TR20_57_61

5. Examination of Gardners quarry, Relbia.

V.M. Threader

A seismic survey by W.L. Matthews (appendix 1) and a field study by the writer were carried out in a basalt quarry situated on the north-east flank of Cocked Hat Hill, midway between Relbia and Breadalbane [EQ165038] (fig. 11). The material won from this quarry is used in the as-mined condition for gravel road construction by the St Leonards Municipal Council.

GEOLOGY

The quarry is situated near the eastern edge of a Tertiary basalt flow which extends about 8 km in a NW-SE direction and one kilometre in a NE-SW direction. The eastern edge of the flow could not be determined accurately due to soil cover. The basalt rests on Tertiary sediments of the Launceston Basin (fig. 11). The basalt is deeply weathered and is extracted by ripping.

QUALITY OF MATERIAL

The accompanying graphs (fig. 12) represent particle size distributions of two samples taken from stockpiles on the quarry floor. Only -25 mm material was taken as larger particles appeared to be friable and so would break down to the smaller size with handling and compaction. The grading conforms to the specification for that maximum size and has a dust ratio of 0.67 which is within prescribed limits.

		NAASRA Specification	
Other tests	*Result*	*Sealed roads*	*Gravel roads*
Liquid limit	50	<25	<35
Plastic limit	26	<6	<9
Linear shrinkage	11	<2	<3

These results indicate that the material may be subject to excessive volume changes when wet and is therefore of marginal quality.

RESERVES

The area bounded by three fences and the broken line on Figure 13 is approximately 0.9 ha, and within this area the volume of rippable stone is estimated to be about 100 000 m^3 and was calculated as follows:

Area (m^2)	*Length (m)*	*Volume (m^3)*
900 (shaded on Section AB)	70	63 000
600 (shaded on Section CD)	60	36 000
		100 000

The basalt flow extends 10-11 km from Relbia to Western Junction and similar locations to Gardners quarry could be found anywhere along the flow. At the quarry there are approximately 1 200 m^3 of basalt per metre of length (*i.e.* in a north-west to south-east direction). If such a volume is continuous along the basalt margin alternative sources of supply should be easily located if required.

