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1981/32. Progress report - St Helens bar evaluation

D.E. Leaman

Abstract

All geophysical work near the mouth of Georges Bay near St Helens has been collated. Initial work and recommendations for future work in the region of the bay mouth sand bars are described and a coupling of seismic and gravity methods is suggested for future exploration.

INTRODUCTION

The Department of Main Roads has requested occasional surveys of the sand bar - bay mouth of Georges Bay over the past decade. It has also sought the results of any teaching - demonstration surveys undertaken by the University of Tasmania. Such surveys have provided a patchy assessment of the overall structure and sand distribution in the region - a distribution which changes, often dangerously for fishermen, with time. Results of early surveys have been treated tentatively and any training wall construction has been managed by small increments in order to minimise any risk of a catastrophic change in water flow - sand movement conditions. Careful observations have followed each stage of construction and water depth is regularly monitored.

However, it is evident that any decision for future development of the channel, control of sand or movement of facilities must be based on much information. Critical pieces of information are the total volume of sand in circulation (a closed system is implied) and the volume of sand which could be eroded and added to current circulation by incorrect placement of walls. The Department of Mines was asked to carry out a long term survey with the aim of assessing sand volume onshore, sand volume below high water level, and the distribution of rock outcrops. Accessory to these requests was the need to define regions where rock was exposed or occurred at shallow depth.

The seismic refraction method was the obvious choice and has been used in all surveys to date. Unfortunately few details are available for all previous work and it is not possible to accurately compare velocities, depths, or locations. The available data is often conflicting in terms of depth estimates and it was therefore decided to note only that a range of sand thicknesses from three to twenty-one metres had been recorded, being thickest east of the training wall. It was decided to cover the entire area systematically with a new survey, with all results reported. This report describes the initial stage of that survey.

SURVEY 1

Twenty-one refraction seismic spreads were fired in the region of the beach and first bar immediately east of the training wall (see fig. 1).

The results are summarised and tabulated below and structure contours for the interpreted sand/rock interface are shown in Figure 2.

Spread no.	Velocity distribution (m/s)	Interpretation
1	1600/2400	~37 m sand
2	1500-1650/2250-2300/4500-7000	26-40 m sand, some clay?
3	1500-1700/5000-6000	37-48 m sand
4	1650/1850-1950/2800-3000/4500-6000	<42 m sand, clay present
5	1450/1650/3000-4500/6000	13-33? m sand
6	1000/1500/2250/3750-4100/6000	1-10 m sand
7	1500/2200/3400-6000	0-10 m sand
8	1500/1600/3300-6400	1.5-7 m sand
9	1600/2000/3400-6000	3-11 m sand
10	1500/2250/3300-6000	1-7 m sand
11	1000/1500-1650/2300/3300-6000	5-20 m sand
12	1200/1600/3600-6000	4-17 m sand
13	1500/4500-6000	4.5-8 m sand
14	1000/1800/4000-6000	1.5-7.5 m sand
15	~1000/2000/3300-6000	3-10 m sand
16	1200/~1800/3300-6000	<10 m sand
17	1200/1500/3000-4800	<10 m sand
18	1000/1500/6000) 1450/3300/4500)	<17 m sand
19	1500-1650/4200-6500	35-45 m sand
20	1500/6000	2-20 m sand
21	1000/1500/3300-5000/6000+	<25 m sand

The velocities have been interpreted as follows:

