



Investigation of possible extensions to the HBMI quarry at Leslie Vale

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Abstract

A seismic survey of an area near the HBMI quarry at Leslie Vale has indicated that good quality dolerite is likely to occur at 2–5.5 m below the surface over an area of about eight hectares. Drilling should be undertaken to confirm this. There are extensive areas in the general region where further reserves could very likely be proven.

INTRODUCTION

The manager of Hobart Blue Metal Industries requested that an area near the present quarry be examined to determine its potential for the future extension of the present quarry.

The survey has involved a reconnaissance survey of the geology of the area, and a refraction seismic survey in the area of the proposed extension.

RELIEF AND GEOLOGY

The present quarry has been developed on a plateau area between Mafeking and Boddys Creeks, to the south of the Southern Outlet Road at Leslie Vale. There are two levels on the plateau, the upper flat area being some 15–20 m above the other.

The distribution of rock types is shown in Figure 1. The upper level of the plateau is underlain by sedimentary fossiliferous rocks of Permian age, while the lower flat area is underlain by dolerite. Two small areas of Permian rocks (marked A and B on Figure 1) cap low hills north of the quarry, while another small area (C) is at a lower elevation. Another area of Permian rock occurs east of the quarry but this extends to lower levels in altitude.

The large area of Permian sediments, and the small areas A and B, appear to be caps sitting on dolerite i.e. the dolerite is sill-like and there are erosional remnants of the sedimentary rocks covering the dolerite body. The sedimentary rocks are baked, and this supports this conclusion. The Permian rocks in this area are generally flat bedded, although locally, such as near the road entrance to the quarry, they dip strongly and may be downfaulted. Drilling here by the Company has indicated that mudstone occurs to deeper levels than would be expected by a hill-top cap. The small area C is either a small raft of sedimentary rock caught up in the dolerite or is a small downfaulted block. The contact between the dolerite and Permian rocks on the eastern side of the quarry is either a fault line or a transgressive contact, although around the southern margin it is sill-like again, with the contact between the two rock types at a lower level than near the quarry. The probable relationships between the various areas of rocks is shown on the cross section.

The dolerite is the material largely used in the quarrying operation and it is variably weathered around the quarry. On

the northern side of the large area of Permian rock near the quarry, and up to the small area B, there are several outcrops of dolerite, while in the area of the seismic survey and north-east of the quarry there are only occasional outcrops. Quarries developed near the track to Mafeking Creek show the dolerite to be deeply weathered on the sloping land.

SEISMIC SURVEY

Twenty-two seismic refraction spreads were fired in undertaking the survey. Twenty of these were fired in a flat area west of the quarry (fig. 2), where the extension is being seriously considered by the company. One spread was fired between this area and the existing quarry (from one end only), while one was fired on the southern margin of the present quarry. Each spread had 12 geophones spaced at 7.5 m intervals, and the spreads were fired on each end.

The interpreted profiles under each spread are shown on Figure 3. Each of the spreads in the main area being examined has high velocity material underlying it at depth. These velocities are in the range of 5500–6800 metres per second, and it is almost certain that dolerite underlies the whole area. The material at the surface has varying velocities, ranging from about 850–2000 m/sec. Some of this lower velocity material will be soil, while some will be dolerite boulders in soil, weathered dolerite, and perhaps largely unweathered dolerite with abundant open joints. The thickness of the material with lower velocity on top of the largely unweathered dolerite is from about 2–5.5 m, with perhaps the thickest generally being on the north-west end of the area.

Each spread has been interpreted separately, and the calculations depend on average velocities being used. It will be noted that the depth to solid rock does not match exactly on the ends of some of the spreads where a number are in a line. This is probably partly due to different average velocities being used on the abutting spreads.

The spread fired near the southern margin of the present quarry indicated lower velocities at depth. This suggests that the dolerite is more deeply weathered, or is open jointed.

CONCLUSIONS AND RECOMMENDATIONS

Extensive areas of dolerite occur around the quarry, and there are prospects of extending the quarry. Where the seismic survey was undertaken, dolerite almost certainly underlies the whole area. Other possible extensions for the quarry operation are to the south of B on Figure 1 (where there may be less weathered material over solid dolerite), and back towards and to the north-east of the office. If these two other areas were considered possibilities, further work would be required.

