

1985/57. Seismic and gravity surveys in the New Henbury area near Avoca

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Abstract

Three reversed seismic refraction spreads and a set of gravity readings along the seismic lines showed that the alluvial sediments vary in thickness from zero near the New Henbury tin mine to approximately 70 m near the South Esk River.

INTRODUCTION

At the request of V.M. Threder of the Economic Geology Section, the seismic refraction and gravity methods were used to determine the depth of the alluvial sediments in the New Henbury area of the South Esk River valley [EP660790]. Three reversed refraction spreads were recorded and interpreted using the reciprocal method (Hawkins, 1961). A 15 m geophone interval was used for Spread 1 and a 30 m geophone interval was used for Spreads 2 and 3. The northern end of Spread 1 (fig. 1) was located on granitic outcrop.

The gravity value was measured at each geophone position and corrected to a uniform height datum using a Bouguer density of 2.67. This corresponds to a correction of 0.197 mgal per metre. No terrain or latitude corrections were made.

RESULTS

Figure 2 shows the gravity anomaly, the ground surface and the base of the alluvial sediments as shown by the seismic refraction data.

The velocities and depths based on the critical distance formula are as follows for each spread:

Spread 1

15 m geophone spacing

End shots 15 m north of geophone 1 and 15 m south of geophone 24.

$V_1 = 1650$ m/sec

V_2 (northern end) = 7140 m/sec

V_2 (southern end) = 4080 m/sec

Depth from centre shot 11-16 m

Depth from south end shot 39 m

The differing V_2 velocities and a sudden reduction in arrival amplitudes near the centre of Spread 1 suggest that there is a fault near this point, with granite shallowing to the north on the northern side and a different rock type (probably Mathinna Beds) deepening to the south.

Spread 2

30 m geophone spacing

End shots 30 m north of geophone 1 and 30 m south of geophone 24.

$V_1 = 1610$ m/sec

$V_2 = 5160$ m/sec

Depth from centre shot 63 m

Depth from north end shot 40 m

Depth from south end shot 75 m

Spread 3

30 m geophone spacing

End shots 30 m north of geophone 1 and 30 m south of geophone 24

Long shots 230 m north of geophone 1 and 230 m south of geophone 24

Geophone 1 of Spread 2 is in the same position as geophone 12 of Spread 2.

V₁ = 1580 m/sec

V₂ = 5000 m/sec

Depth from centre shot 60-62 m

Depth from north end shot 72 m

Depth from south end shot 72 m

The position of the base of the alluvial sediments was then calculated from the data of all three spreads using the reciprocal method. The uncertainty in depth is no more than ±10%.

The gravity traverse shows a steep increase in values to the north of the inferred fault, but then remains almost flat until the base of the alluvial sediments starts to shallow at the southern end of the line. The normal increase in gravity value with increasing latitude is counteracted by the deepening of the base of the alluvial sediments.

REFERENCE

HAWKINS, L.V. 1961. The reciprocal method of routine shallow seismic refraction investigations. *Geophysics* 26:806-819.

[29 October 1985]

