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1987/18. Foundation conditions at a proposed hospital site at Cooee.

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Abstract

Basalt at a proposed hospital site at Cooee is deeply weathered; this has been confirmed by test pits and seismic spreads. Determination of soil properties suggests that the clay derived from the weathering of the basalt will have expansive properties. Unstable conditions have prevailed on slopes nearby and special care will need to be taken with siting of the building and maintenance of these slopes to protect the structure.

INTRODUCTION

Gutteridge, Haskins and Davey, Consulting Engineers, requested that test pits be examined and seismic spreads be fired at the site of a proposed private hospital near Brickport Road, Cooee [DQ057554]. The proposed building is a single-storied structure and covers a considerable area.

LOCATION AND GEOLOGY

The site is located on part of a dissected basalt plateau above the coastal plain. The plateau top is undulating and the basalt is deeply weathered. The slopes to the coastal plain on the north and western sides are steep and are underlain by basalt soil and talus, while Precambrian slate and quartzite crop out at a few points. Much of the lower slopes are likely to be underlain at depth by these older rocks. A valley extends in an east-west direction near the southern margin of the property, resulting in moderately steep slopes on the property in this area.

Landslides are common on much of the sloping land in the Burnie area and this has restricted development on some of the steeper slopes and some of the flatter land near these slopes.

TEST PITS

Six test pits were dug with a backhoe at the approximate locations shown on Figure 1. Logs of the pits are appended.

The pits confirmed the considerable depth of weathering of the basalt. Pit 4, on the northern margin of the site, was the only hole that encountered fresh basalt, and this rock was quite strongly fractured.

The basalt mostly weathers to a friable clay but in lower lying areas, where water is more likely to accumulate for longer periods (such as around Pits 5 and 6), some of the near-surface clay is plastic.

SEISMIC SPREADS

Two seismic spreads were fired at approximately right angles across the site in the flatter, lower lying parts. Approximate profiles of refractors are shown in the cross sections (fig. 2).

The seismic spreads support the notion of the basalt being deeply weathered and there appears to be about 8-15 m of relatively unconsolidated material with seismic velocities in the range of 325-530 m/sec. Material with these

