

UR1985_05

1985/05. Foundation conditions at the proposed radio telescope site, Cambridge.

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Abstract

A seismic survey suggested that relatively unweathered dolerite occurs at shallow depth beneath the proposed radio telescope site at Cambridge. This was confirmed by shallow test pits. Excavations for the foundations and the drilling of holes to install rock bolts should provide further useful information on foundation conditions.

INTRODUCTION

The University of Tasmania is proposing to erect a radio telescope on its property at Cambridge, and requested that investigations be undertaken to examine foundation conditions. The site is a flat-topped hill, Mount Pleasant, to the north of the irrigation dam [EN359605]. Six concrete pads 3 m x 3 m and 1.5 m thick are proposed for the foundation of the tower supporting the telescope. Rock bolts are to be installed into the rock under the pads for 3-5 m. Seismic and magnetometer surveys were proposed to examine rock quality.

GEOLOGY

The top of the hill is underlain by Jurassic dolerite. Almost flat exposures occur at isolated locations around the side of the hill and occasionally near the telescope site but generally the dolerite is overlain by a thin layer of soil containing abundant silt to fine sand and clay. The silt to fine sand is probably windblown material while the clay would be derived from the *in situ* weathering of the dolerite. Triassic sandstone occurs around the lower slopes on the west side of the hill and Tertiary sediments occupy the flatter land further west. A plan showing an outline of the geology of the area was prepared for some work undertaken on the nearby dam and a copy of this is attached (fig. 1).

