TR18_28_31

4. A radioactive anomaly in central northern Tasmania (E.L. 14/73).

P.L.F. Collins

An area of anomalous radioactivity within Tasminex N.Ls exploration licence E.L. 14/73 was visited on 20 November 1973 in the presence of the company's prospector.

The anomalous area [38/977892] is situated on steep hill slopes forming the southern bank of the Lea River in central northern Tasmania (fig. 7); and is readily accessible by logging roads which leave the Cradle Mountain road at the eastern end of the Middlesex Plains. A brief inspection was also made at a second area of interest which is situated approximately 1.5 km east of Leary's Corner, where the Cradle Mountain road crosses the Iris River [38/964832].

LEA RIVER ANOMALY

Previous work undertaken by Tasminex N.L. included geochemical sampling and reconnaissance scintillometer surveys. The geochemical sampling indicated anomalous radon in the water in a creek flowing north-east to the River Lea (fig. 7); and high uranium and thorium values of 0.025% U and 0.95% Th were obtained in a single rock sample which was described by Cooper (1973) as a silicified rock formed by the replacement of limestone. It would appear that, from the petrographic description of this rock (Cooper, 1973), the high uranium and thorium values are probably due to monazite which commonly contains 4-12% ThO_2 and up to 30% ThO_2 in the variety cheralite (Deer *et al.*, 1966).

A scintillometer survey over the area surrounding this rock sample revealed a rather small anomaly, of the order of 30 m in diameter.

Geology

The anomalous area is situated within Cambrian quartz and quartz feldspar porphyries which are unconformably overlain by Ordovician conglomerates, with Tertiary basalt blanketing much of the surrounding areas (Barton, C.M. *et al.*).

The Cambrian sequence appears to be dominated by quartz porphyry lavas (*e.g.* 73-658*) consisting of rounded quartz phenocrysts 0.5-5 mm in diameter in an aphanitic groundmass. Within this lava sequence is a sheared tuffaceous unit which consists of quartz crystals and lithic fragments in a siliceous matrix (73-659). Although it was indicated that the sample containing the high uranium and thorium values was from within this tuffaceous unit, a silicified rock which could have formed from the replacement of limestone was not observed.

Apart from the opaque minerals, there were no other minerals observed in thin sections of either the lava (73-658) or the tuff (73-659) which could readily account for radioactivity.

Filling fractures within the lavas are several quartz veins up to one metre wide which had previously been prospected by means of trenches, two adits and a shallow shaft, but only one of these veins contains significant quantities of pyrite, chalcopyrite and possibly some cobaltite (fig. 7).

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*Detailed descriptions of the specimens referred to in the text are given in Appendix 1.