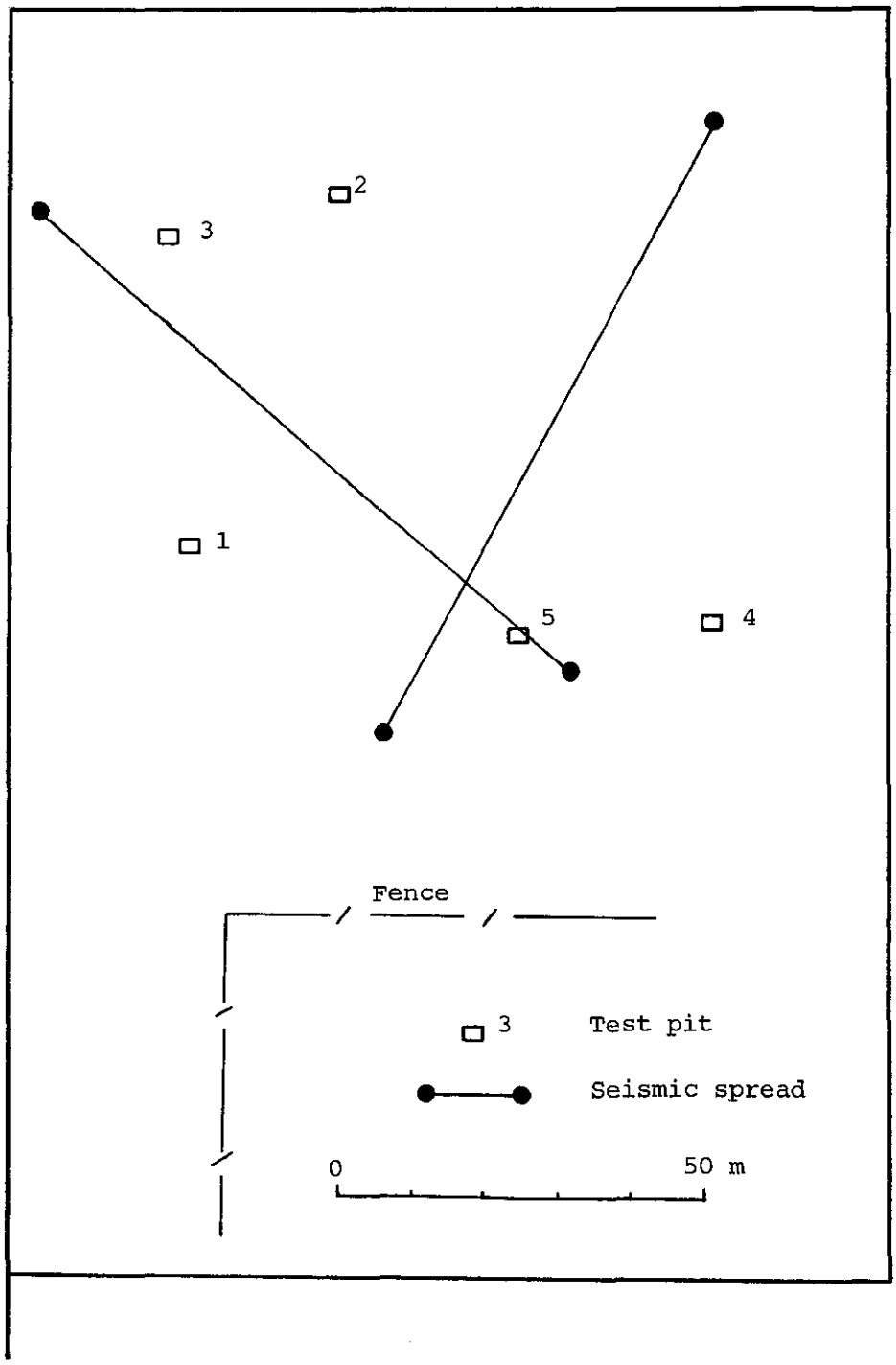

Figure 1. *Sketch plan of test pits and seismic spreads, Cooee Hospital site.*

5 cm

velocities would be soil and clay with varying compaction and moisture content. There may be unweathered boulders interspersed within this material but wide zones of rock above this depth range along the lines of the spreads are unlikely.

The refractor with the highest velocity in each spread represents rock in each case. This rock may be either Tertiary basalt or Precambrian rock. If the former, it would have to be slightly weathered or jointed.

MATERIAL PROPERTIES

Atterberg limits and linear shrinkages have been determined for a few samples of clay derived from the weathering of basalt.

Pit no.	Depth (m)	LL	PL	LS
1	1	87	23	18
5	0.5-0.7	134	28	26
6	0.5-1.0	129	28	25
6	1.5	132	26	27

Determinations by P. Terry and R. Woolley, Department of Mines.

CONCLUSIONS

The test pits and seismic spreads show that the site is underlain by deep soil. Excavation to level the site should be relatively easy, even if fractured basalt (as encountered in Pit 4) is struck.

As the loads are low, there should be little problem with supporting the structure even though it will be founded on dominantly clay material. The material properties suggest that expansive soils (reactive) may be a problem and foundation design should take this into account.

The proposed outlay of the building places it quite near to steep slopes, particularly on the north side, and it is recommended that the shape is altered so that the building is no closer than about 30 m from these slopes. In addition, it is a little close to shallower slopes on the south. This could be overcome by lengthening the building along the flatter land to the north-west.

Further movements on the steep slopes surrounding the site are likely and special attention should be given to preventing this. Excavation around the slopes should be avoided, excess drainage down them should be prevented, and the establishment of further trees should be encouraged.

[10 March 1987]

