UR 1978-02

Drilling for groundwater at Lennonville, North Bruny Island.

W.R. Moore

Abstract

Eight shallow auger and diamond drill holes were drilled to check the interpretation of the Roberts Hill area from the surface mapping and geophysics undertaken for a previous groundwater investigation. It was hoped that these holes would reduce the risk of encountering dolerite when a water bore was drilled. As the groundwater quantity from the geophysics appeared suspect, one of these holes was drilled through the Triassic sandstone and mudstone into the Permian mudstone and siltstone sequence. This hole was pump tested for a short period giving 15 *l*/min before the 50 mm screen became clogged with clay. The water was suitable for stock with a total dissolved salts content of 1500 ppm.

From these results, a deep water bore was recommended to the owner. Dolerite was encountered in the first water bore, the second failed to reach the water table and the third obtained very poor quality groundwater at a rate of 50 *l*/min. The water had a total dissolved salt content of 6000 ppm and was from the Permian sediments below the Triassic contact.

INTRODUCTION

Difficulties had been experienced in interpreting the geology in the Roberts Hill area of North Bruny Island. Reconnaissance mapping and a geophysical survey were undertaken in 1975 (Moore, 1977), with detailed regional mapping of the area being undertaken by N. Farmer in late 1975. The geophysics, particularly the magnetometer survey, had been difficult to interpret and the resistivity sounding had indicated the likelihood of saline groundwater. A series of auger and diamond drill holes were drilled with a Gemco drill in an attempt to delimit the dolerite/sediment boundary and reduce the risk of encountering dolerite when a water bore was drilled. This was considered necessary because of the high probability of obtaining unsuitable groundwater supplies and the high cost of transporting drilling equipment to the island.

SHALLOW DRILLING

Eight holes were drilled using a Gemco rig. Five of these holes were sited on seismic lines 1, 2 and 3 overlooking Alexander Bay, with the remaining three drilled south of the drainage divide towards Appollo Bay (fig. 1).

All of these holes, with the exception of Hole 1, were less than 5 m deep and confirmed much of the geological and geophysical interpretation of the area. The lithological logs for these holes are given in Appendix 1. Gemco Hole 1 was drilled to approximately 16 m in order to find the thickness of Triassic rock overlying the Permian sediments exposed on the foreshore of Alexander Bay. It was hoped that this hole could be flushed of drilling mud and then pump tested using a 50 mm diameter screen with a single pipe venturi pump set at 9 m depth to indicate the quantity and quality of the water available. This test was only partially successful, with the small hole giving approximately 13 *l*/min before the screen became clogged with clay. The longest pumping time was only 20 minutes, but the water level appeared to have become stabilised before this clogging re-occured. The quality of the water from the hole was 1500 ppm, most of which