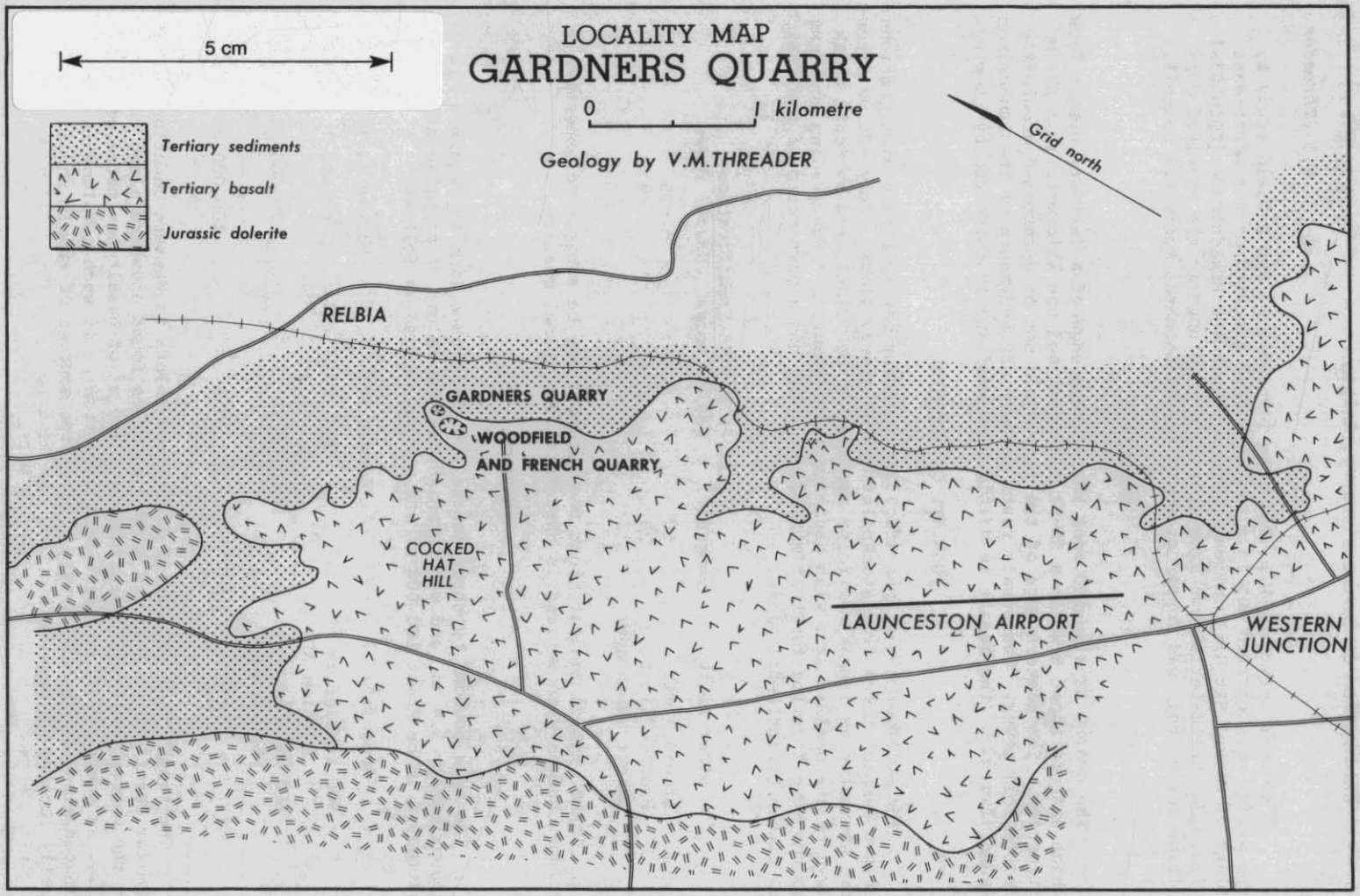
5 cm
LOCALITY MAP
GARDNERS QUARRY
0
1 kilometre
Geology by V.M.THREADER
Grid north
Tertiary sediments
Tertiary basalt
Jurassic dolerite
RELBIA
GARDNERS QUARRY
WOODFIELD
AND FRENCH QUARRY
COCKED
HAT
HILL
LAUNCESTON AIRPORT
WESTERN
JUNCTION

Figure 11.

