COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1971/33

Molonglo Bridge Site Seismic Refraction Survey, Australian Capital Territory, 1969

by

R. J. Whiteley

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SUMMARY

Bedrock at the bridge site is well consolidated at a maximum depth of about 80 feet on the southern river bank and shallowing to about 50 feet on the northern bank. Weathered bedrock occurs at a depth of less than about 30 feet on all traverses.

1. INTRODUCTION

The National Capital Development Commission (NCDC) is considering the construction of a bridge crossing the Molonglo River as part of a freeway linking the districts of Woden and Belconnen.

As geological consultant to the NCDC the Bureau of Mineral Resources, through its Geophysical Branch, carried out a seismic survey to determine bedrock conditions at the proposed site.

The seismic survey was done in August 1969 by a geophysical party consisting of R.J. Whiteley (geophysicist) S. Hall (fieldhand) and two additional field hands provided by the Department of Works.

2. GEOLOGY

In the vicinity of the site, bedrock consists of the medium- to coarse-grained dacitic crystal tuff of the Silurian Mount Painter Porphyry. Interbedded with this are thin lenses of sandstone (Opik, 1958).

Sandstone crops out in the river bed and has an approximately north-south strike with a dip of 30 to 40 degrees to the west.

3. SEISMIC REFRACTION METHOD

A 24-channel refraction seismograph (Dresser S.I.E. Co.) and 20-Hz geophones (Technical Instruments Co.) were used.

The standard single-traverse refraction procedure was employed, with 23 geophones laid in a line and shots fired at 5, 25 and 200 feet beyond each end. An additional geophone was used to obtain travel times between the 200 feet shot-points as required by the reciprocal method of interpretation. As detailed information was required 6 traverses were done with a geophone spacing of 10 feet. The locations of the traverses and geophone positions are shown in Plate 1.

The seismic results were interpreted using the reciprocal method developed by the Bureau of Mineral Resources (Hawkins, 1961). Depths to the deepest refractor were calculated at each geophone position and reproduced as a continuous bedrock profile. Thicknesses of intermediate layers were calculated at the near shot-points and interpolated between them.

4. RESULTS

The layers encountered can be conveniently classified according to their seismic velocity (Table 1).

TABLE 1

Seismic Velocity (ft/s)	Rock Type
1000-2500	Soil
4500-5000	Completely weathered bedrock or saturated, unconsolidated material
6000-8000	Weathered bedrock to slightly weathered bedrock
11000-15000	Unweathered bedrock

The seismic results are shown in Plate 2.

Soils form the uppermost layers; they are generally less than 10 feet in thickness on Traverses A, B, C, and D but thicken up to 20 feet on the northern river bank along traverse F.

On the southern bank the underlying 4000-5000 ft/s weathered layer gradually thins towards the river and is absent on the northern bank. As a very weathered outcrop occurs near the northern end of traverse D it is probable that this layer represents completely weathered bedrock rather than saturated, unconsolidated material.

Unweathered bedrock occurs at a depth of less than about 50 feet on Traverses E and F but at considerably greater depth on the southern bank, to a maximum depth of about 80 feet in the vicinity of Traverse C.

Bedrock velocities are about 1000 ft/s higher in the north-south direction than in the east-west direction. This is to be expected as the strike of the bedrock is in a general northerly direction. On the southern river bank the velocities in the weathered bedrock and bedrock decrease towards the river, indicating deeper weathering as the river is approached.

5. CONCLUSIONS

Weathered bedrock occurs at a depth less than about 30 feet on all traverses. Bedrock at the site is well consolidated, and the degree of weathering increases as the river is approached. The bedrock shallows to depths of about 50 feet on the northern river bank.

6. REFERENCES

HAWKINS, L.V., 1961 - The reciprocal method of routine shallow seismic refraction investigations. Geophysics 26(6), 806-819.

OPIK, A.A., 1958 - The geology of the Canberra City District. Bur. Min. Resour. Aust. Bull. 32.

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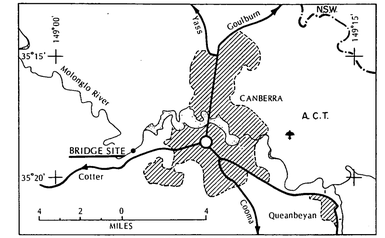
PLATE 1



LOCALITY MAP

LEGEND

- Geophysical traverse with station number (e.g. E23)
- Topographical contours (1800')
- Strike of formation with dip shown (30–40°)
- Sandstone
- Mount Painter Porphyry

MOLONGLO RIVER BRIDGE SITE A.C.T. 1969

LOCALITY MAP AND TRAVERSE LAYOUT

METRES
10 0 10 20 30

FEET
40 20 0 40 80 120

(Contour Interval 5 Feet)

