Tasmania Department of Mines—Report 1989/43

Results of a water bore in Ordovician quartzite, Lune River area

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Abstract

Groundwater occurrences were examined in a series of shallow holes drilled into chert and residual chert gravel interbedded with and overlying the Precambrian dolomite in the Hastings area. One hole encountered competent jointed quartzite and produced large quantities of groundwater.

INTRODUCTION

During a drilling program undertaken by the Department of Mines in late 1986 to determine silica resources in the Hastings area, groundwater occurrences were also examined. A series of shallow holes was drilled into chert and residual chert gravel interbedded with and overlying the Precambrian dolomite. A few holes were drilled in areas mapped as Ordovician quartzite. Most of the holes drilled in rocks of both ages intersected loose or weathered material. One hole (Hole 6), drilled on the North Lune Road at DM877933 (fig. 1), encountered competent jointed quartzite from the surface to the depth drilled, and also produced large quantities of groundwater.

TOPOGRAPHY AND GEOLOGY

The site of Hole 6 is on the edge of a small hill on North Lune Road, the hill rising some three metres above the generally flat plain. Hogs Back, about one kilometre to the north, is a north-trending ridge, and the small hill on which the bore was drilled is in line with this. The Hogs Back may be a tight anticline, and the outcrop on North Lune Road, which dips east at 50°, probably forms part of the eastern limb of this fold. The flat land surrounding the hill is underlain by considerable depths of alluvium consisting mainly of boulder beds of rounded quartzite.

DRILLING

Hole 6 was drilled to 29.5 m and penetrated quartzite for its entire depth. The quartzite was particularly severe on the drilling bits used (air/hammer, 6½ inches diameter).

Water was struck at 22.5 m at a rate of 227 L/m (3000 gallons/hour); at 24 m at a rate of 680 L/m (9000 g/h); and at 25 m for a total of about 1350 L/m (18,000 g/h).

PUMP TEST

A pump test was conducted at a rate of about 760 L/m (10,000 g/h) for a little over three hours. It was proposed to pump the hole for about 8 hours but this was prevented by a pump failure. Pumping at this rate only drew the water level down to 6.35 m below ground level from a standing water level of 0.35 metres.

The pump test results are plotted on Figure 2. The plots form a good line from about 10 minutes to the end of the test. If this line is projected to 100,000 minutes, a theoretical drawdown of 12.5 m is suggested. Whether this would occur in practice will depend on the consistency of the joint pattern for the rock surrounding the bore for quite large distances. Again, theoretically, a doubling of the pump test rate would only draw the water level down to 25 metres. Thus 1500 L/m (20,000 g/h) is likely to be the upper possible limit of the capacity of the bore. In practice the safe yield in the long term is likely to be lower than this figure.

WATER QUALITY

A sample of the water has been analysed by the Department of Mines laboratory in Launceston with the following results:

pH	7.4
Conductivity (µS/cm)	270
Item (mg/L)	
CO_3	nil
HCO_3	160
Cl	17
SO_4	<5
Ca	28
Mg	9.4
Fe	<0.1
Al	<0.2
K	0.6
Na	9.2
TDS	175
Hardness – Permanent	nil
Hardness – Temporary	109
Alkalinity as $CaCO_3$	130

The water is of good quality and could be used for most purposes. It is a bicarbonate water with both calcium and magnesium higher than sodium. This is probably due to the influence of nearby Ordovician limestone and Precambrian dolomite.

DISCUSSION

Four water bores have previously been drilled in the Ordovician quartzite in Tasmania. The Lune River hole demonstrates that where the rock is well fractured, it is possible to obtain considerable quantities of good quality water.

