TR19_106-109

13. Groundwater prospects, Cape Sorell and Braddon Point, western Tasmania.

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The groundwater potential of the region near the mouth of Macquarie Harbour was investigated at the request of Comalco Ltd. Large quantities of fresh water (of the order of 1000 *l*/min) will be required by the company should it commence operations at Cape Sorell. Two areas with groundwater potential were delineated (fig. 30).

Area 1 is low-lying, swampy in places and generally flat. It lies west of Hells Gates and is bounded to the north-east and south-west by higher sand dunes flanking Pilot Bay and Tiddys Beaches. Outcrops of Precambrian quartzite mark its north-western and south-eastern limits. The area contains a number of lagoons which receive surface water from the surrounding quartzite hills, and possibly groundwater from the neighbouring sand ridges. Natural surface drainage is north-west to Pilot Bay Beach, but the area is waterlogged for most of the year.

Area 2 encompasses the low-lying (mainly below 20 m), gently undulating sandy region opposite Hells Gates at the south-western extremity of Ocean Beach (Braddon Point). For the most part, it is sparsely timbered or under grass. The lack of any obvious permanent surface streams attest to the high infiltration rate of the sand; both Areas 1 and 2 receive more than 1500 mm of precipitation annually.

GEOPHYSICAL WORK

A number of seismic spreads were fired in both areas in an attempt to establish the basement depths. Geophone spacings of 8 m, with extension shots up to 130 m, were employed. Seismic results are summarised in Table 1. In most cases on Braddon Point, water was struck at shallow depth (1 m) during augering for seismic shot holes. The water was tested for quality, and the results are listed in Table 2.

Area 1

Spreads 7 and 8 were located on the flat saturated area to the south of the lower lagoon, approximately 50 and 150 m respectively from quartzite outcrops. Refractor velocities in the range 960-1520 m/s are indicative of saturated peaty soil and subsoil (lower values) and saturated sand and clay (higher values). Basement depths range from 20 m under Spread 7 (close to outcropping quartzite) to 28 m beneath Spread 8. Basement velocities are in the range of 3460-3950 m/s and probably represent shale and phyllite, or possibly fractured quartzites. These results, together with those obtained by Comalco in 1971, suggest that Area 1 consists of beach and bar deposits laid down during an interglacial high sea level period. As such, the sand and gravel deposits are considered to contain large supplies of groundwater.

Area 2

None of the spreads on Braddon Point located basement. In all cases, seismic velocities indicate that saturated sand (and possibly clay and Tertiary sediments) extends to considerable depths (probably not less than 50 m). Given the high average annual precipitation, the relatively extensive catchment area and the high infiltration rate of the sand, large potential supplies of groundwater exist. (Even in the present dry period water table levels are very close to the surface).