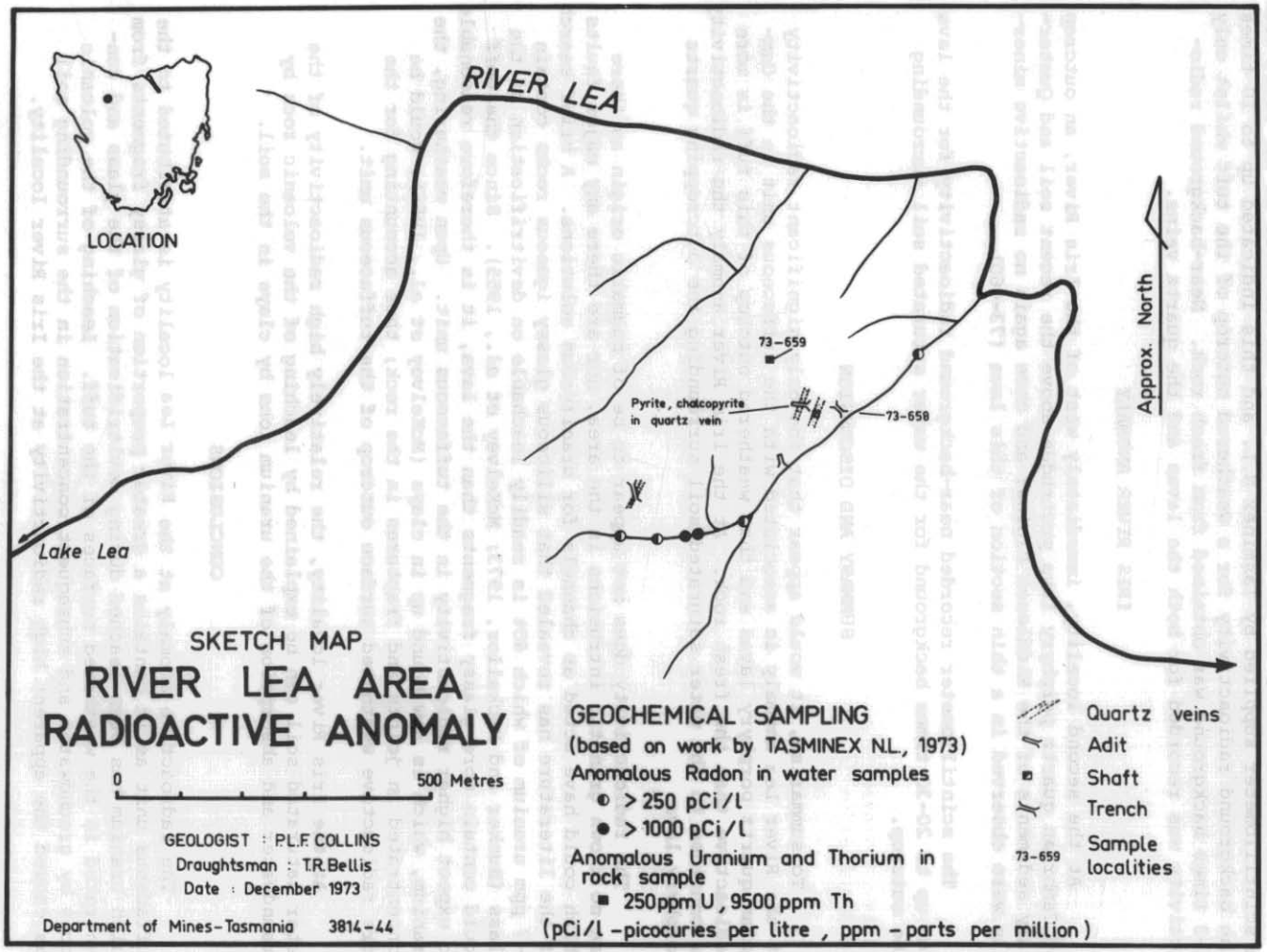
RIVER LEA
LOCATION
Lake Lea
73-659
Pyrite, chalcopyrite in quartz vein
73-658
Approx. North
SKETCH MAP
RIVER LEA AREA
RADIOACTIVE ANOMALY
0
500 Metres
GEOLOGIST : P.L.F. COLLINS
Draughtsman : T.R.Bellis
Date : December 1973
Department of Mines-Tasmania 3814-44
GEOCHEMICAL SAMPLING
(based on work by TASMINEX N.L., 1973)
Anomalous Radon in water samples
> 250 pCi/l
> 1000 pCi/l
Anomalous Uranium and Thorium in rock sample
250ppm U, 9500 ppm Th
(pCi/l - picocuries per litre, ppm - parts per million)
Quartz veins
Adit
Shaft
Trench
73-659
Sample localities

Figure 7.

5 cm

Scintillometer

The radioactivity of the tuffaceous unit was measured in the field with a scintillometer supplied by Tasminex N.L. and this indicated up to 10 times the background radioactivity for a weathered outcrop of the tuff whilst only 2-3 times background was obtained from fresh rock. Near-background radioactivity was recorded for both the lavas and the quartz veins.

