ordinates are in feet

METRES 100 0 100 200 300 400 500 METRES

FEET 400 0 400 800 1200 FEET

150°39'
1096000E
1098000E
1100000E
150°40'
1102000E
1986000N
1984000N
1982000N
35°09'
1980000N
LAKE WINDERMERE
LAKE McKENZIE
Traverse F (Spread 1)
Traverse A (Spread 2)
(Spread 3)
(Spread 9)
Water level of lake at time of survey
Traverse E
W x 10
Traverse C (Spread 6)
Traverse D (Spread 5)
CAVE BEACH ROAD
Traverse B (Spread 4)

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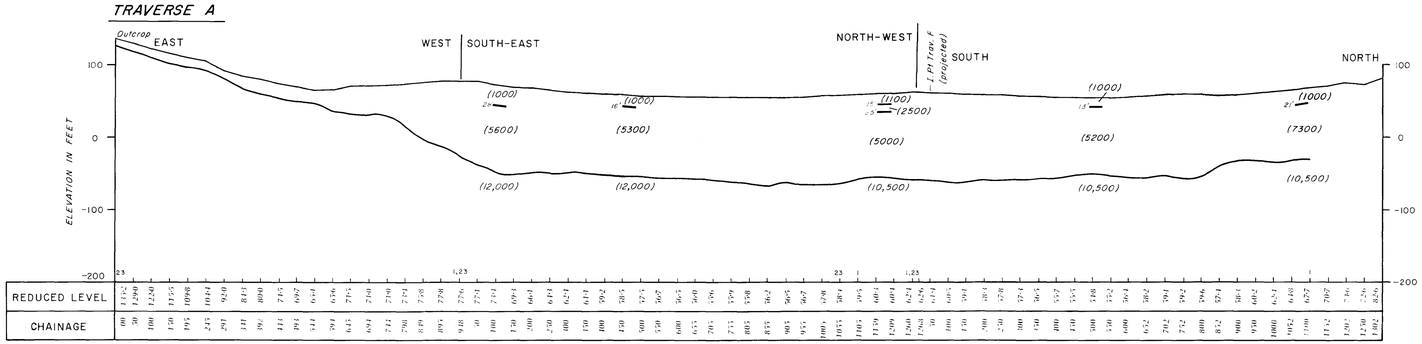
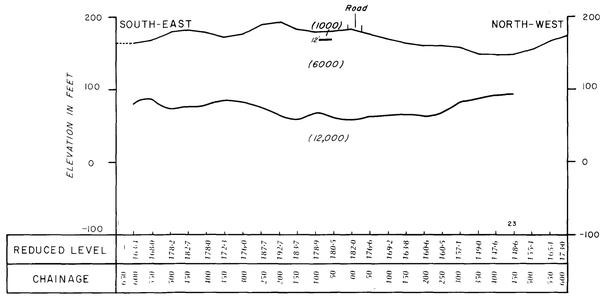
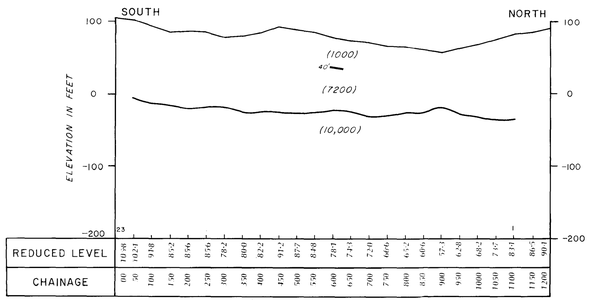
TRAVERSE A



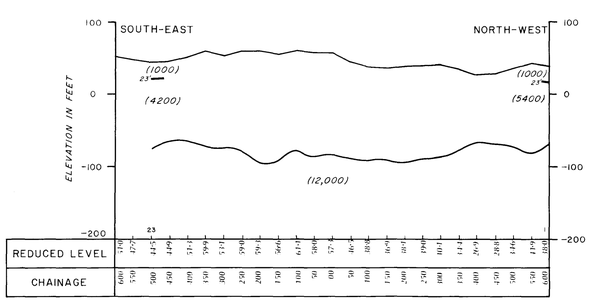
TRAVERSE B



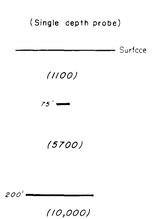
TRAVERSE C



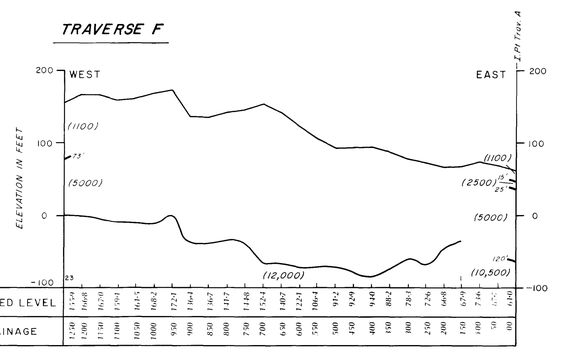
TRAVERSE D



TRAVERSE E



TRAVERSE F



LEGEND

(6000) Seismic velocity (ft/s) in formation

12° Depth to formation with different seismic velocity

I. Pt Traverse intersection point

Unweathered bedrock boundary

I.23 Geophone locations

SEISMIC CROSS — SECTION

TRAVERSES A,B,C,D,E & F

200 0 200 400 Feet

50 0 50 100 150 Metres

(Horizontal Scale)

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