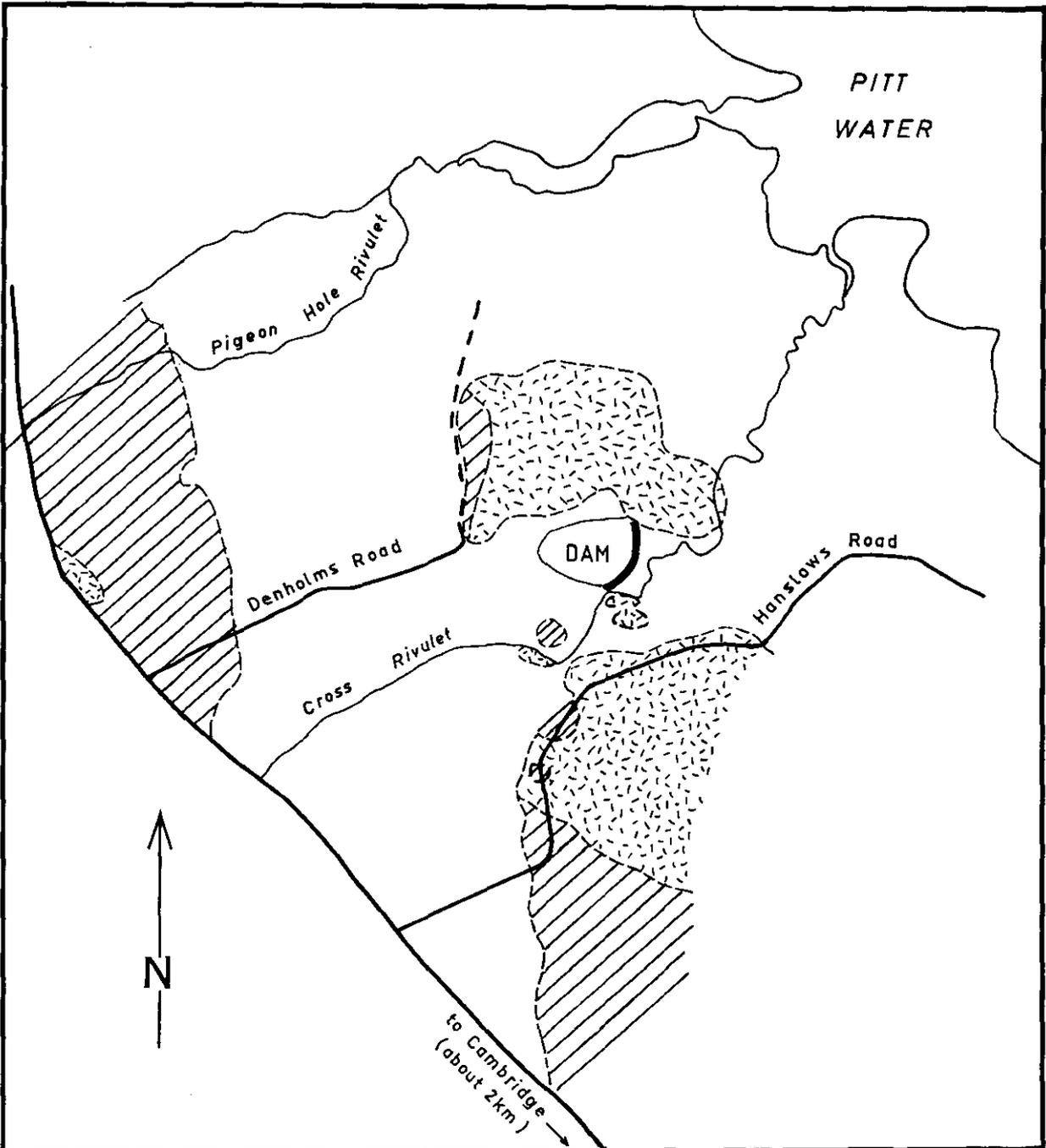
GEOPHYSICS

Seismic survey

Six seismic spreads with a four metre geophone spacing were fired across the proposed foundation area in the approximate locations shown on Figure 2.

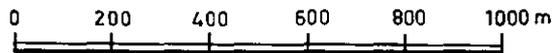
Calculated seismic velocities indicate that only two materials are present at the site. The surface layer has a seismic velocity of about 450-550 m/sec and would represent the soil and clay with some boulders, as well as any very fractured zones on top of the dolerite. The lower layer has a seismic velocity range of about 5200 to 6200 m/sec and would represent relatively unweathered dolerite.

From the seismic interpretation, the thickness of the surface layer is about 1-2 m over the whole length of all the spreads. Locally it could be shallower or deeper than this because the velocity has been averaged over the four metre geophone spacing. However large variations from this range are not likely. Relatively unweathered rock is indicated at shallow depth and this is likely to continue at depth. If weathered zones occur in the dolerite at depth under the relatively unweathered near-surface rock,



GEOLOGY AROUND CRAIGOW DAM

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-  Deep soil, recent alluvium and Tertiary sediments
-  Dolerite
-  Sandstone and shale

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Figure 1.

this would not be indicated in a refraction seismic survey. Such a situation is fairly unlikely.

Magnetometer survey

Traverses with a magnetometer were undertaken along the seismic lines, with measurements being taken at the seismic geophone locations and at the shot points. The datum point (0) was assigned to the northern shot point on seismic spread 1.

In weathered dolerite terrains variations of 4000-5000 gammas can be obtained (R.G. Richardson - pers. comm.). In these traverses the variations are smaller than this, the greatest being about 2500 gammas. In general, the magnetic profiles are relatively flat for dolerite. This suggests that there is little variation in the quality of the rock and depths of weathering. A zone with negative readings relative to the above datum point occurs near the central point of the traverses and to the north-east of the central point. This zone appears to correspond to parts of the seismic spreads where fresh dolerite is closer to the surface.

TEST PITS

Subsequent to the undertaking of the geophysical work, six test pits have been dug with a back-hoe at the sites of the proposed foundation pads. All encountered relatively fresh dolerite at usually slightly shallower depths than interpreted from the seismic results. Brief descriptions of these pits are appended.