The depth of weathering and/or open-jointed dolerite in the area of the seismic survey ranges from 2–5.5 m. This is similar

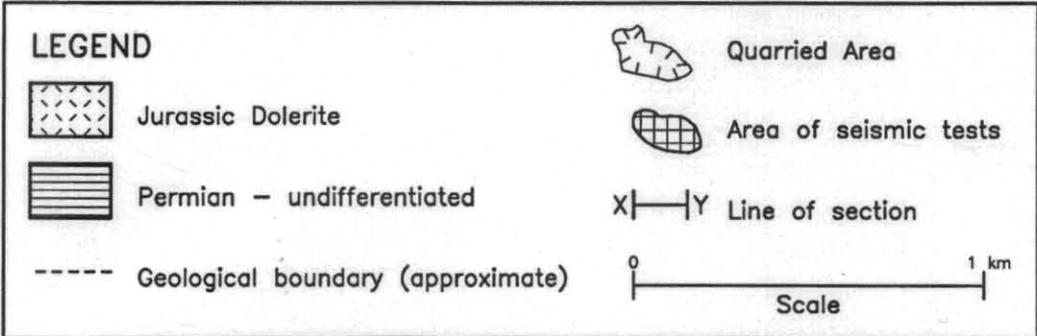
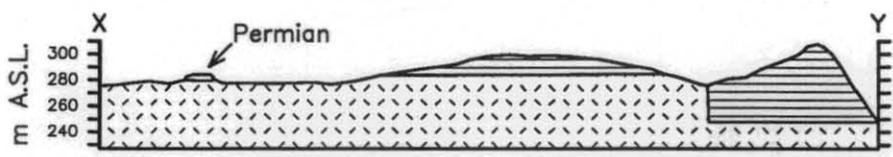
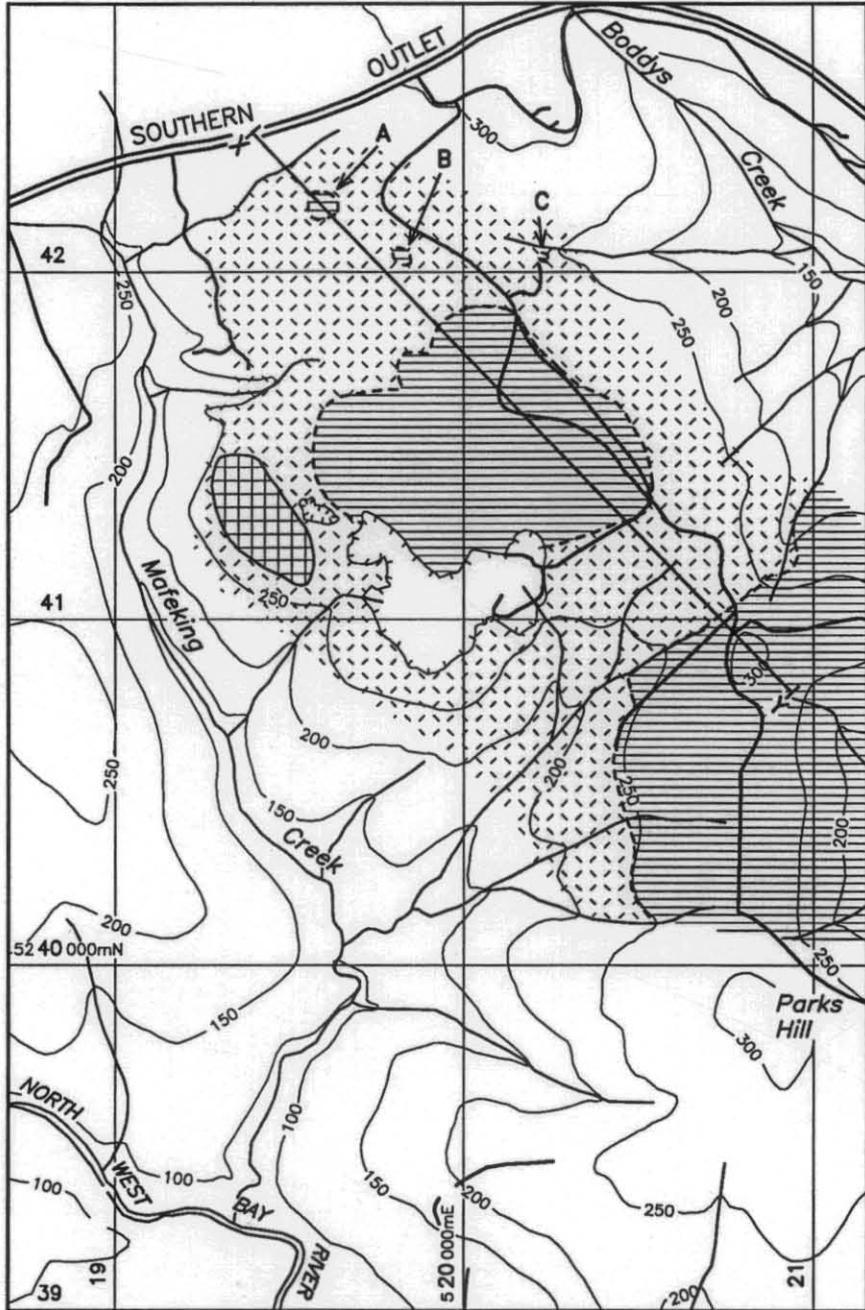
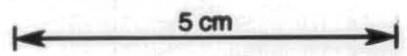


Figure 1. Geology and cross-section of quarry area.



to the depth indicated by a seismic spread on the southern margin of the existing quarry.