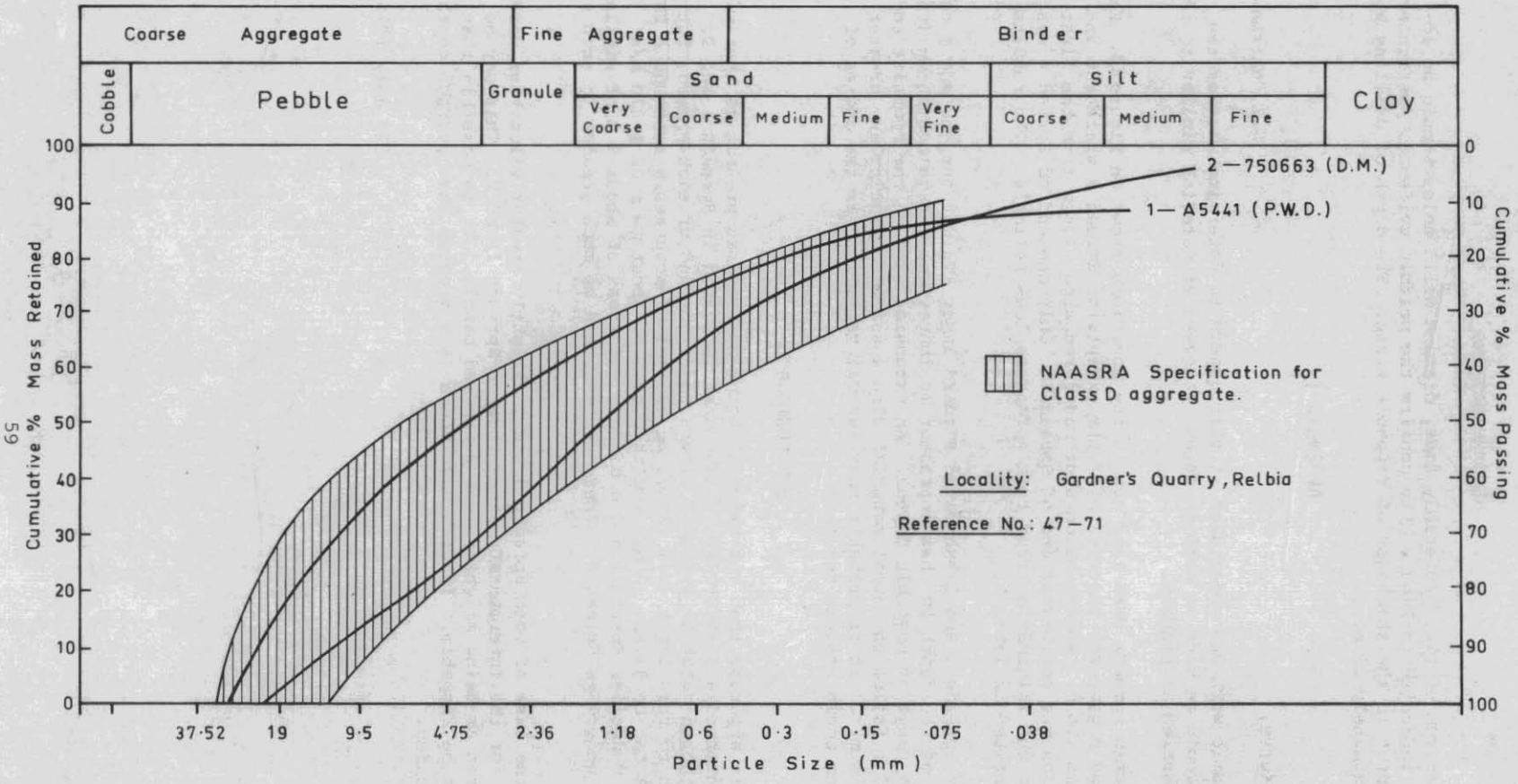

Figure 12. *Grading curves, Gardners Quarry, Relbia.*

5 cm

RECOMMENDATIONS

A minimum of two, preferably four, diamond drill holes should be located as indicated on Figure 13 to confirm the seismic evidence, particularly with respect to the thickness of rippable stone. The depth of drilling would be approximately 15 m.

APPENDIX 1

Seismic survey

W.L. Matthews

Seismic work was undertaken at this quarry to determine whether the results could be used to help to assess reserves of material similar to that being quarried at present.

Seismic spreads were laid out in the positions shown on Figure 13. Each spread had a geophone interval of 7.6 m except for Spread 2 where the interval was 4.6 m. An extension shot was fired about 4.6 m from the first geophone on the north-west end of Spread 1. Only one end of Spread 4 was fired, so the information from this spread is less reliable. The results are summarised in Table 1.

Only Spreads 1 and 2 exhibited a third layer (V_2) at one end and a calculation of the depth to this refractor is imprecise; the values shown (table 1) give a range of possible depths. An extension shot on the opposite end of Spread 1 failed to reveal material with a seismic velocity any greater than 1 585 m/s. It is probable that lateral variations in the degree of weathering would account for this.

CONCLUSIONS

It is apparent that the material being quarried at present is that within the intermediate layer (V_1 = ∿1300 m/s) indicated in Spreads 1 and 2. Less weathered material probably occurs under one end of each spread, but the depth to this layer (V_2) cannot be determined accurately although a range of depths can be given. A minimum thickness of about 14 m of 1 310 m/s material underlies Spread 1 and a minimum thickness of about 9 m of similar material underlies Spread 2. These depths could be much greater in each case.

In the case of both Spreads 3 and 4, slightly greater velocities were obtained for the intermediate layer than in Spreads 1 and 2. This may be interpreted as being slightly less weathered basalt. It is possible that it might not be rippable. In each case there is a greater than average depth of overburden.