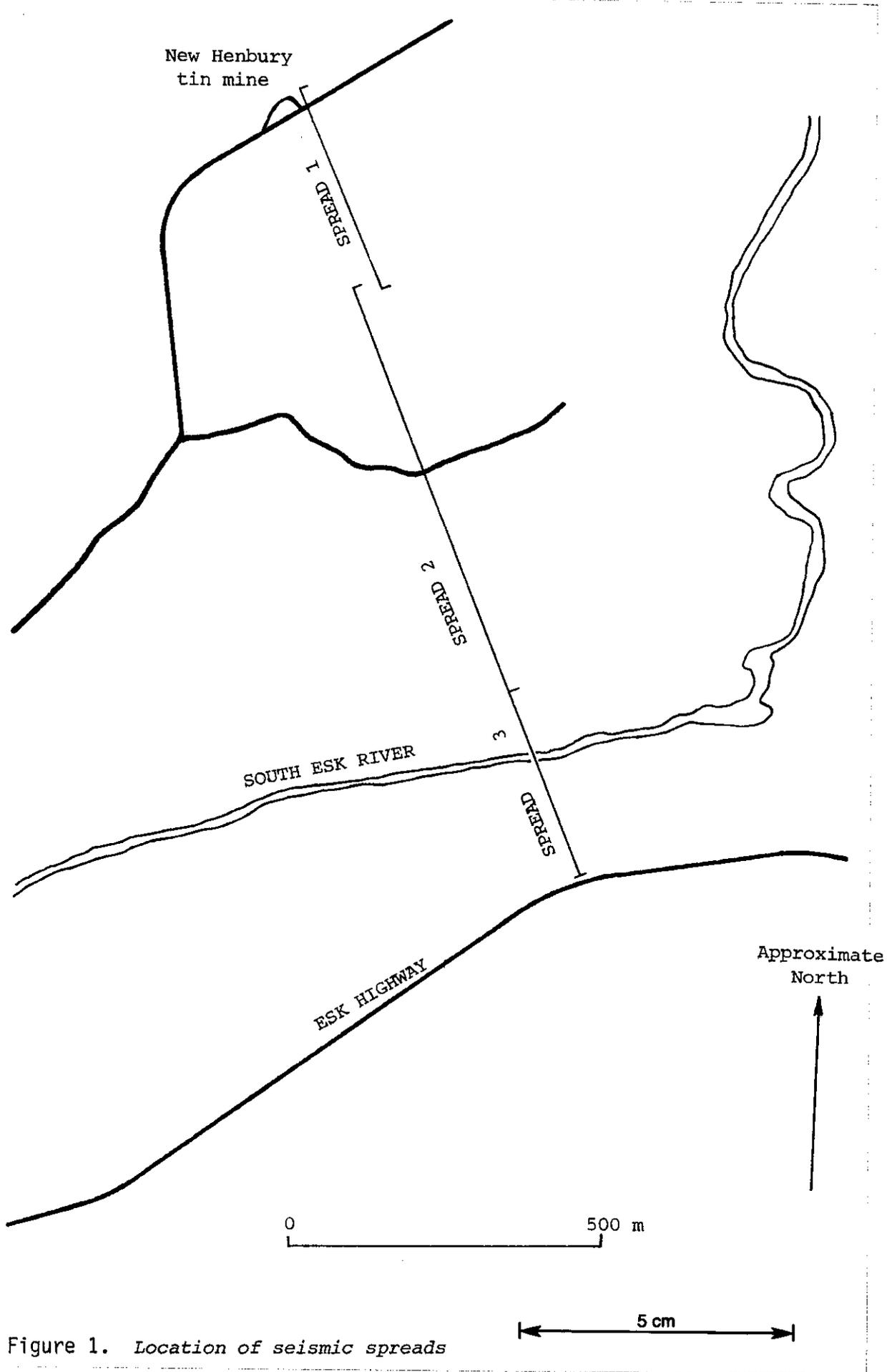
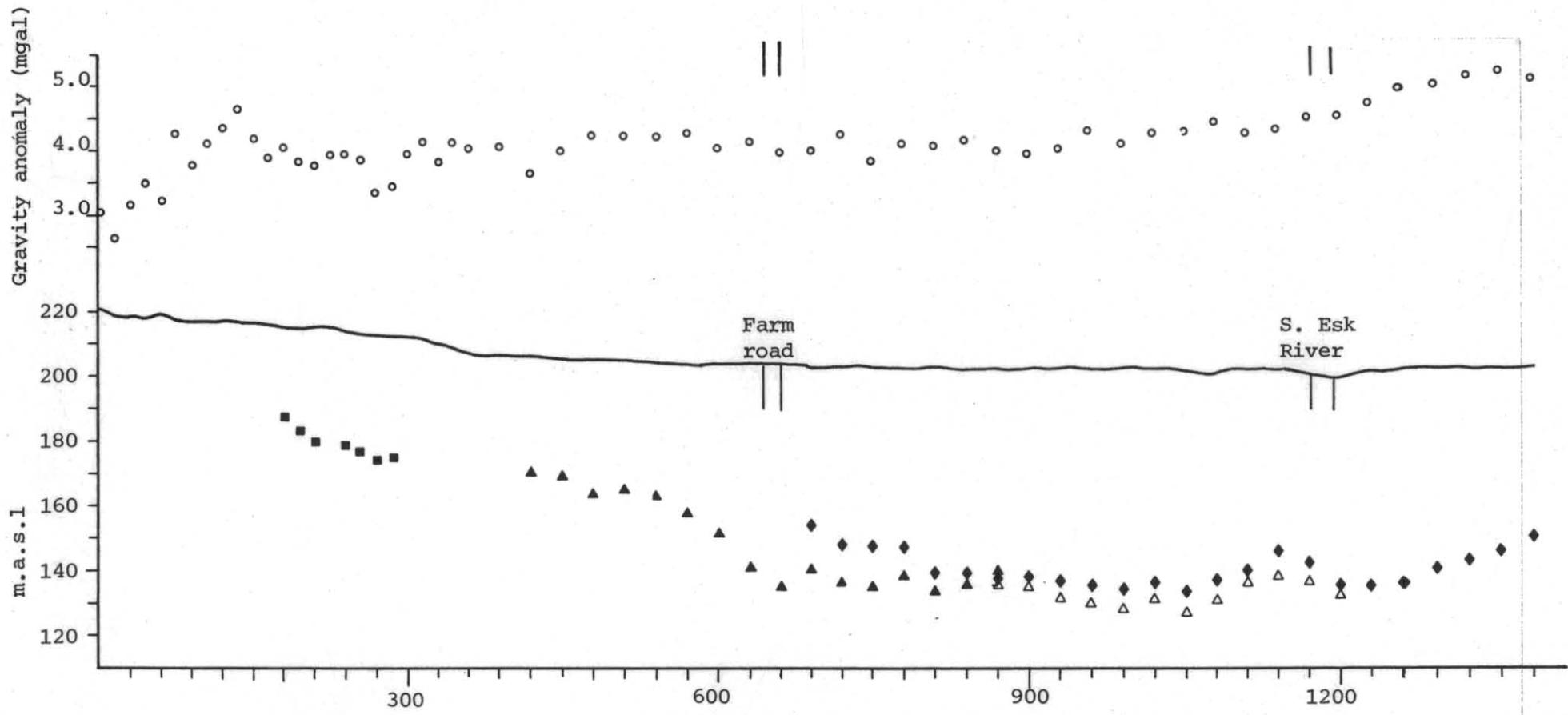


Figure 1. Location of seismic spreads

57-4



Base of alluvial sediments from:

- Spread 1 end shots
- ▲ Spread 2 end shots
- △ Spread 3 end shots
- ◆ Spread 4 long shots

5 cm

Figure 2. Gravity and seismic profiles