Drilling should be undertaken in the area of the seismic survey if this is to be seriously considered for extension of the quarry. Some cored holes would be useful to examine the undisturbed rock, and three in the positions marked on Figure 2 are sites that could be considered. A further nine percussion (or air-track) holes are recommended. In the event that it is decided not to undertake core drilling (which would be much more expensive) the three holes should be drilled with the percussion drill. Each hole should be drilled to about 30 m or more to adequately test the area, and chip samples should be collected and drilling rates recorded.

The seismic refraction method will not indicate whether weathered dolerite or some other rock type occurs under the near-surface solid dolerite at shallow depth. These are both unlikely possibilities but for greater certainty drilling is recommended.

The area between the Permian mudstone and the bushline marked on Figure 1 is about 80 000 m² or eight hectares. A 20 m thickness of useable rock over this area would amount to about 4.5 million tonnes of rock (or about 2.25 million tonnes per 10 m depth).

Other possible additions to the reserves could probably be proved by deeper drilling on the area of the seismic spreads, by drilling in the floor of the present quarry, or by considering the zone between these two areas (although lower velocities were indicated in the one spread fired here). Other probable additions occur up the western side of the Permian mudstone and in the vicinity of the present office. It is expected that dolerite underlies the large area of Permian mudstone between the quarry and the entrance road, and this could add significantly to reserves. A use for the overburden (mudstone) would need to be found.

[2 May 1989]

