

TRI-22-25

URANIUM DEPOSIT AT CASTLE CAREY CREEK

By TERENCE D. HUGHES

Introduction

The association of uranium and organic material in black shales and coals is well known in the United States; extensive prospecting operations have been undertaken in strata containing these beds, and much literature has been written on the results of such progress. In Australia, the information is not extensive and in Tasmania there has previously been no record of this association. This deposit at Castle Carey Creek, discovered by Messrs. B. Pitchford and C. Eadie and held by them under lease, is doubly interesting, for not only is it the first discovery of a syngenetic deposit in this State, but it is the first recorded radioactivity in sedimentary rocks of any kind.

Location

At four miles from Avoca, a town in the central east of Tasmania and fifty miles from Launceston, the road to the mining settlement of Rossarden commences a long climb up the west bank of Castle Carey Creek to the plateau. Two miles from the bottom of the hill and five hundred feet above it, Permian rocks may be seen in the road cuttings. This is part of the Permian sequence, the lower beds of which, at creek level, contain uranium. The actual prospect is located in the bed of a small creek called here Prospect Creek, four chains above its junction with Castle Carey Creek. This junction is not far from the six-mile peg from Avoca on the Rossarden road.

Topography

The valley sides of Castle Carey Creek are very steep with an average slope of 30°. Where the underlying rock is granite, the slopes are steeper than where it is Permian. The creek itself rises at the edge of the plateau and falls fourteen hundred feet in four miles. The road closely parallels the creek and near the prospect reaches its greatest height above it of 200 feet.

Geology

The general geology of the area is interesting because of the excellent section of over 400 feet of Permian rocks exposed in and about Prospect Creek. The base of the Permian is visible in the granite at several points near Castle Carey Creek. The Permian rocks are limited to the east and west by two north-south faults, and the throw of this central rock is down and of the order of a thousand feet. Thus granite occurs to the west of the western fault which is located almost along the road and to the east of the eastern fault, about half-way up the east slope of the valley formed by Castle Carey Creek. Granite also is revealed in outcrop below the Permian on either side of Castle Carey Creek above Prospect Creek. In other words the slope of the granite roof and Permian floor is steeper than that of the creek. The granite itself is typical of the extensive outcrops of this rock between Rossarden and Avoca and described in so many reports; that is, it is a medium to coarse-grained type with larger phenocrysts, particularly of felspar. The Permian beds may be shown in a column as follows:—

Height above sea level	Width	Strata
ft.	ft.	
1560	120	Softer shales.
1440	110	Unfossiliferous siltstone.
1330	80	Fossiliferous siltstone.
1250	70	Hard blue quartzite with secondary quartz on joint planes.
1180	40	Black shales with some siliceous beds arkose and conglomerate.
1140	Granite.

The lower siltstone beds contain plentiful fossils, namely bryozoans, while those above appear, superficially, to be barren. The quartzites are very hard and form small cliffs and waterfalls. They contain secondary quartz in joint planes and somewhat resemble Pre-Devonian rocks. Occasionally they grade into a fine conglomerate on the one hand or a hard mudstone on the other. The black shales are not completely continuous and sometimes give way to beds of an arkose character. They occur near the base of the Permian but are often separated from the underlying granite by a few feet of dark siliceous rock. These three rock types are described by G. Everard as follows:—

1. Medium to coarse-grained, light-coloured rock with iron stains. Visible grains (up to 0.25 cm.) include quartz, completely altered feldspars and black rock fragments. The bulk of the rock is quartz and the grains are extremely well cemented together.

In thin section, the rock is seen to consist predominantly of angular quartz grains. Other minerals present are feldspar, completely sericitised, with minor tourmaline, muscovite and zircon. Rock fragments consisting of black shale and quartzite are prominent.

The rock is a sub-greywacke.

2. Fine-grained black rock showing jointing and lamination.

In thin section the rock appears to consist largely of angular grains of quartz, of 0.1 mm. average size, embedded in a black or brown opaque carbonaceous ground mass. Angular grains of sericitised feldspar are also quite common.