[20 November 1989]

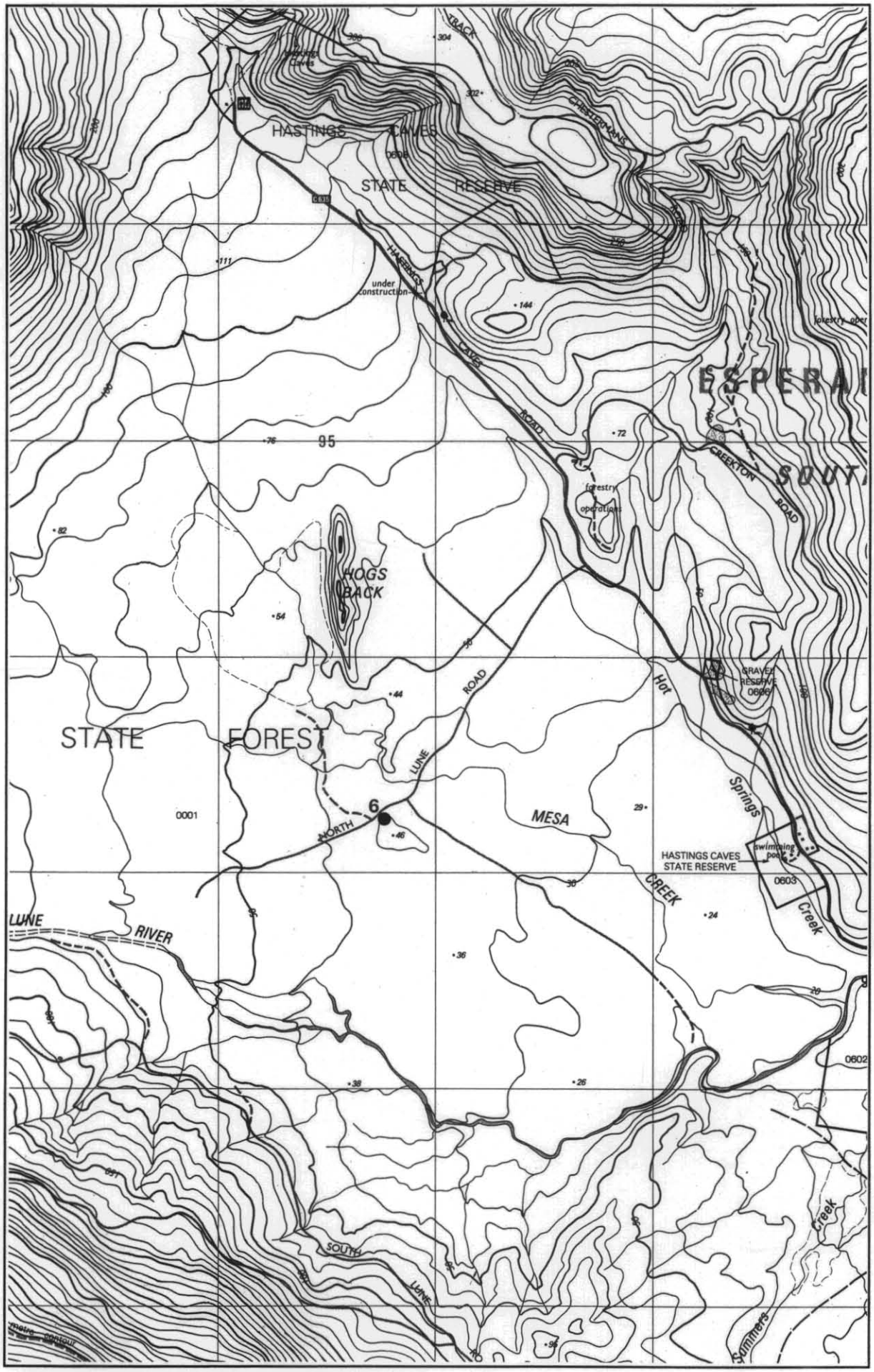

Figure 1. *Location of Drill Hole 6, North Lune Road.*