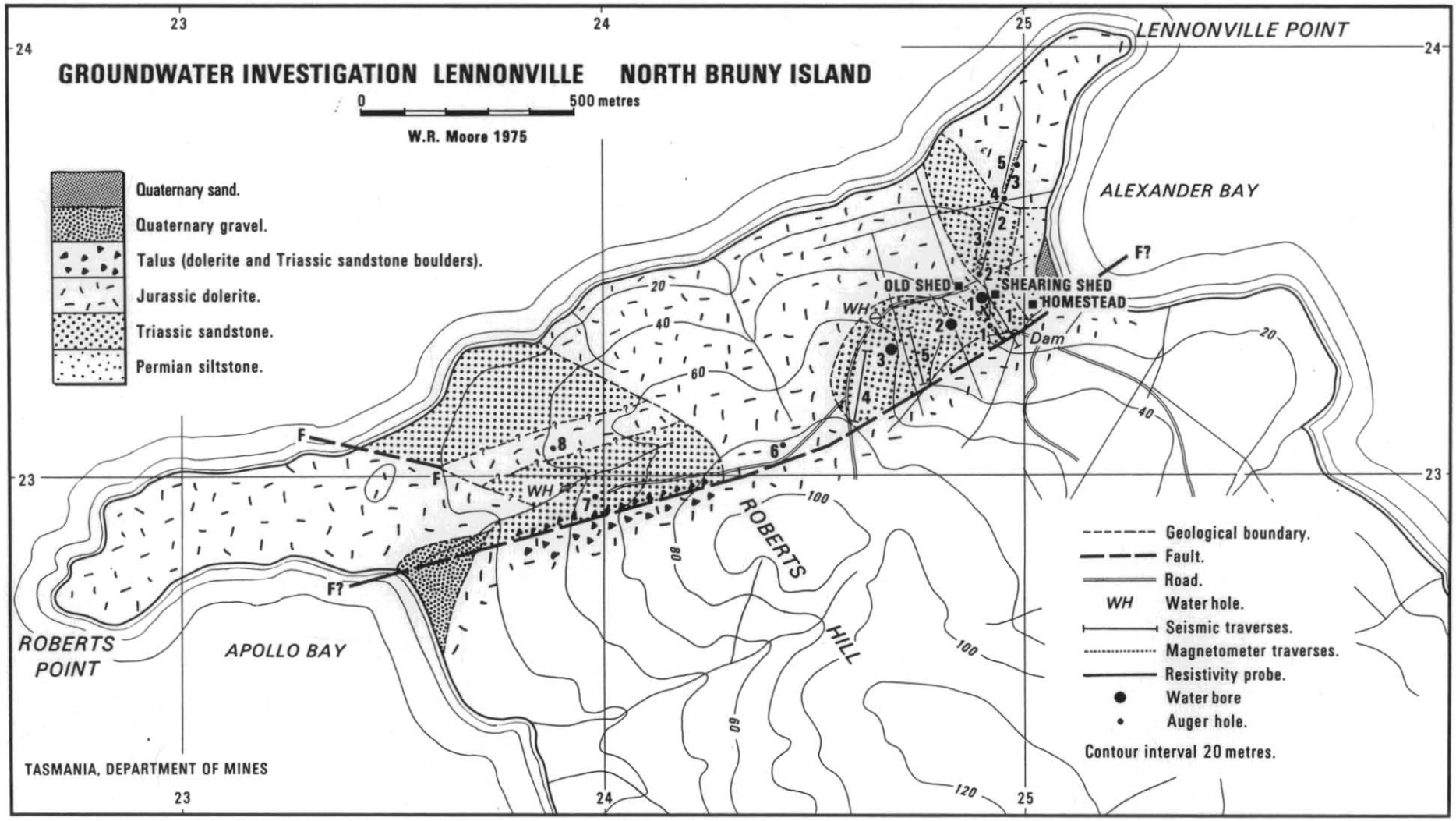
GROUNDWATER INVESTIGATION LENNONVILLE NORTH BRUNY ISLAND
0 500 metres
W.R. Moore 1975
Quaternary sand.
Quaternary gravel.
Talus (dolerite and Triassic sandstone boulders).
Jurassic dolerite.
Triassic sandstone.
Permian siltstone.
LENNONVILLE POINT
ALEXANDER BAY
OLD SHED
SHEARING SHED
HOMESTEAD
Dam
WH
F
F?
ROBERTS HILL
ROBERTS POINT
APOLLO BAY
Geological boundary.
Fault.
Road.
Water hole.
Seismic traverses.
Magnetometer traverses.
Resistivity probe.
Water bore
Auger hole.
Contour interval 20 metres.
TASMANIA, DEPARTMENT OF MINES
23
24
25

Figure 1

5 cm

was common salt; this water was suitable for stock. This water was also a better quality than the water from the main stock dam situated on the stream near the road entrance to the homestead, which contained 3470 ppm TDS.

WATER BORE DRILLING

On the available evidence, a Mayhew rotary drill rig with down-the-hole hammer was used to drill three holes. Hole 1, drilled opposite the shearing shed (fig. 1), encountered dolerite to 13 m and was abandoned (Appendix 2). Hole 2 was drilled below seismic line 5 and encountered Triassic sandstone and mudstone to a depth of 25 m. The water table was not reached and the hole was abandoned. Hole 3 was drilled higher up the hill above Seismic Line 5 and reached a depth of 36 m, comprising 18 m of Triassic sandstone and mudstone with the remaining depth being in Permian mudstone and siltstone. This bore gave 50 *l*/min of poor quality water with 6000 ppm TDS. No full chemical analysis of this water is available due to loss of the sample.

REFERENCES

FARMER, N. *In press*. Geological atlas 1:50 000 series. Sheet 88 (8311N). Kingborough. *Department of Mines, Tasmania*.

MOORE, W.R. 1977. Groundwater investigation, 'Lennonville', Bruny Island. *Tech.Rep.Dep.Mines Tasm.* 20:283-286.

[24 July 1978]

APPENDIX 1

Logs of 'Gemco' auger and drill holes.

