

Groundwater prospects at South Arm.

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At the owner's request, an investigation into groundwater prospects was conducted on J.R. and E.M. Robb's property at South Arm. The land covers some 46 acres on both sides of the main highway from Hobart and consists entirely of gently undulating vegetation-tied sand dunes approximately 10 m above sea level. Sections of the property are under orchard and the owners require sufficient subsurface water for irrigation purposes. A dam some 5 m deep in the southern paddock intersected the water table at 4 m and subsequent geophysical investigations were used to establish the depth of the water table elsewhere on the property.

METHODS AND RESULTS

Electrical resistivity and refraction seismic methods were employed. Three 50 m resistivity traverses, using both Wenner and Schlumberger configurations, were laid approximately E-W on the western side of the dam (see fig. 1). Initially, high resistance electrode contacts with the dry sandy soil presented problems, but these were overcome by employing mud-electrodes. Although the resistivity results were generally inconclusive, they were consistent in that all three traverses indicated a rapid decrease in apparent resistivity with depth, suggesting a gradation from dry to wet sand.

Five refraction seismic spreads, each 40 m in length, were located on the property. Three spreads (1-3) were conducted on the southern and two spreads (4, 5) on the northern paddock (see fig. 1). Geophone spacings varying from 2-5 m were designed to indicate the depth of the water table. The following results were obtained:

Spread No.	Layer	Seismic Velocity (m/s)	Layer Thickness (m)	Interpretation
1	1	315	5-6	Dry-damp sand.
	2	1650	?	Saturated sand, or clay.
2	1	320	6	Sand.
	2	1360	?	Saturated sand, or clay.
3	1	240	3	Sand.
	2	1040	?	Saturated sand, or clay.
4	1	380	5	Sand.
	2	1075	?	Saturated sand, or clay.
5	1	400	7	Sand.
	2	1440	?	Saturated sand, or clay.

DISCUSSION

The five seismic spreads show consistent results. Layer 1 velocities are representative of dry sand becoming progressively wetter with depth. It is apparent, however, that the thickness of this layer varies considerably over the property, from at least 3 to a minimum of 7 m. It appears to be thickest in the northern paddock.

The interpretation of layer 2 is uncertain, as the seismic velocities obtained may be representative of saturated sand, impervious clay, or possibly a mixture of both. Although it appears likely that the top of layer 2 represents the water table, the possibility of clay being present instead cannot be overlooked. Resolving of this ambiguity is of prime importance since it greatly affects estimates of groundwater reserves. If layer 1 rests on impervious clay at depths ranging from 3-7 m, reserves may be severely restricted since no fresh water is likely to occur at a greater depth. Alternatively, if clay is absent, more than sufficient fresh water should be available for irrigation. The groundwater present in the dam on the southern paddock was tested for salinity and found to be of excellent quality (350 parts per million of dissolved solids) for this purpose.

To illustrate the problems which may arise if impervious clay layers are present in low-lying coastal sand dunes, a diagram showing possible water table conditions in these areas is shown in Figure 2. Although salt water contamination of excessively pumped and overdeepened bores is often a major problem in such cases, the likelihood of this occurring at South Arm is considered remote.

CONCLUSIONS AND RECOMMENDATIONS

Good quality underground water is apparently present at shallow depths on the property and reserves appear to be sufficient for irrigation. The water table is probably at a greater depth (7 m) in the northern paddock and is close to the surface (3-5 m) in the southern paddock. It is not known with certainty whether sand or clay exist below this level.

