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16. Gravity survey of the Devonport-Port Sorell-Sassafras area.

W.C. Cromer

Previous regional gravity surveys in northern Tasmania (Longman and Leaman 1971; Leaman *et al.*, 1971) delineated large negative anomalies associated with Tertiary structural troughs. Leaman (1973) extended the coverage to the Devonport-Port Sorell area and showed that anomalies of 13 and 6 mgal were related to the Wesley Vale and Port Sorell basins respectively. Both contain a thick Tertiary succession of sediments and basalts (Burns, 1965; Gee and Legge, 1974). Leaman correlated the gravity data with logs of oil bores drilled in the Port Sorell basin and concluded that the structures were probably fault controlled troughs. The bores established a Tertiary sequence 350 m thick, and assuming the absence of a substantial thickness of basalt in the adjoining Wesley Vale basin, Leaman arrived at a minimum thickness of 450-500 m. However, recent drilling near Wesley Vale has proved the existence of a Tertiary succession 365 m thick, including the presence of 140 m of basalt (Cromer, 1977). This implies a basement depth considerably greater than 500 m.

EXTENDED SURVEY

Burns (1965) suggested that a deep lead system extended north through Northdown from the Wesley Vale basin. Leaman's (1973) gravity data supported this hypothesis, although his coverage did not include the 12 km stretch of coastline from East Devonport to Point Sorell, and the existence of the deep lead system remained unestablished. The structural closure or otherwise of the Wesley Vale basin may have significant hydrological implications, and as the whole region is at present the subject of a regional groundwater investigation it appeared judicious to conduct a coastal gravity survey along Pardoe, Moorland and Northdown Beaches.

The gravity data also suggested that a third trough existed north of Sassafras, and that it may represent a southward continuation of the Wesley Vale basin. A broad basement saddle separated it from the adjacent Port Sorell basin. A detailed survey (which was later extended south to Sassafras) was thus conducted to elucidate the structure.

SURVEY DETAILS

Seventy-two stations (2000-2071 on fig. 41) were added to those previously established by Longman and Leaman (1971) and Leaman (1973). Twenty-four stations were situated along the coast between East Devonport and Point Sorell, and the remainder in the Sassafras-Harford area. The coastal stations were accurate to 50 m in latitude, and were not terrain corrected. Those near Sassafras were accurate to 50 m in latitude and 2 m in altitude, and were terrain corrected to a radius of 19 km. The accuracy is thus comparable to previous surveys.

The local base station for the entire survey was station 2028 (fig. 41) at the junction of the Harford and East Sassafras roads. This corresponds to Leaman's (1973) principal tie-station 6751.0586, where the observed gravity is 9802711.4 $\mu m/s^2$.

The survey was conducted during the period 12-13 December 1972, using Worden meter 273 (scale constant 0.937 $\mu m/s^2$. div.)

INTERPRETATION

A density of 2670 kg/m^3 was used to reduce the observed gravity. The residual Bouger anomaly and the generalised basement geology are presented in Figure 42.

Coastal area

Steep gradients along Northdown Beach demonstrate the absence of a major outlet and indicate that the Wesley Vale basin was apparently land-locked by a fault-bounded northern margin. The generally smooth contours preclude the possibility of all but a small-scale outlet.

Sassafras area

The extended survey verified the presence of a third structure, here termed the Sassafras basin, north-east of the township. It is comparable in area and depth to the Port Sorell basin, but considerably smaller than the Wesley Vale basin. A recent deep bore drilled by the Department of Mines 3.5 km north of Sassafras established the presence of 330 m of Tertiary sediments and basalts (Cromer, 1977).

The survey failed to clarify the relationship between the Sassafras basin on one hand, and the Wesley Vale and Port Sorell structures on the other. All three are separated by a broad shallow basement saddle west of Harford. However, the lower Tertiary sequence in each is very similar and it is apparent that the basement saddle was overtopped and buried at an early stage in deposition.