[22 July 1975]

Table 1. SEISMIC RESULTS

Spread No.	V_0 Velocity (m/s)	Thickness (m)	V_1 Velocity (m/s)	Thickness (m)	V_2 Velocity (m/s)	Depth to V_1/V_2 interface (m)
1	380	4.6- 6.7	1 310	14.3-21.3	3 050 (one end only)	20-22 or 26-28
2	365	1.0- 6.4	1 280	9.1-15.2 or 24.4-28.0	1 920 (one end only)	14-17 or 31-34
3	490	7.6-11.6	1 830			
4	535	2.7- 8.2	1 525			

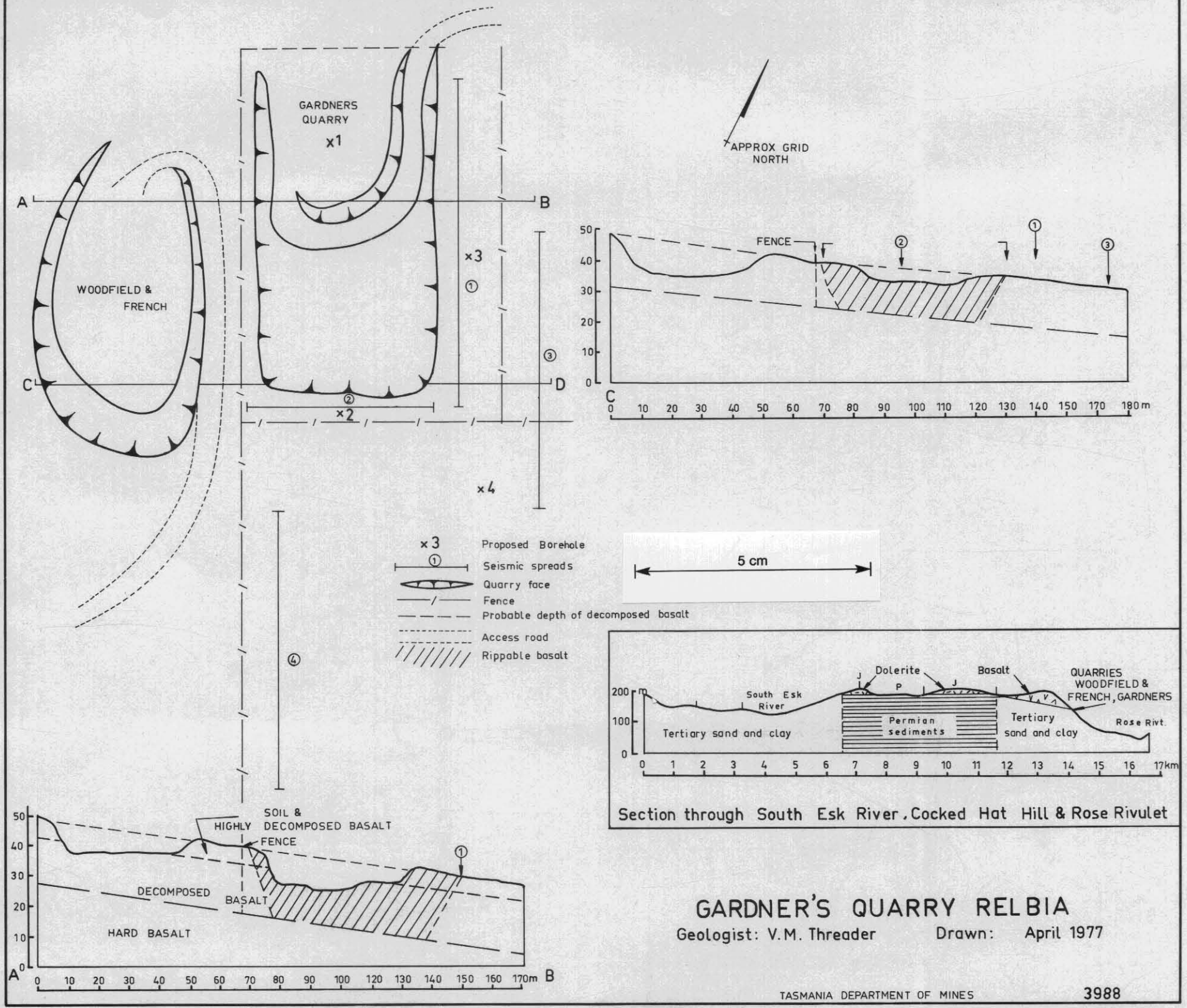

FIGURE 13

TR20_57_61

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