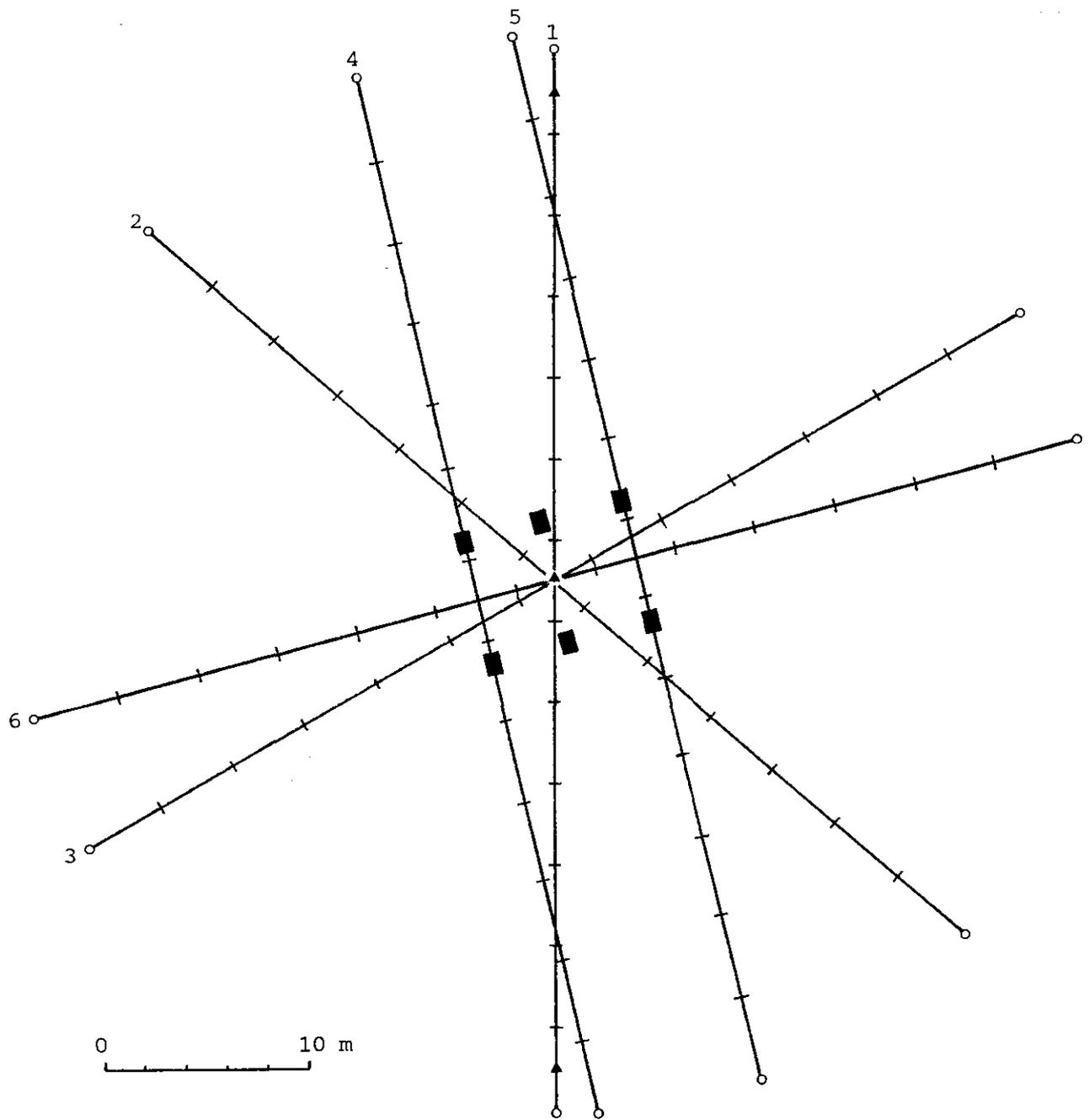
Apart from a little fracturing of the dolerite in one of the pits, the rock has fairly widely spaced jointing and the unweathered surface is usually flat. The dolerite is medium-grained.

CONCLUSIONS

Seismic spreads across the site indicate that relatively fresh dolerite occurs close to the surface (within 1-2 m). This is confirmed by test pits. Magnetometer traverses suggest that there is little variation in the weathering of the dolerite over the site.

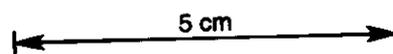
Normally it would be judicious to undertake subsurface investigations to deeper levels. For example a diamond-drill hole to 3-5 m at each foundation pad would show whether the rock quality continues at depth. However, as it is proposed to excavate the rock a further 0.5-1 m and install rock bolts, this will allow a closer examination of the foundation material to be made. The excavated pits for the pads should be examined closely for variation in foundation conditions and during the drilling of the rock bolt holes it should be possible to determine the presence of any clay bands in the dolerite (a fairly remote prospect). If thought necessary, any modifications to the foundation design can be made at this stage.

[15 February 1985]



- +—+—+—○ Seismic spreads showing shot points and geophone positions. These points are also magnetometer reading locations.
- ▲ Survey pegs
- Test pit

Figure 2. Location of seismic spreads and magnetometer traverses.



