1977/5. Seismic survey at Swain Creek, north-east Tasmania.

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A seismic survey covering a flat marshy area drained by Swain Creek [EQ829564], east of the Ringarooma River, was undertaken to establish if the Tertiary sediments present beneath the plain were thick and extensive enough to warrant a drilling investigation programme for alluvial tin.

Granite crops out on the ridges bordering the flats while a thin veneer of probable Tertiary sediments occurs along the margin. Exploration drilling and tin sluicing pits near the Ringarooma River, west of the area investigated, indicate that the cover of Tertiary sediments is thin.

SEISMIC RESULTS

Seven spreads with a geophone spacing of either 7.6 or 15 m were fired. The shot points of each spread were overlapped so that the spreads formed a traverse which started and finished close to granite outcrops.

The velocity layers found in each seismic spread, plus the calculated depth to the interfaces of these velocity layers and a geological interpretation is given in Table 1. Unfortunately, some of the seismic records were of a low quality owing to the malfunction of the equipment in wet conditions, but overall, the results do not warrant returning to the area for refiring.

The greatest calculated thickness of possible Tertiary sediments (V <1800 m/s) is 17.4 m at the north-east end of Spread 2. This thickness is exaggerated: when firing from a mid shot point towards the north-east end of the spread, a slow surface layer (V = 610 m/s) is present and the calculated depth to the granite is reduced to between 9.1 and 11.9 m. This slow surface layer is not visible when firing is at a distance of 30 m at the north-east end of the spread.

A thicker layer up to 10 m thick (V = 1500 m/s) occurs on Spreads 2 and 7 and on the south end of Spread 3. This layer illustrates the difficulty of interpreting seismic velocities in a layered weathered granite/Tertiary sediment situation. Hard unweathered granite with V >3000 m/s is usually overlain by a layer of weathered granite (V = 1800-3000 m/s) followed by decomposed granite with V <1800 m/s. This latter velocity overlaps the velocity range for Tertiary sediments in north-eastern Tasmania.

If the intermediate velocity range (V = 1800-3000 m/s) appears frequently in an area being seismically surveyed, it is possible to generalise that the 1500-1800 m/s layer, where present above the 1800-3000 m/s layer, is likely to be composed of deeply weathered and decomposed granite rather than Tertiary sediment, particularly if this intermediate velocity layer has no obvious pattern and is patchy in its distribution as at Swain Creek. It is possible to interpret the layer as a slope on a Tertiary/granite interface or, as appears to be more likely in this zone, a localised deeper area of weathering in the granite.

CONCLUSIONS

From the seismic results obtained at Swain Creek, there appears to be no extensive area of thick Tertiary sediments. The only area where a thicker slow layer does occur is in Spreads 2 and 7 and the south end of Spread 3, where calculated thicknesses in excess of 10 m occur. Most of this slow material is likely to be deeply weathered and decomposed granite rather than

Tertiary sediment. Under these circumstances the seismic results do not appear to warrant the cost of any further investigation by drilling.

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Table 1. *SEISMIC RESULTS, SWAIN CREEK.*