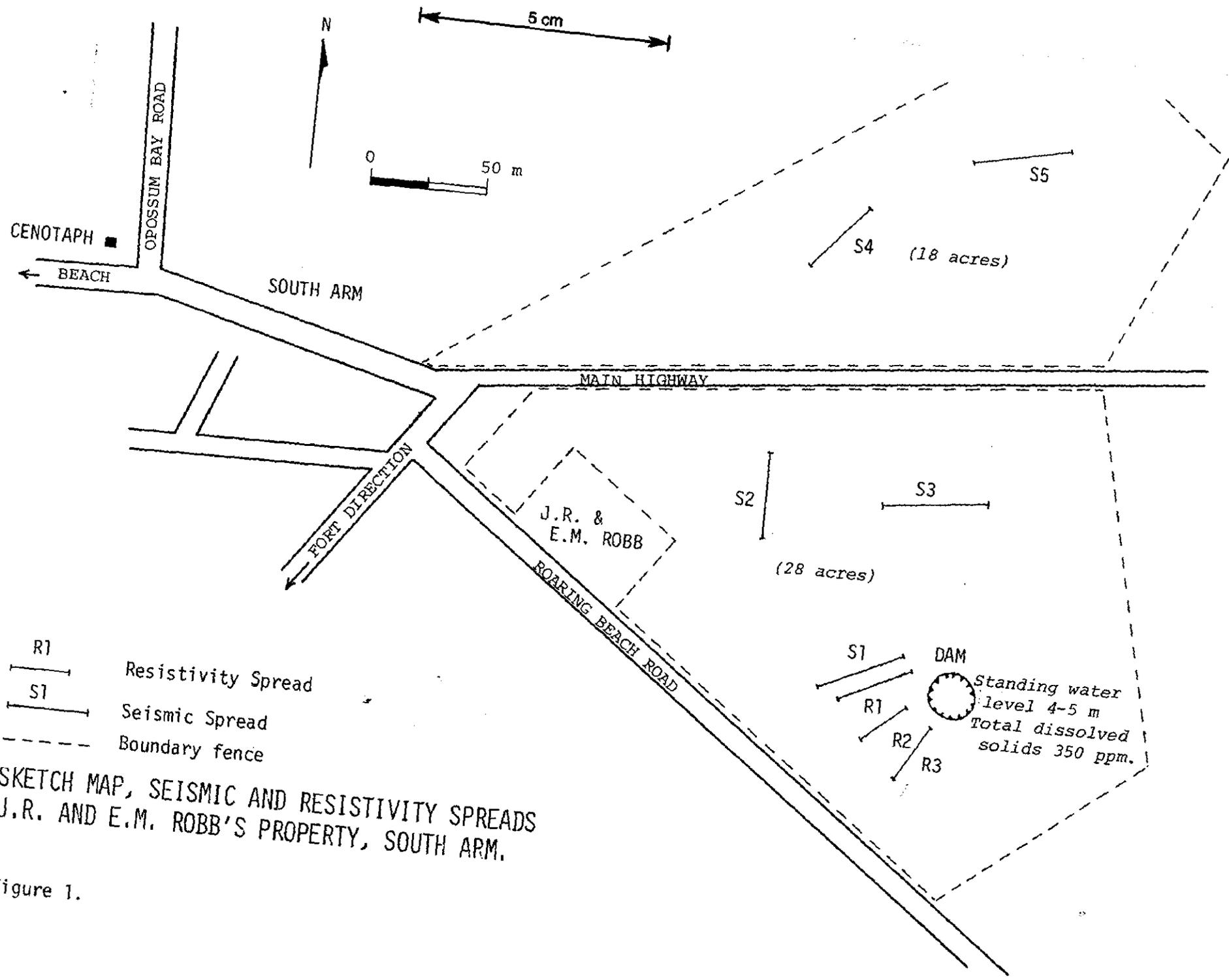
It is essential that an exploratory bore or hand-augered hole be sunk on the property to a depth of 7-10 m, preferably in a low-lying site in the southern paddock. This will demonstrate conclusively the presence or absence of an impervious clay layer and will give an indication of water reserves. It is also desirable to test the water for salinity content.

It may be possible to tap sufficient quantities of water from a small number of such holes, provided that they extend well below the water table and are not pumped at an excessive rate. (It is doubtful whether a single bore will provide sufficient water for irrigation). Pumping small quantities over an extended period (or even continuously) is considered preferable to drawing large amounts over a short time.

Alternatively, it may be possible to tap the water by excavating a dam to a depth below the water table, as is the case with the present dam in the southern paddock, but again it is desirable to employ low pumping rates.

Finally, whether bores or dams are constructed to obtain water, it is essential that any clay layer encountered during boring should not be punctured.

[24 November 1972]



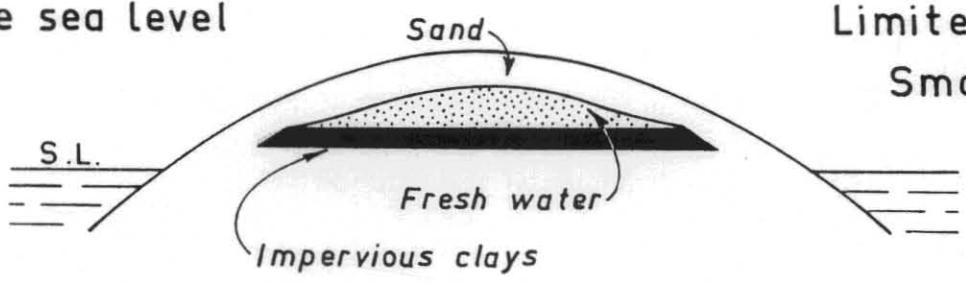
SKETCH MAP, SEISMIC AND RESISTIVITY SPREADS
 J.R. AND E.M. ROBB'S PROPERTY, SOUTH ARM.