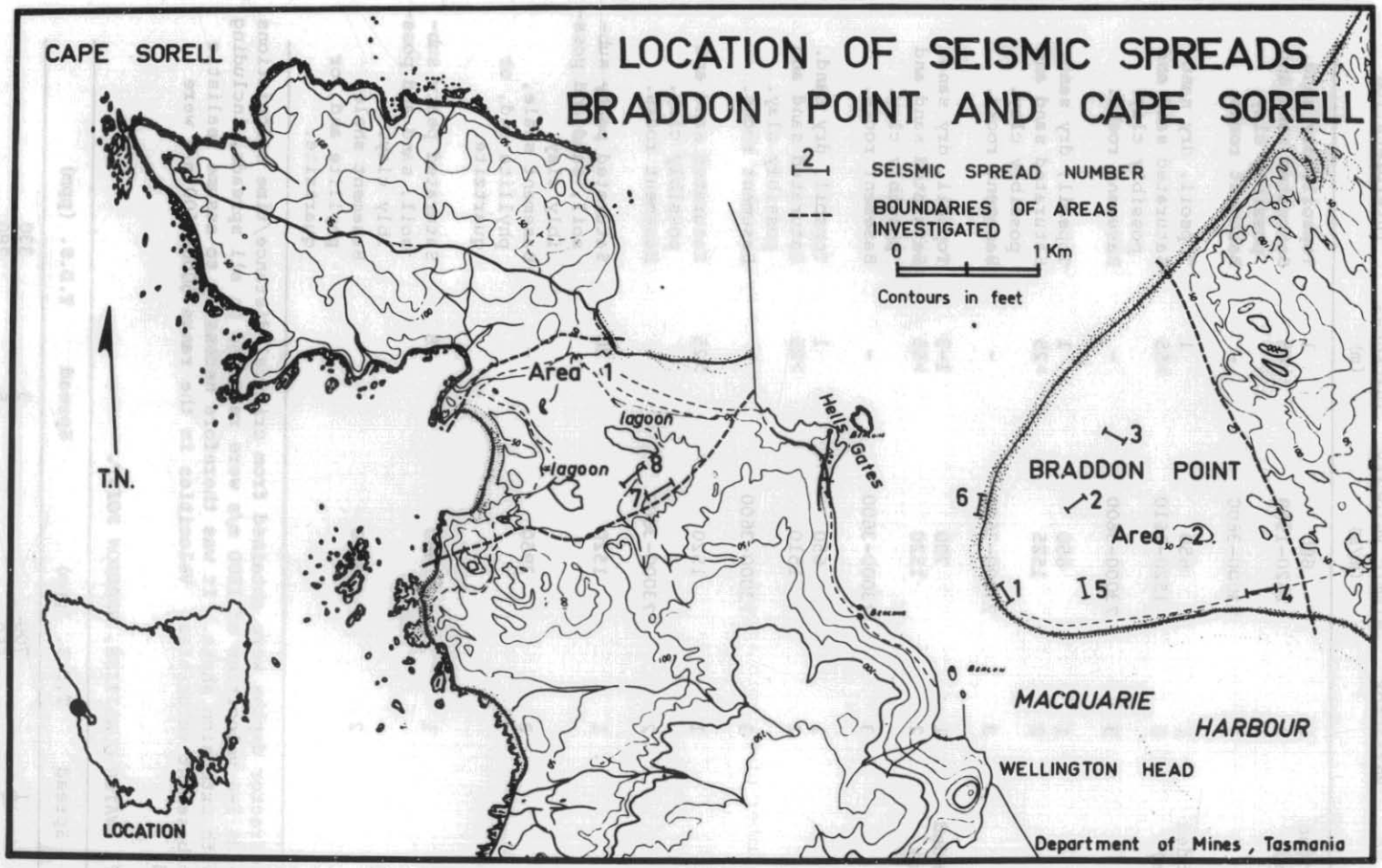

Figure 30.

5 cm

Table 1. SUMMARY OF SEISMIC RESULTS

Spread No.	Refractor	Seismic Velocity (m/s)	Thickness (m)	Interpretation
1 (extended 100 m)	1	600	1	Topsoil, dry sand.
	2	1520-1580	>45	Saturated sand and possibly clay.
	3	?3000-3600	-	Basement rocks.
2 (extended 130 m)	1	650	1	Topsoil, dry sand.
	2	1520-1610	>55	Saturated sand and possibly clay.
	3	?3000-3600	-	Basement rocks.
3	1	650	1	Topsoil, dry sand.
	2	1525	>25	Saturated sand and possibly clay.
	3	?3000-3600	-	Basement rocks.
4 (extended 100 m)	1	700	1-3	Topsoil, dry sand.
	2	1520	>55	Saturated sand and possibly clay.
	3	?3000-3600	-	Basement rocks.
5	1	650	1	Topsoil, dry sand.
	2	1510	>25	Saturated sand and possibly clay.
	3	?3000-3600	-	Basement rocks.
6	1	1520	>25	Saturated sand and possibly clay.
	2	?3000-3600	-	Basement rocks.
7	1	1520	20	Saturated peaty subsoil, sand and possibly clay.
	2	3950	-	Basement shale, phyllite and, or quartzite.
8	1	960	28	Saturated peaty subsoil, sand and possibly clay.
	2	3460		Basement shale, phyllite and, or quartzite.

Refractor depths were obtained from critical distance/time calculations. In Spreads 1-6 velocities of 1500 m/s were recorded on all spreads, including those with extension shots. It was therefore necessary to assume realistic minimum basement velocities. Velocities in the range 3000-3600 m/s were adopted.

Table 2. WATER QUALITIES, BRADDON POINT.

Spread	T.D.S. (ppm)	Spread	T.D.S. (ppm)
1	700	3	330
2	550	5	280

WATER QUALITY

The water struck at shallow depth on Braddon Point is of good quality. Four samples were analysed for total dissolved solids (T.D.S.). The results are shown in Table 2. Values (ppm) ranged from 700 near high water mark, to 280 further inland. The water is suitable for domestic and drinking purposes, in addition to the industrial usage envisaged.

RECOMMENDATIONS

Because large supplies of groundwater are required, Braddon Point with its larger catchment area and potential sand reservoir is considered the more favourable. However, both areas have considerable potential, and the question may become an economic rather than a geological one since water obtained from Area 2 will need to be pumped across the mouth of Macquarie Harbour.

If Area 1 is utilised (even on an interim basis) extended pump-testing of the lower, deeper lagoon is recommended. Depending on the transmissivity of the underlying sediments, it may be feasible to pump all supplies in this manner.

Water from Braddon Point may be obtained by pumping from a series of spear-point systems. The method is employed, for instance, on King Island where the township of Currie draws all supplies (about 700 *l*/min) from sand aquifers. Each spear-point system contains up to a dozen spears arranged in a 20 m diameter circle, all connected to a central pump. A number of such arrays extending over a few hectares on Braddon Point would, if working efficiently, supply the desired amount of water. For proper spear operation, appropriate screen sizes are necessary to prevent excessive pumping of sand into equipment. A grain size analysis of sand from Braddon Point gave the following:

Sieve Size (mm)	*% Sand Retained*
0.50	0.0
0.30	0.25
0.25	0.75
0.18	17.0
0.125	80.0
0.075	1.5
0.045	0.5
	100.0

A sieve size of 0.150 mm (150 μ) would retain 56% of the sample. A screen with openings of a similar size should be utilised with any spear-point system on Braddon Point. This will allow approximately 45% of the sand to be removed during the initial stages of pumping, thus creating a natural 'gravel' pack around the spear.

If a spear-point system is used, screens should be placed approximately 2 m below the summer water table level. Low, uniform pumping rates are preferable to intermittent periods of rapid withdrawal.

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