Spread	Direction	Length of spread (m)	Geophone spacing (m)	Velocity layers (m/s)	Calculated depth to interface (m)	Shape of time velocity plot	Geological interpretation	Remarks
1	NE-SW	145	7.6	V_0 = 915 V_1 = 3050-3810 V_2 = 4870-7620 *Mid SP* V_0 = 610 V_1 = 1525-1830	V_0/V_1 = 7.6-9.1 V_1/V_2 = 21.3-25.9 V_0/V_1 = 3.9-5.2	Very large step 61 m from SW end of spread.	V_0 - Recent fine grey sand and quartz. Tertiary gravel, sand and clay. V_1 (1525-1830 m/s) - Deeply weathered granite, possibly Tertiary sediments. V_1 (3050-3810 m/s) - Unweathered granite. V_2 - Hard granite.	No intermediate 1520-1830 m/s layer except on mid SP firing. Indicates layer is thin, little thickness of Tertiary sediments.
2	NE-SW	145	7.6	*NE Shot point* V_0 = 1220-1525 V_1 = 3810-4570 V_2 >6100 *SW shot point* V_0 = 1525 V_1 = 4570 V_2 >6100 *Mid SP (NE)* V_0 = 610 V_1 = 1830 V_2 = 3050-3810 *Mid SP (SW)* V_0 = 610 V_1 = 1830 V_2 = 3810	V_0/V_1 = 14.6-17.4 V_1/V_2 = 27.4-29.3 V_0/V_1 = 12.2-14.6 V_1/V_2 = 31.7 V_0/V_1 = 3.3-4.3 V_1/V_2 = 9.1-11.9 V_0/V_1 = 3.6-4.6 V_1/V_2 = 7.9-9.1	Strongly assymetrical with V_0 layer thicker at NE end of spread.	V_0 (610 m/s) - Superficial surface layer Tertiary sediment. V_0 (1220-1830 m/s) - Tertiary sediments, weathered and decomposed granite. V_1 - Hard granite V_2 - Extremely hard granite.	3-5 geophones did not record except on Mid SP firing.
3	N-S	205	7.6	*SP North* V_0 = 610 V_1 = 1525 V_2 = 3050-3810	V_0/V_1 = 3-4.3 V_1/V_2 = 20.1-22.9	Assymetrical with thicker V_0 layer at south end V_0/V_1 interfaces slope to the south.	V_0 (610 m/s) - surface sand and gravel. V_1 (1220-1525 m/s) - Tertiary sediments, deeply weathered and decomposed granite. V_2 - Unweathered granite.	V_1 = 1525 m/s probably Tertiary sediment. V_1 = 2290 m/s probably weathered granite.

Table 1. *(continued)*

Spread	Direction	Length of Spread (m)	Geophone spacing (m)	Velocity layers (m/s)	Calculated depth to interface (m)	Shape of time velocity plot	Geological interpretation	Remarks
3	N-S	205	7.6	*SP South* V_0 = 1220 V_1 = 2290 V_2 = 3810-4570	V_0/V_1 = 11.6-13.4 V_1/V_2 = 26.8-28.6			
4	N-S	145	7.6	V_0 = 1220-1525 V_1 = 2290-2400 V_2 >6100 *Mid SP South* V_0 = 760 V_1 = 2290 Artificial V_2 = 4570 *Mid SP North* V_0 = 760 V_1 = 2290 V_2 = 4570	V_0/V_1 = 3.9-8.2 V_1/V_2 = 24 V_0/V_1 = 4.0-5.2 V_1/V_2 = 15.5-17.1 V_0/V_1 = 3.3-4.0 V_1/V_2 = 9.7-11.6	Assymetrical with large step down from geophone 9, north end. Surface layer shallows to north.	V_0 - Tertiary sediment. V_1 - Weathered granite. V_2 - Hard granite.	Mid SP velocities more reliable. V_1/V_2 more likely to be 10-15 m deep. Mainly weathered but consolidated granite.
5	E-W	228	15	V_0 = 1160-1370 V_1 = 3050-3810 V_2 >6100 *Mid SP* V_0 = 790-850 V_1 = 2590-3050	V_0/V_1 = 5.8-12 V_1/V_2 Not calculated V_0/V_1 = 4.8-7.3	Very stepped. Four geophones did not record.	V_0 - Superficial sand, possibly some Tertiary sediment and weathered granite. V_1 - unweathered granite.	
6	N-S	145	7.6	V_0 = 1525-1675 V_1 = 3810 V_2 = 5485-7620	V_0/V_1 = 8.5-9.4 V_1/V_2 = 21.9-24.3	Strongly assymetrical and very stepped. Results not reliable.	V_0 - Superficial sand, possibly some thin Tertiary sediment. V_1 - Hard granite.	V_1 values averaged from stepped graph.
7	NE-SW	145	7.6	V_0 = 1370-1525 V_1 = 4570-7620	V_0/V_1 = 11.6-14.3	Very stepped and irregular with high V_1 velocities.	V_0 - Tertiary sediments and weathered granite. V_1 - Hard granite.	No surface layer recorded.