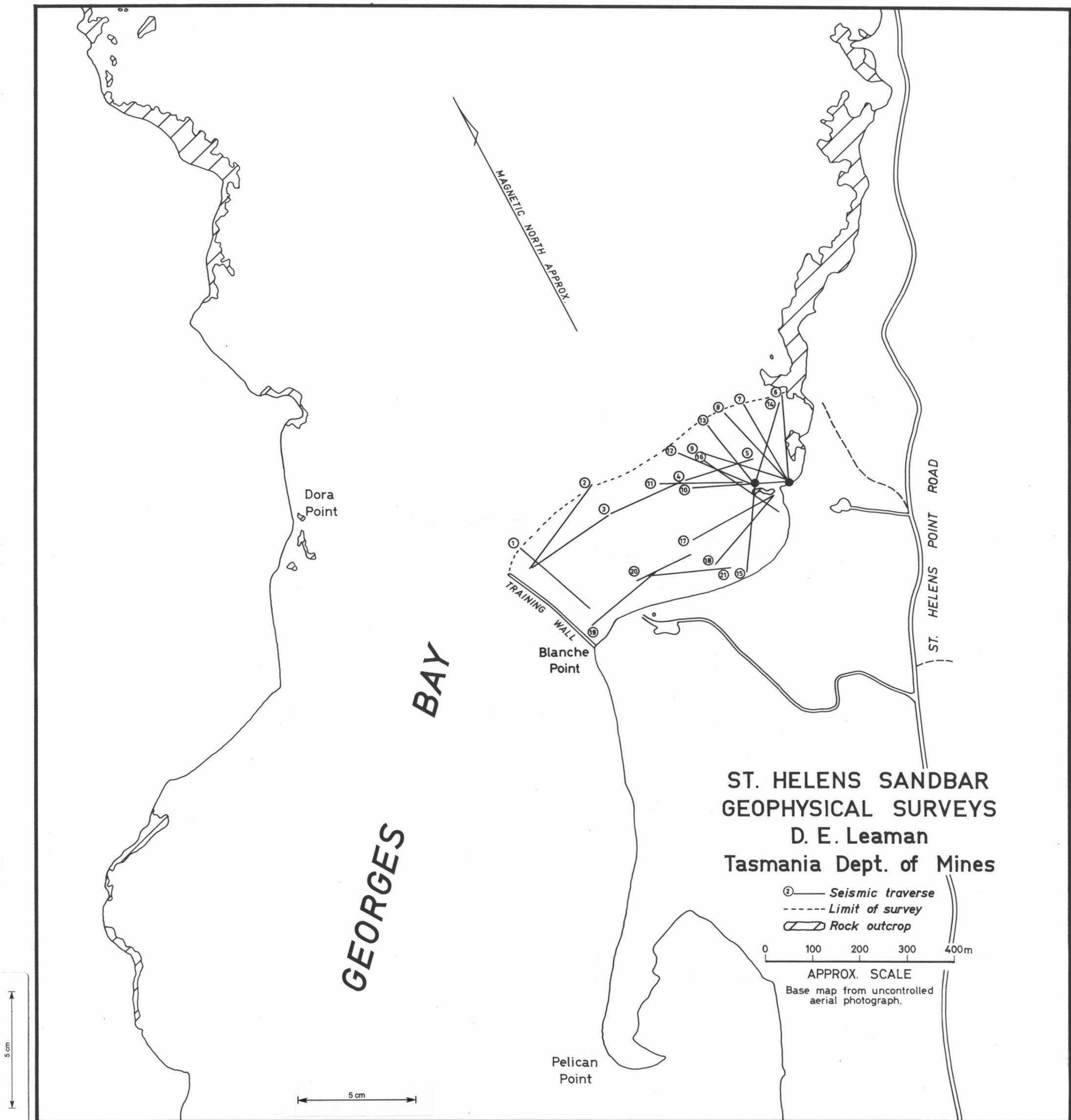
- (1) <1400 m/s Sand, at least partly aerated. Dry sand is typically 1000-1100 m/s.
- (2) 1400-1650 m/s Sand, saturated and slightly packed.
- (3) 1800-2000 m/s Sandy-clay, clay. Possibly weathered rock. Rock at this site is always a granite variant.
- (4) 2300-3300 m/s Weathered rock.
- (5) >3300 m/s Fractured, slightly weathered rock. Values greater than 4500 m/s imply massive rock with minimal weathering along a few joints.

Thus the interpretation integrated in Figure 2 is based on velocities less than 1650 m/s for sand (wet and dry). The interface between the 1600 m/s 'layer' and those below it is quite sharp and the interpretation is likely to be sound. However, interpretations directed at depth to firm bedrock are more uncertain due to the velocity gradation through, in many cases, a substantial but variable weathered zone.

Consequently no attempt has been made to provide an integrated interpretation of rock (>3300 m/s) at this stage. However, a review of the velocity profiles will show that, in many cases, rock in good condition directly underlies the sand. This is, of course, evident along the shoreline.

The first stage of the survey has located a major accumulation of sand east of the training wall. The areal extent of this deposit may be most economically evaluated using gravity methods. Anomalies up to 1 mgal may be expected.