IRIS RIVER ANOMALY

At the second locality, immediately west of the Iris River, an outcrop of Cambrian quartz porphyry lava protrudes above the recent soil and Quaternary sediments of the Middlesex Plains; and once again no radioactive minerals were observed in a thin section of this lava (73-660).

The scintillometer recorded near-background radioactivity for the lava but up to 20-30 times background for the water saturated soil surrounding the outcrop.

SUMMARY AND DISCUSSION

To summarise, it would appear that the only significant radioactivity at the River Lea anomaly is associated with the tuffaceous unit in the Cambrian quartz porphyry lavas and that weathered outcrop of this tuff is more radioactive than the fresh rock. At the Iris River anomaly the radioactivity is confined to the water saturated soil surrounding the outcropping quartz porphyry lava.

The radioactivity does not appear to be of magmatic origin as there are no known granitic intrusions in the area, nor are there any major faults which could have acted as channels for uraniferous solutions. A brief search of the literature has revealed that siliceous glassy igneous rocks contain 6-7 ppm uranium of which 40% is readily leachable on devitrification of the glass (Bunker and Mackallor, 1973; McKelvey *et al.*, 1955). Since the tuff would contain more glassy fragments than the lava, it is therefore reasonable to expect higher radioactivity in the tuffaceous unit. Upon weathering, the uranium, which is now bound up in clays (McKelvey *et al.*, 1955), would be concentrated in joints and fractures in the rock; thus accounting for the more radioactive weathered surface outcrop of the tuffaceous unit.

At the Iris River locality, the relatively high radioactivity of the water saturated soil can be explained by leaching of the volcanic rock by groundwater and absorption of the uranium ions by clays in the soil.

CONCLUSIONS

The radioactive anomaly at the River Lea locality is attributed to the tuffaceous unit as it contains a greater proportion of glassy fragments from which uranium has been leached during devitrification of the glass and concentrated in the weathered surfaces of the tuff. Leaching of the volcanic rocks by groundwater and subsequent concentration in the surrounding soil has caused the apparent high radioactivity at the Iris River locality.

Therefore, the apparent anomalous radioactivity at both localities is due to secondary surface enrichment of uranium-bearing minerals, which has resulted from weathering and leaching of volcanic rocks originally containing very low concentrations of uranium.

REFERENCES

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APPENDIX 1

Petrographic descriptions of Cambrian quartz porphyry lavas and tuffs.

73-658. [38/978895]. Quartz porphyry lava.

A cream to light brown rock consisting of rounded quartz phenocrysts in an aphanitic groundmass. In thin section the phenocrysts are subhedral with well rounded corners and range from 0.5-5 mm in diameter. Embayment of the phenocrysts by the cryptocrystalline groundmass is common. Quartz microveins are prominent in the groundmass and can be traced through the phenocrysts along lines of silica alteration. The phenocrysts comprise 40-50% of the rock.

73-659. [38/977892]. Sheared, crystallo-lithic tuff.

The light grey-green rock contains quartz phenocrysts and green lithic fragments in a siliceous matrix. The rock has been sheared and contains bands of disseminated sulphides, and irregular elongate patches of chlorite.

In thin section the rock consists of approximately equal quantities of quartz phenocrysts (40%) and lithic fragments (35%) in a cryptocrystalline groundmass (20%) which has been sericitised and chloritised. The broken and angular quartz phenocrysts often have quartz-sericite pressure shadows and are occasionally embayed. The very fine-grained lithic fragments, which are of both sedimentary and volcanic origin, have also been sericitised, and often have indistinct margins. Opaque minerals (5%) are disseminated throughout the rock. Very fine, elongate, blood-red flakes of hematite are often associated with the opaque minerals.

73-660. [38/964832]. Quartz porphyry lava.

The rock is similar to 73-658 but the often embayed quartz phenocrysts are much smaller, ranging from 0.4-1 mm across, and only comprise 10-20% of the rock. The cryptocrystalline groundmass contains approximately 5% pyrite in disseminated patches.

[20 December 1973]