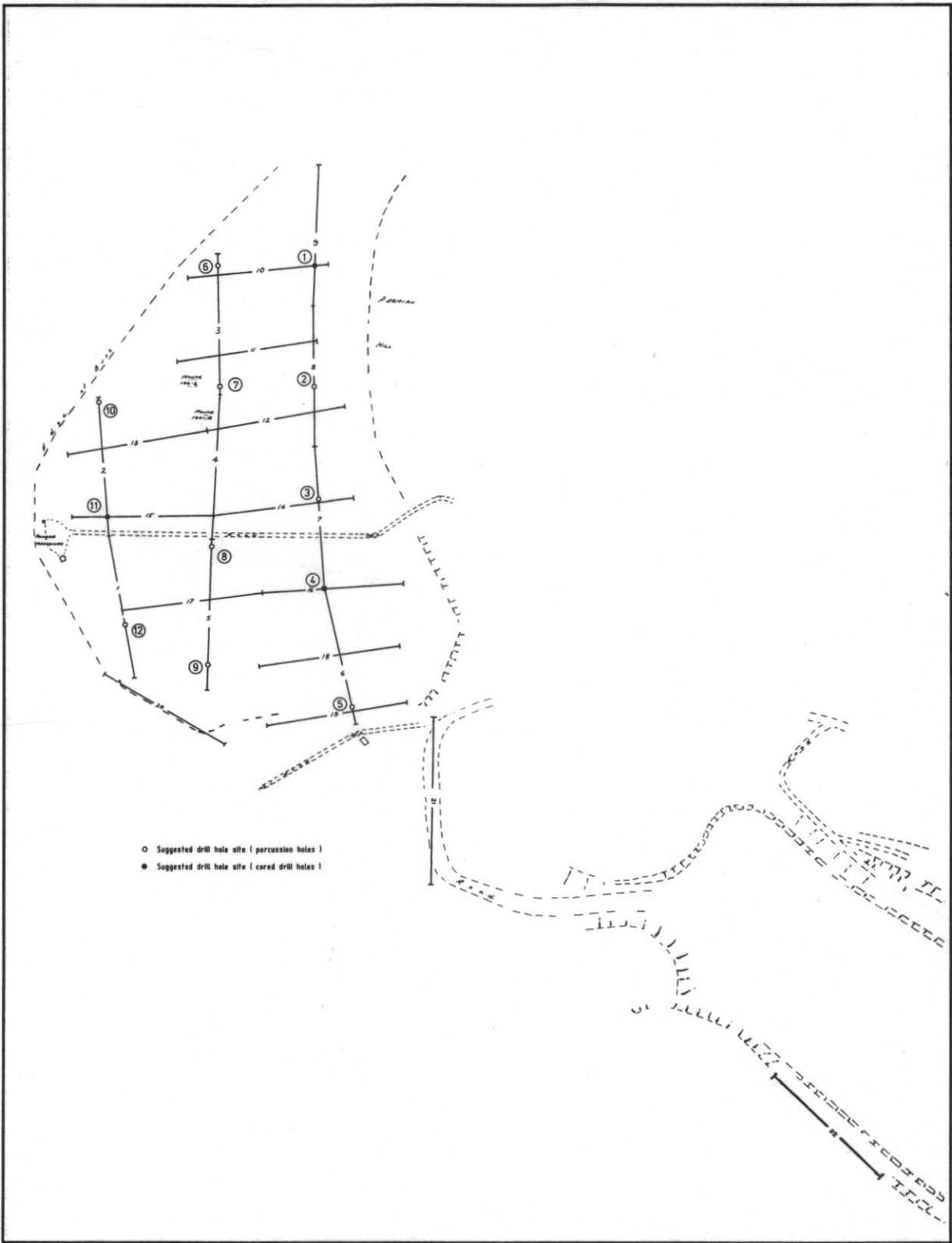


Figure 2. Location of seismic spreads, and suggested drill hole sites

5 cm

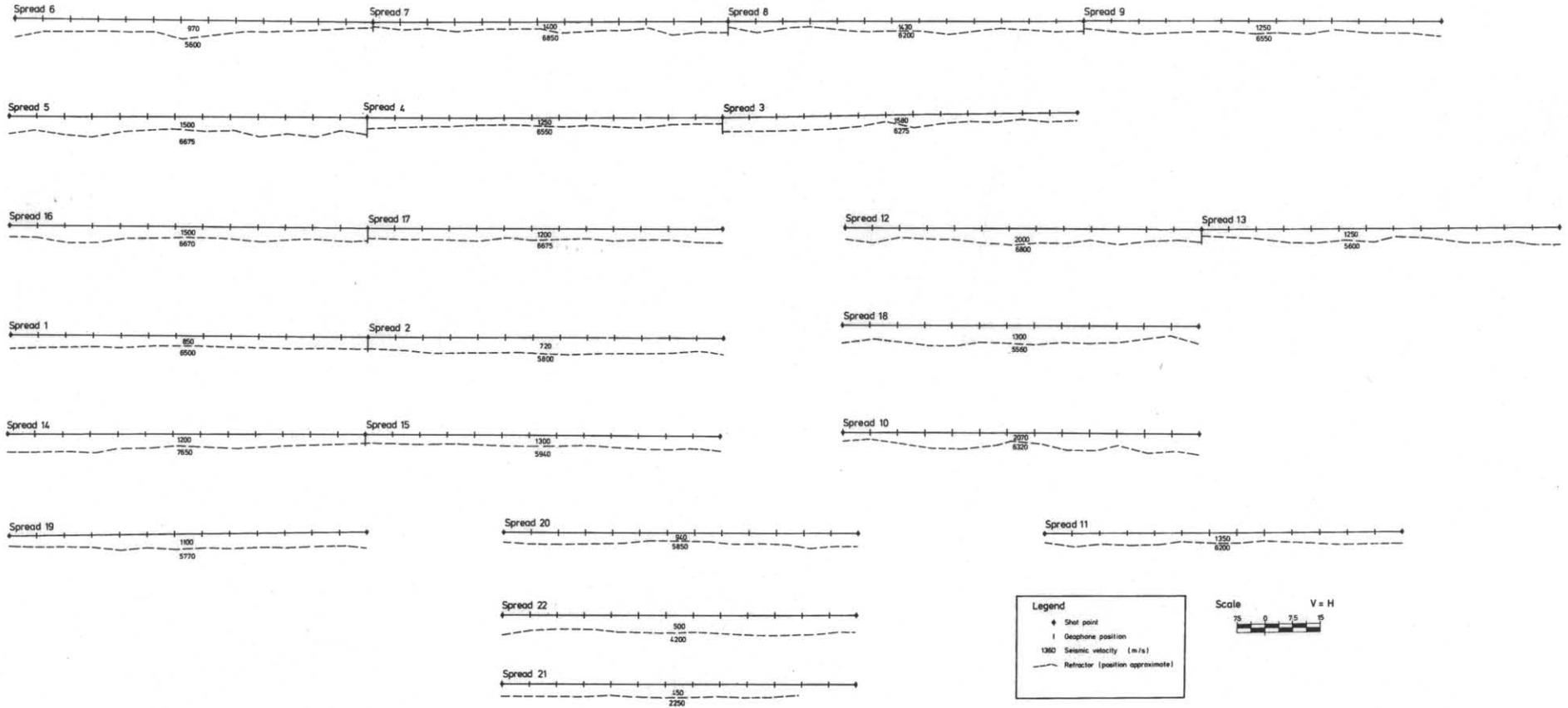


Figure 3. Seismic profiles