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**ST. HELENS SANDBAR
GEOPHYSICAL SURVEYS
D. E. Leaman
Tasmania Dept. of Mines**

- ② — Seismic traverse
- Limit of survey
- ▨ Rock outcrop

0 100 200 300 400m

APPROX. SCALE

Base map from uncontrolled
aerial photograph.

Fig 1.

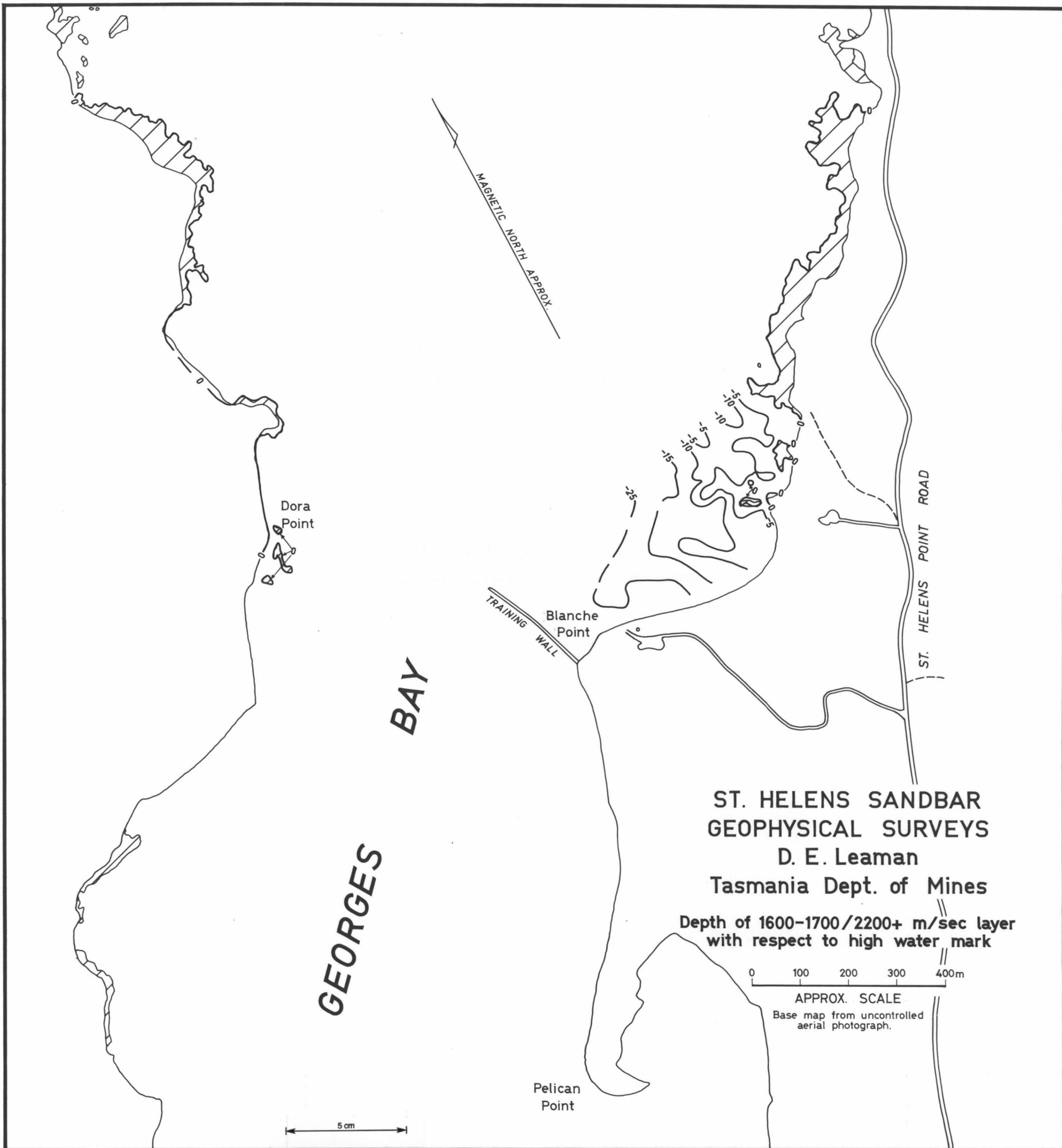


Fig 2.