TRAVERSE A
TRAVERSE B
TRAVERSE C
TRAVERSE D
TRAVERSE E
TRAVERSE F
MOLONGLO RIVER
Road
Rock Outcrop
TRUE NORTH (approximate)

To accompany Record No. 1971/33

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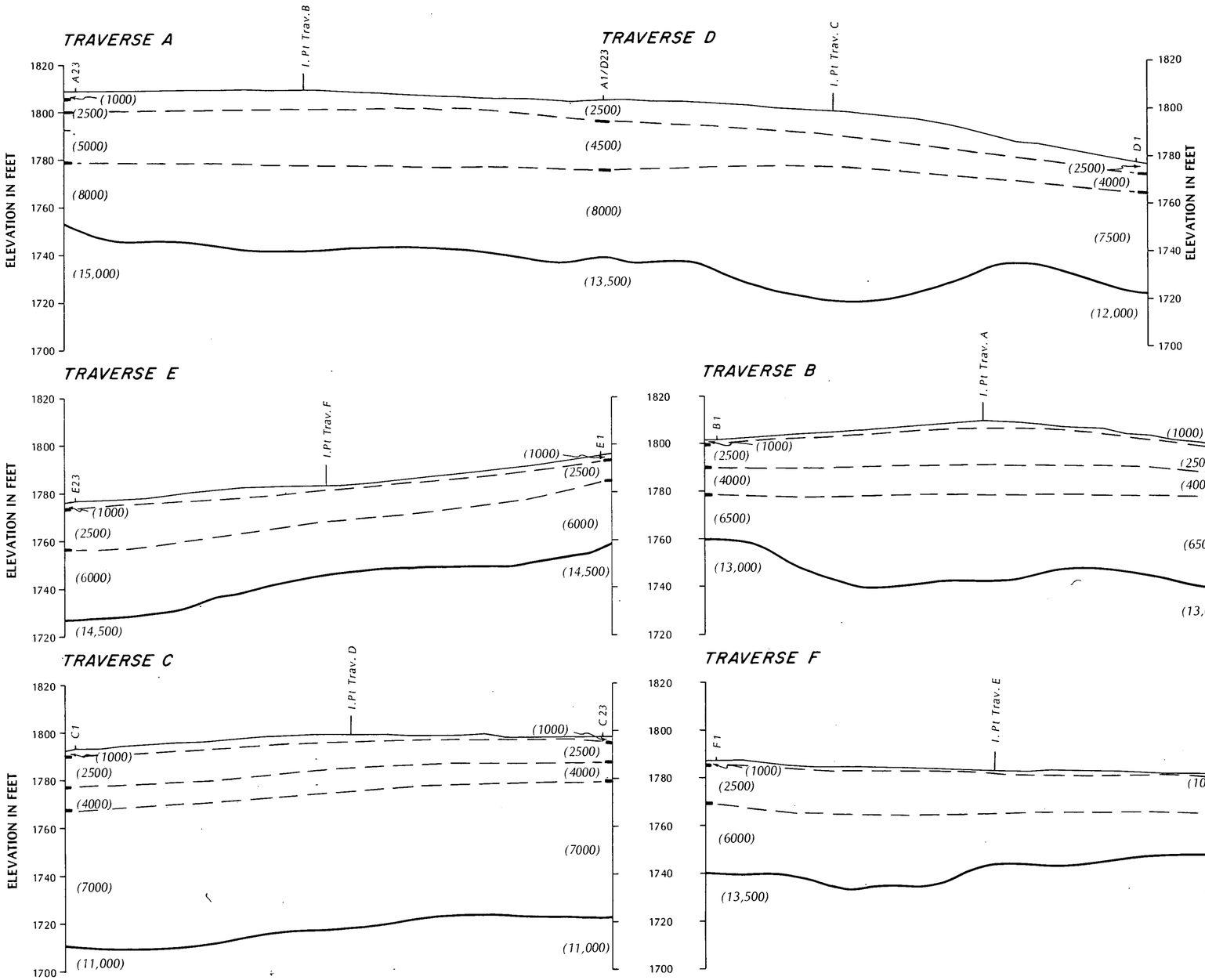
PLATE 2



LEGEND

(13,000) Seismic velocity in ft/s

D Depth to intermediate layer

I.Pt Trav. Traverse intersection point

Unweathered bedrock boundary

Intermediate layer boundary

METRES 10 0 10 20 30

FEET 40 20 0 40 80 120

(Horizontal and Vertical)

MOLONGLO RIVER BRIDGE SITE A.C.T. 1969

SEISMIC PROFILES

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