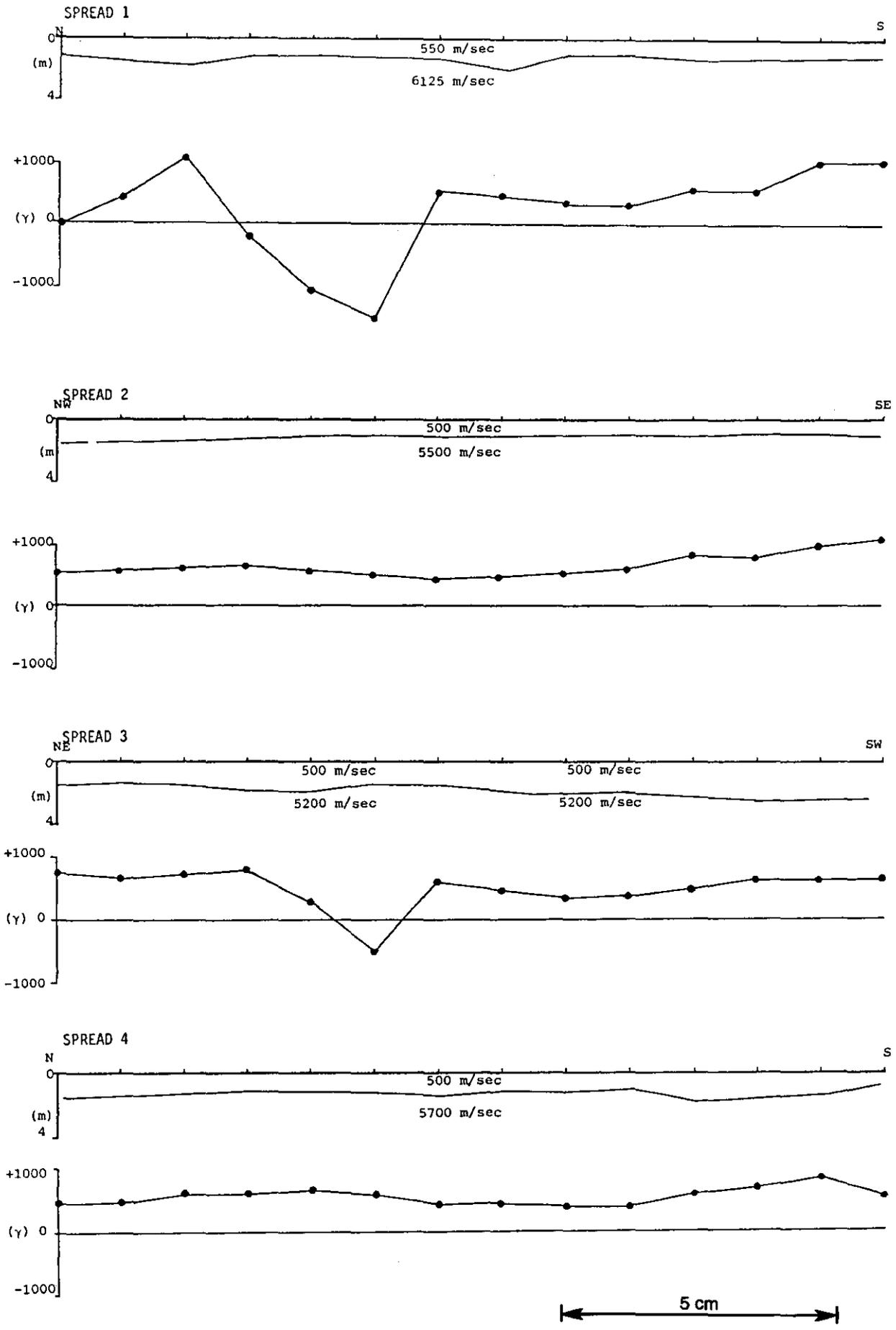


Figure 3. Seismic and magnetometer surveys

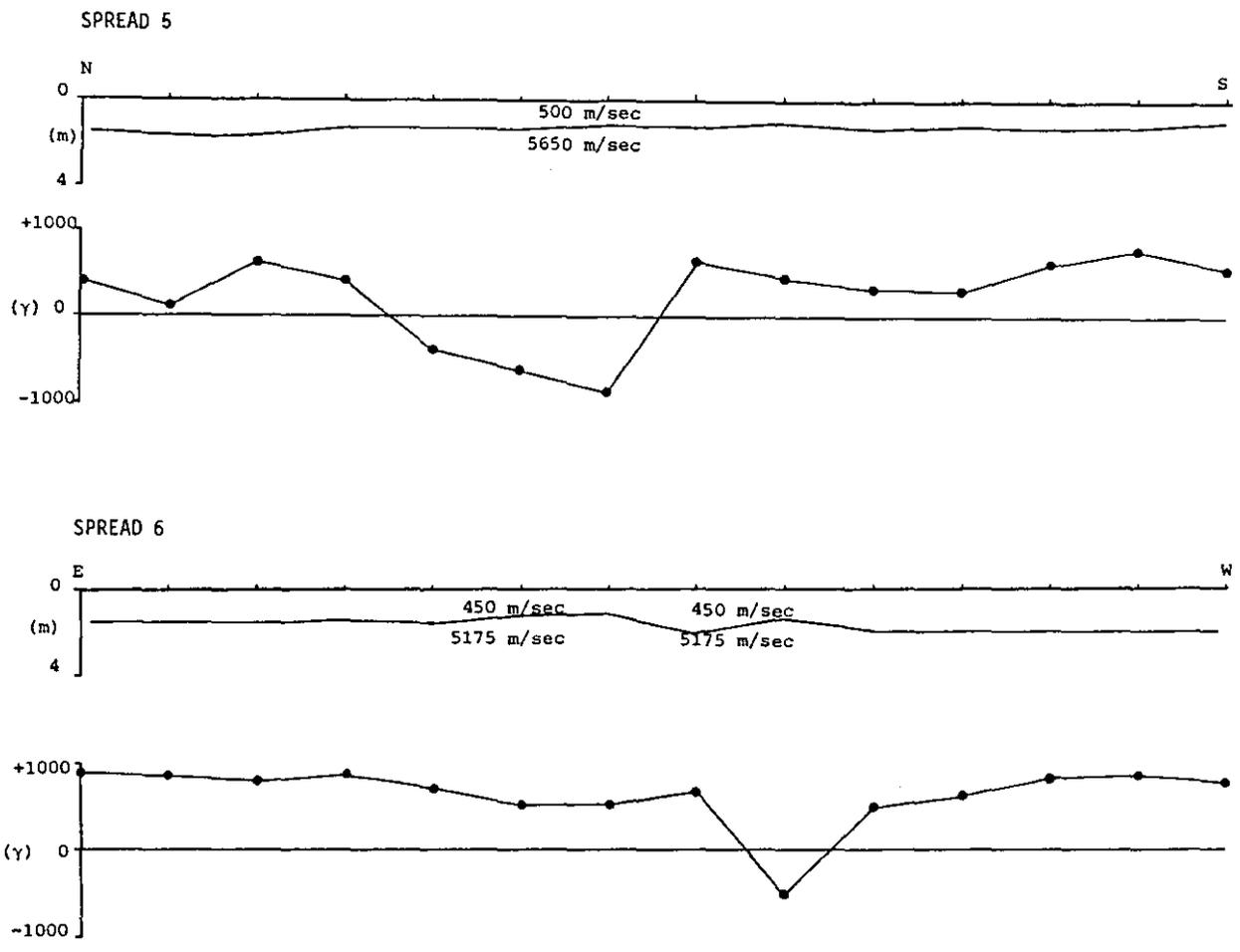
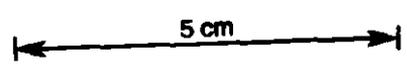


Figure 3. (continued)



APPENDIX 1

Description of test pits

- Hole 1* - About 0.7 m deep and about 2.0 m long and 0.6 m wide. Sandy silt soil on top of fractured rock and clay. Solid dolerite on flat surface at base of pit. Some narrow clay-filled joints extend about 20 mm into rock.
- Hole 2* - About 0.4 m deep, 2.0 m long and 1.0 m wide. Sandy silt on surface. Largely unweathered dolerite on flat surface, some clay-filled joints 20 mm deep.
- Hole 3* - Up to 1.2 m deep, 2.0 m long and 1.0 m wide. Sandy silt soil, some clay at depth. Unweathered rock surface uneven, sloping towards north-west where it is about 1.2 m deep. Clay-filled joints extend at least 20 mm into rock.
- Hole 4* - 0.7 m deep, about 2.0 m long and 1.0 m wide. Sandy silt soil. Largely unweathered rock on flat surface some 0.7 m below the surface. Occasional clay-filled joints up to 50 mm deep.
- Hole 5* - 0.6 m deep, about 2.0 m long and 1.0 m wide. Sandy silt soil. Largely unweathered dolerite on flat surface. Clay-filled joints extend up to 70 mm into this surface.
- Hole 6* - 0.8 m deep, 2.0 m long and 1.0 m wide. Sandy silt soil. Most of pit base consists of largely unweathered solid dolerite. Irregular shattered rock in north-west corner.