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[17 September 1975]

DEVONPORT – PORT SORELL – SASSAFRAS GRAVITY SURVEY

LOCATION OF GRAVITY STATIONS

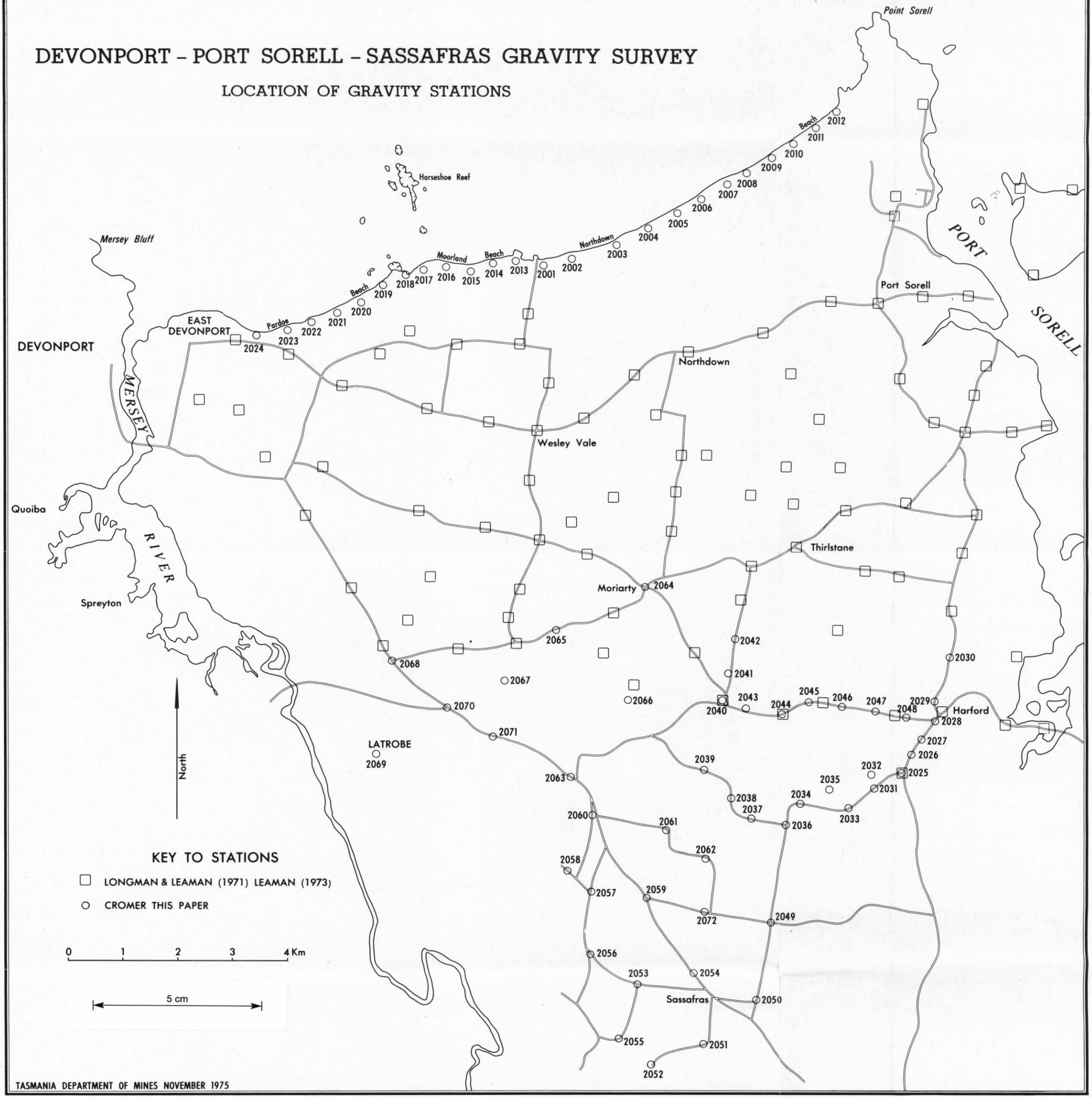

FIGURE 41

TR20_139_140

DEVONPORT - PORT SORELL - SASSAFRAS GRAVITY SURVEY

RESIDUAL BOUGUER ANOMALY

CONTOUR INTERVAL 10μm/s²

TERRAIN CORRECTION r-19km

p-2670kg/m³

W.C. CROMER

Horseshoe Reef

Point Sorell

Mersey Bluff

DEVONPORT

EAST DEVONPORT

Pardoe Beach

Moorland Beach

Northdown Beach

Port Sorell

PORT SORELL

WESLEY VALE BASIN

Northdown

Wesley Vale

Moriarty

Thirlstane

SORELL BASIN

Harford

Quoiba

MERSEY

Spreyton

LATROBE

RIVER

SASSAFRAS BASIN

Sassafras

0 1 2 3 4 5 Km

N

Jurassic Dolerite

Permian sediments

GEOLOGY : After Burns (1963), Gee & Legge (1971), Jennings et al (1959) & Gulline (1973).

GRAVITY DATA : From Leaman (1973) & Cromer (this paper).

5 cm

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FIGURE 42

TR20-139-140