Hole 1 (augered/cored)

Depth (m)	*Description*	*Age*
0 - 0.05	Brown sandy soil.	
0.05 - 1.50	Yellow sandy clay.	
1.50 - 3.00	Massive yellow sandy clay.	
3.00 - 3.04	White - yellow sandy mudstone.	
3.04 - 4.00	Closely bedded, micaceous mudstone, with some minor bedded laminae sandstone less than 1 mm thick.	Triassic
4.00 - 4.60	Closely bedded white micaceous sandstone with mica on bedding plane faces. Some minor mudstone beds present. Bedding interfaces show rusting.	
4.60 - 7.00	Broken zone of core of above sandstone grading down to brown micaceous mudstone with a vertical joint.	
7.00 - 7.05	Laminae bedded, micaceous sandstone.	
7.05 - 8.01	Massive brown mudstone with a joint dipping at 80°.	Transitional zones
8.01 - 9.06	Brown mudstone with characteristic 'curly' texture of regurgitated and bottom current swirl sedimentation. Bedding indistinct. Rusting on steep joints.	Permian
9.06 - 11.02	Grey-brown, muddy siltstone with steep, near vertical joints. Joint faces rusty and open.	
11.02 - 12.07	Massive to poorly bedded grey-brown siltstone showing swirl patterns.	
12.07 - 14.02	Poorly bedded mudstone with steep joints from 70° - 90°.	
14.02 - 15.08	Grey-brown siltstone with minor sandstone beds forming wisps and thin indistinct beds. Probably Ferntree Formation.	

Hole 2 (augered/cored)

0 - 3.06	Brown sand, soil and clay.	
3.06 - 5.07	Brown sandy clay.	
5.07 - 7.06	Yellow clay and mudstone and fine white sandstone.	Triassic
7.06 - 9.04	Broken core - fine white feldspathic sandstone and bedded yellow micaceous sandstone.	

Hole 3 (augered/cored)

0 - 1.08	Grey sandy soil.	
1.08 - 3.03	Massive yellow sand and sandstone.	Triassic

Hole 4 (augered/cored)

0 - 0.02	Grey-brown soil and clay grading down to weathered and decomposed dolerite.	Jurassic
3.00 - 3.04	Broken core of unweathered dolerite, with open iron-stained joints.	

Hole 5 (augered/cored)

0 - 0.03	Soil and dark grey organic clay, rubbly clay and deeply weathered dolerite.	
0.03 - 1.03	Very broken core of weathered dolerite.	Jurassic
1.03 - 4.06	Broken core of weathered dolerite with a near-vertical joint.	

Hole 6 (augered)

0 - 1.05	Soil and brown clay.	Jurassic
1.05 - 3.01	Dolerite boulders and dolerite.	

Hole 7 (augered)

0 - 1.08	Soil, yellow clay and dolerite boulders.	
1.08 - 3.03	Yellow clay, mudstone and sandstone.	Triassic

Hole 8 (augered)

0 - 1.05	Soil,clay and dolerite boulders	
1.05 - 3.01	Dolerite and dolerite boulders.	Jurassic

APPENDIX 2

Logs of 'Mayhew' drill holes

Hole 1

Depth (m)	*Description*	*Age*
0 - 2	Surface soil and sandy clay.	
2 - 8	Weathered dolerite.	Jurassic
8 - 13	Dolerite	

Hole 2

0 - 1	Surface soil.	
1 - 2	Grey-brown sandy clay and white sandstone.	Triassic
2 - 8	Closely bedded fine grey-brown micaceous mudstone.	
8 - 14	Grey fissile micaceous mudstone with some fine sandstone.	
14 - 22	Hard, yellow, light grey fine-grained sandstone with mica and graphite grains on bedding faces.	
22 - 24	Brown fissile mudstone.	
24 - 25	Fine grained yellow sandstone.	

Hole 3

0 - 2	Dark brown sandy soil and clay.	
2 - 8	Soft yellow-weathering light grey micaceous mudstone.	Triassic
8 - 14	Fine-grained white micaceous sandstone and closely bedded quartz micaceous sandstone.	
14 - 18	Dark grey micaceous mudstone and fine-grained dark grey sandstone. Also white micaceous sandstone.	
18 - 22	Grey mudstone and brown fine quartz sandstone. White micaceous sandstone (Triassic lithology) and dark grey hard mudstone (Permian lithology)	Transitional zone
22 - 26	Brown fissile mudstone and dark grey hard siltstone and mudstone.	Permian

26 - 34	Dark grey compact and hard mudstone and siltstone.
34 - 36	Dark grey siltstone and silty sandstone. Also some dark grey fine-grained sandstone.

APPENDIX 3

Analyses of water samples

Item	*Gemco Hole 1*	*Lower waterhole*
pH	5.6	6.9
CO_3	nil *ppm*	nil *ppm*
HCO_3	13	110
Cl	260	98
SO_4	82	46
SiO_2	26	n.s.
Ca	3.0	20
Mg	17	60
Fe	70	650
K	1.0	1.0
Na	300	225
Total dissolved solids	1500 filtered	3470 filtered
Permanent hardness	66 filtered	200 filtered
Temporary hardness	11 "	88 "
Alkalinity (as $CaCO_3$)	11 "	88 "
Registered number	750737	750738

Analysis by Department of Mines Laboratory, Launceston.