Much finer quartz is present, above 0.01 mm., but tends to be lost in the opaque ground mass.

The rock is a black shale.

3. Fine-grained grey rock.

In thin section the rock is seen to consist of angular quartz grains, books of white mica, sericitised feldspar and rock fragments. There are also opaque white fragments with laminated structure, that may be organic, rounded green patches, some having the properties of chlorite and others those of glauconite, and white cubes of leucoxene. However, the most prominent fragments are sponge spicules of microcrystalline silica. They are sometimes hollow and the central tube may be filled with pyrite.

The ground mass is a fine siliceous matrix containing much brown carbonaceous matter.

The rock is a carbonaceous siltstone.

Nos. 2 and 3 may represent nothing more than a change of facies. No. 3 was deposited in waters becoming invaded by carbonaceous material, but not yet inimical to life, hence the sponge spicules and other fragments. In No. 2 the carbonaceous material is dense and no faunal remains are left.

No. 1 may represent a time break because it contains fragments of rock very similar to 2 and 3. The grain size is coarser and the grains are more unsorted, showing deposition in shallower water closer to the original source rocks, which seems, in all cases, to have been granite.

Origin of the Uranium

The uranium is found in the black shales and allied rocks at the base of the Permian beds. There is no doubt that its origin is the extensive granite magma, much of which still outcrops in the district and, as at the United Tasmanian Uranium Prospect, is known to contain pitchblende and other uranium minerals. (What is a matter of some doubt is whether the uranium was introduced at the time of formation of the rocks, that is, is it truly syngenetic, or whether it has been introduced in ground-water at some later date. The first of these theories is probably correct,

particularly when the impervious nature of the host rocks are considered. The black shales were laid down in deep, still water in an anaerobic environment. Iron sulphide is plentiful throughout, usually in the form of concretions averaging the size of marbles. Organic matter is plentiful and parts may be called an oil shale; after ignition it will continue to burn. It has not been possible to identify the uranium mineral at this stage but probably because of its association with organic material it is a complex one of the thucholite variety.

Grade

Samples taken on the outcrop in the creek bed showed for four feet above the granite floor in a black siltstone, 0.014 per cent U_3O_8 , and for three feet in black shales above the first sample 0.03 per cent U_3O_8 . A reading on a PRM 200 Geiger showed 600 c.p.m. These rocks right on the surface are exposed to considerable leaching by the creek waters. Since the samples were taken, a small trench has been cut on the southern bank of the stream, revealing more unweathered black slates of greater thickness. A PRM 200 reading in this trench showed up to 1500 c.p.m. It is probable that further away from the surface the count will increase and the uranium content should reach 0.1 per cent, although it is doubtful if the deposit contains uranium of commercial grade. Prospecting in the United States seems to show that although uranium is common in these black shales, it is rarely in economic quantities.

Extent

As this is a bedded deposit there should be no lack of reserves if an economic grade can be proved. At the prospect the black slates are at least six feet in thickness. As the map shows, the Permian beds are quite extensive in this area. Facies variation, and consequently variation in grade, however, must be expected and are indeed visible in one locality. However, the black slates themselves should be quite extensive. An outcrop of black slate in Castle Carey Creek, 25 chains south of Prospect Creek, gave a reading of 200 c.p.m., which is about three times background. The granite floor is of course quite uneven, although with a general slope south, and the thickness of shale will vary from place to place.