Figure 1.

POSSIBLE WATER TABLE CONDITIONS IN COASTAL REGIONS (Diagrammatic)

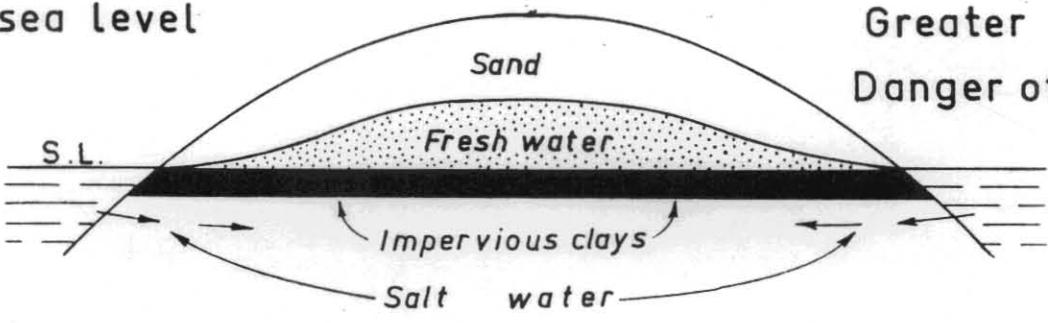
Geologist : W.C.CROMER (Engineering Section)

a) Clay above sea level



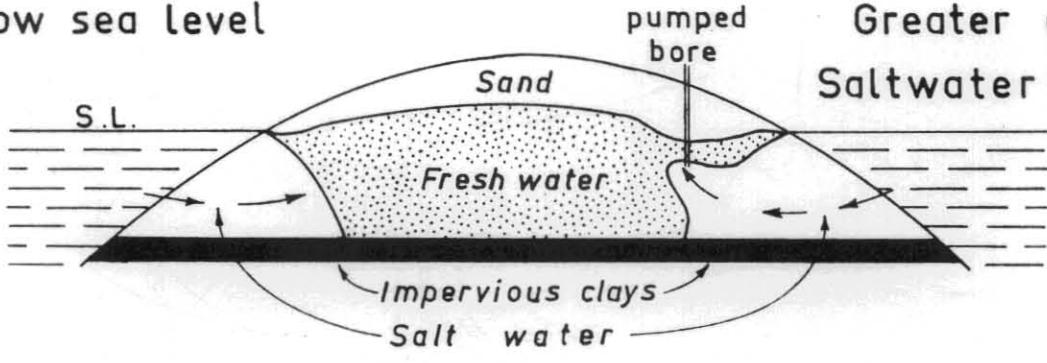
Limited drawdown
Small reserves

b) Clay at sea level



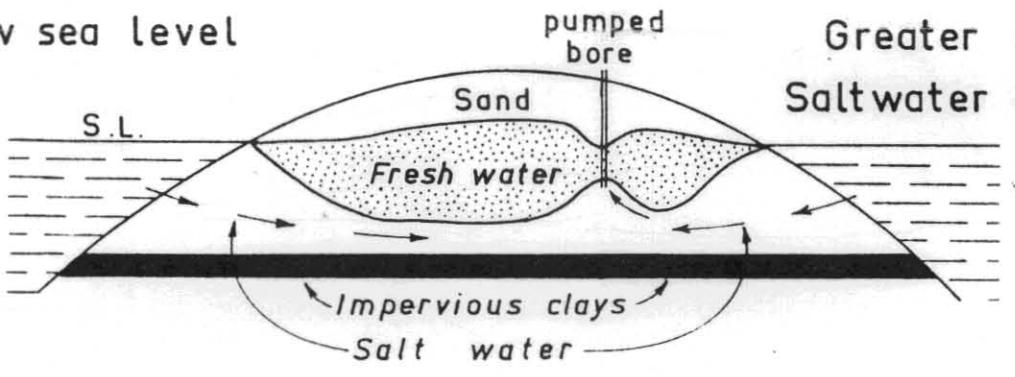
Greater drawdown
Danger of puncture

c) Clay below sea level



Greater drawdown
Saltwater intrusion

d) Clay below sea level



Greater drawdown
Saltwater intrusion

Figure 2.

Drawn : P.J. Donnelly