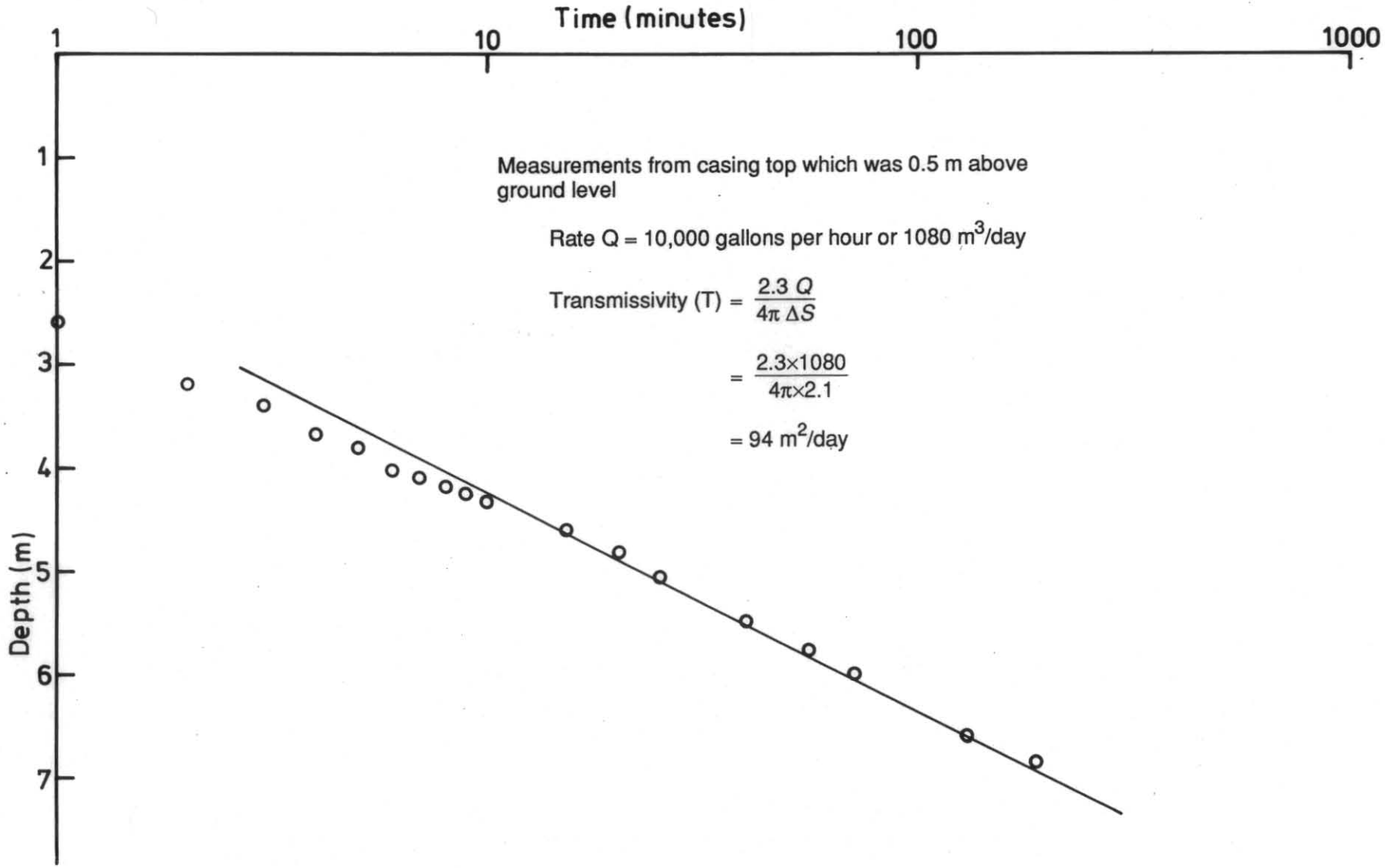

Figure 2. *Pump test data, Hole 6, North Lune Road.*

5 cm