Water Sampling

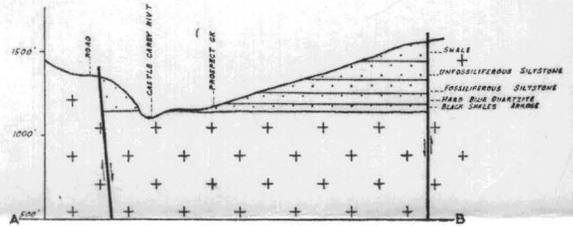
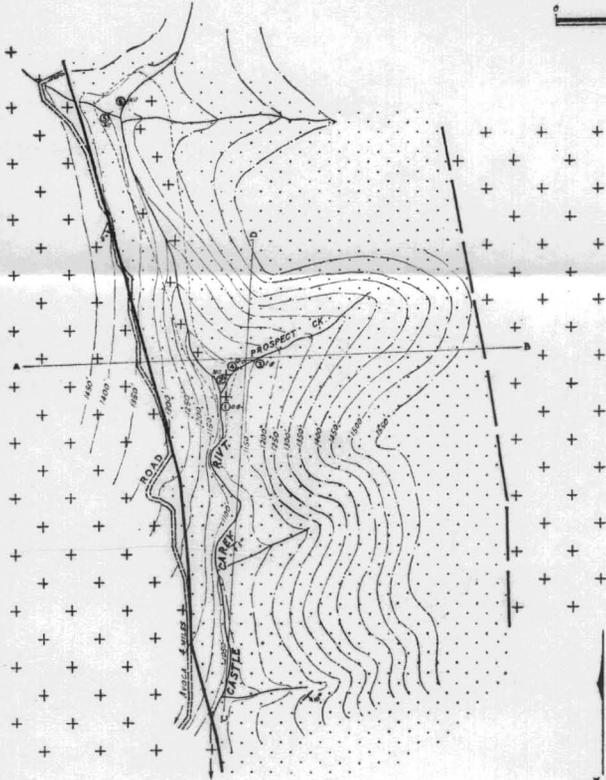
Six samples of water from the neighbouring creeks were collected for geo-chemical testing for uranium. The results of these tests are not yet available.

Conclusions

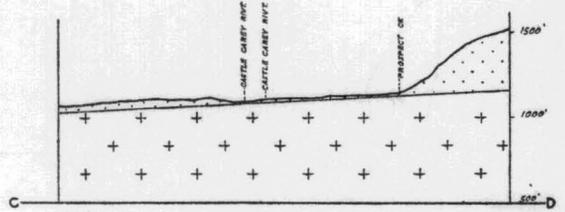
This is the most interesting uranium occurrence yet discovered in Tasmania and the first in sedimentary rocks. While there is some doubt that the prospect will reach economic grade, it is sufficiently encouraging for the lessees to continue the trench so that the slates, unaffected by surface leaching, may be sampled.

URANIUM PROSPECT AT CASTLE CAREY CREEK

SCALE
0 20 CH



SECTION AB

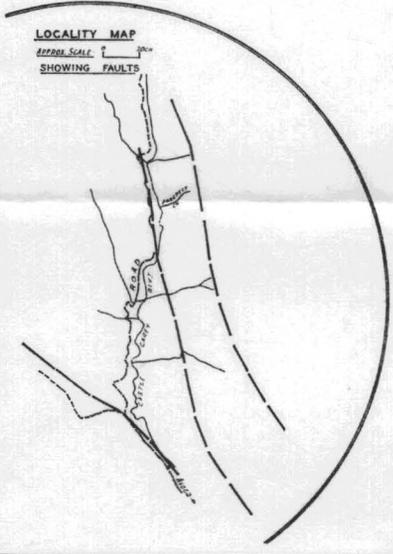


SECTION CD

-LEGEND-

- PERMIAN SHALES SILTSTONE ARKOSE [Symbol]
- DEVONIAN GRANITE [Symbol]
- FORM LINES 50 FT INTERVALS [Symbol]
- WATER SAMPLES [Symbol] ① 50 Gals PER LITER

LOCALITY MAP
25000 SCALE
SHOWING FAULTS



DEPARTMENT OF MINES - TASMANIA			
FIELDWORK	T. D. HUGHES	DRAWING	G. S. GILBERT
PLAN	[Signature]	DRAWING	[Signature]
DATE	26 NOV. 1936	HOBBART	

PLATE 3

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5 cm