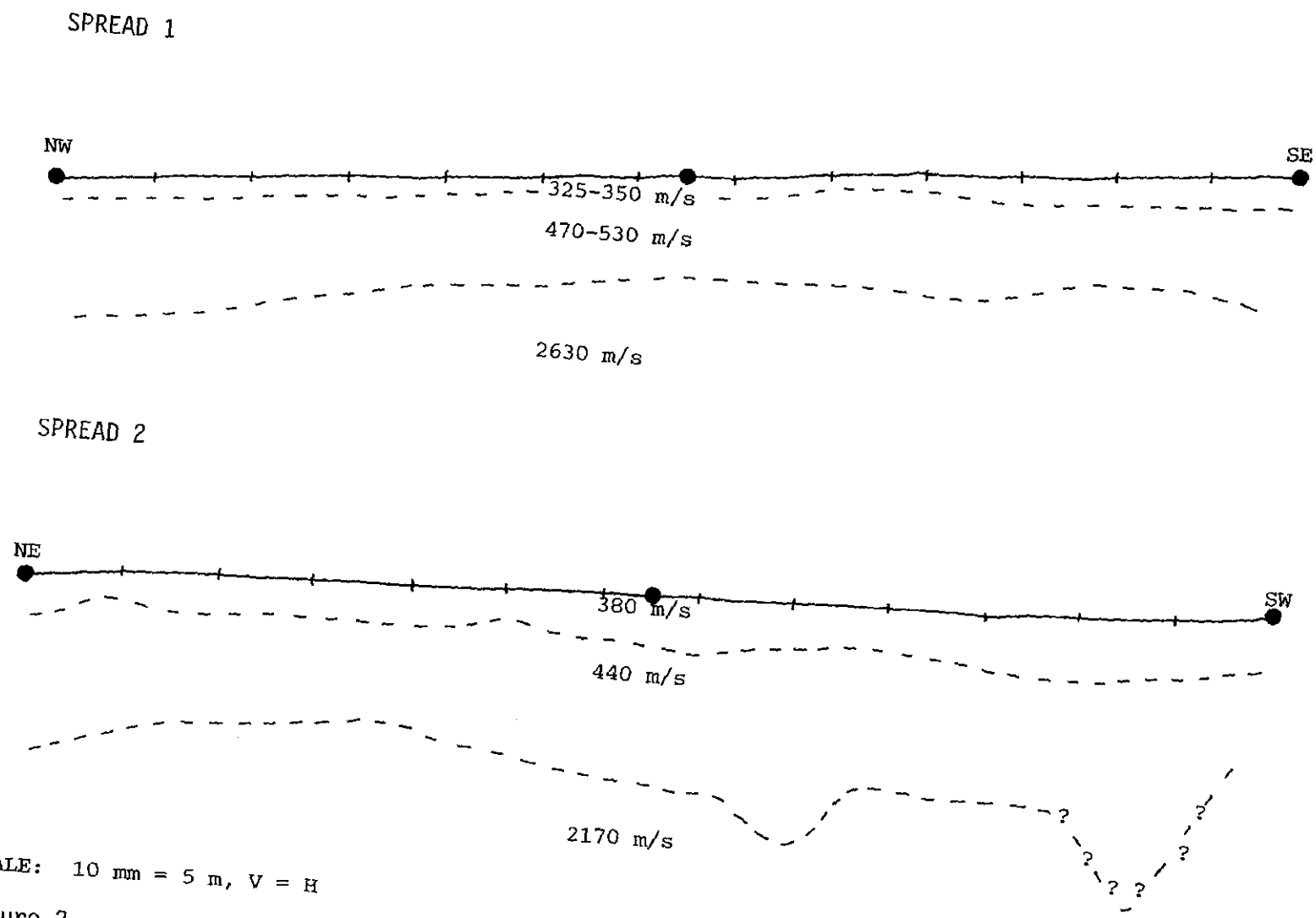

Figure 2. *Seismic spreads, proposed hospital site, Cooee*

APPENDIX 1

Logs of test pits

Depth (m)	*Description*
Pit 1	
0 -0.4	Brown, dry fractured clay soil, grass roots
0.4 -0.7	Red fractured clay, some grass roots, dampish
0.7 -1.0	Red friable clay, dampish, fragmental
1.0 -2.9	Red and grey mottled clay, fragmental, dampish. Some igneous texture. Becoming dull red-brown towards base.
Moist throughout but no free water.	
Pit 2	
0 -0.4	Brown fractured clay soil, grass roots
0.4 -0.7	Reddish-brown fractured clay, some grass roots, becoming slightly moist.
0.7 -1.7	Brown clay, some igneous texture. A few unweathered basalt kernels, becoming moist.
1.7 -1.9	Moist soft clay with igneous texture, light brown
1.9 -3.6	Greenish-brown clay with igneous texture, weathered vesicle fillings, moist (not as moist as 1.7 - 1.9 m).
A small flow of water into pit at 2.8 m on east end.	
Pit 3	
0 -0.5	Dry, brown, fractured clay soil, grass roots
0.5 -1.0	Reddish fractured and fissured clay becoming brownish towards base, moist. Occasional boulders of unweathered basalt up to 0.6 m across.
1.0 -2.0	Brown and greenish-fawn mottled clay, igneous texture visible, friable, some fissures, moist.
2.0 -3.2	Brown and greenish mottled clay with igneous texture, a few small unweathered basalt kernels (up to 100 mm across) and several generally less weathered areas, fairly hard.
Pit 4	
0 -0.4	Brown clay soil with small basalt fragments up to 50 mm across, grass roots, dry.
0.4 -2.4	Light brown-grey weathered basalt with varying degrees of weathering. East end of pit and base has fresh fractured basalt from about 1.4 m. West end has more weathered zones. Clay with igneous texture, becomes dampish at about one metre.
No free water.	

Depth (m)	*Description*
Pit 5	
0 -0.3	Brown clay soil, fractured and dry, roots, occasional basalt boulder up to 50 mm across.
0.3 -0.6	Cream-brown plastic clay, fairly soft.
0.6 -3.2	Brown and creamish green clay with igneous texture (no unweathered centres), fairly hard throughout. Some slip surfaces present.
Pit 6	
0 -0.4	Brown clay soil, fractured, grass roots.
0.4 -1.1	Brown clay, plastic, moisture increases a little with depth, becomes a little softer.
1.1 -2.65	Brown, reddish and cream-brown, mottled clay, igneous texture, no free water.