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1962/13

THE TIN POTENTIAL OF THE FOSSILBROOK AREA, NORTH QUEENSLAND

by

D. O. Zimmerman and R. A. Ruker.

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SUMMARY

In the Fossilbrook area Upper Permian or early Triassic granite has intruded a Precambrian basement complex; acid volcanics are associated with and genetically related to the granite, but they are not extensive within the area mapped. Basalt flows partly filled major valleys during the Tertiary. Cassiterite occurs in greisen lodes within granite as well as in alluvial deposits, most of which are marginal to granite. The area was examined to find whether it contains any alluvial deposits suitable for large-scale working, but none was found.

INTRODUCTION

During 1961 a survey was made to assess the alluvial tin potential in the Fossilbrook area. Detailed mapping was carried out at photo scale (1:46,500), and particular attention was paid to areas of alluvium and to old workings which are indicative of source areas. Only very small yardages of alluvium were found within areas underlain by granite.

Little was known of the Fossilbrook area at the outset of the survey. It had received few brief mentions in early Queensland Government Mining Journals and in Reports of the Geological Survey of Queensland. The area was mapped on a reconnaissance scale by the Bureau of Mineral Resources and the Geological Survey of Queensland during the mapping of the Einasleigh and Atherton 1:250,000 sheet areas, in 1956 and 1959, respectively, but no specific attention was given to alluvial tin deposits at those times.

In July, 1961, a Protective Reserve was taken out over about 350 square miles by the Queensland Department of Development and Mines on behalf of the Bureau of Mineral Resources, and the authors mapped the area between 20th August and 30th September. The survey was extended westwards beyond the limit of the Reserve into low-lying areas surrounding granite where there was a possibility of finding alluvial deposits. Towards and beyond the eastern boundary of the Reserve the country is too rugged for the accumulation of sizeable bodies of alluvium. In all, about 450 square miles were mapped.

LOCATION

The area covered by the Protective Reserve is situated about 130 miles south-west of Cairns (Fig. 1.), and its centre is near Strathfield homestead.

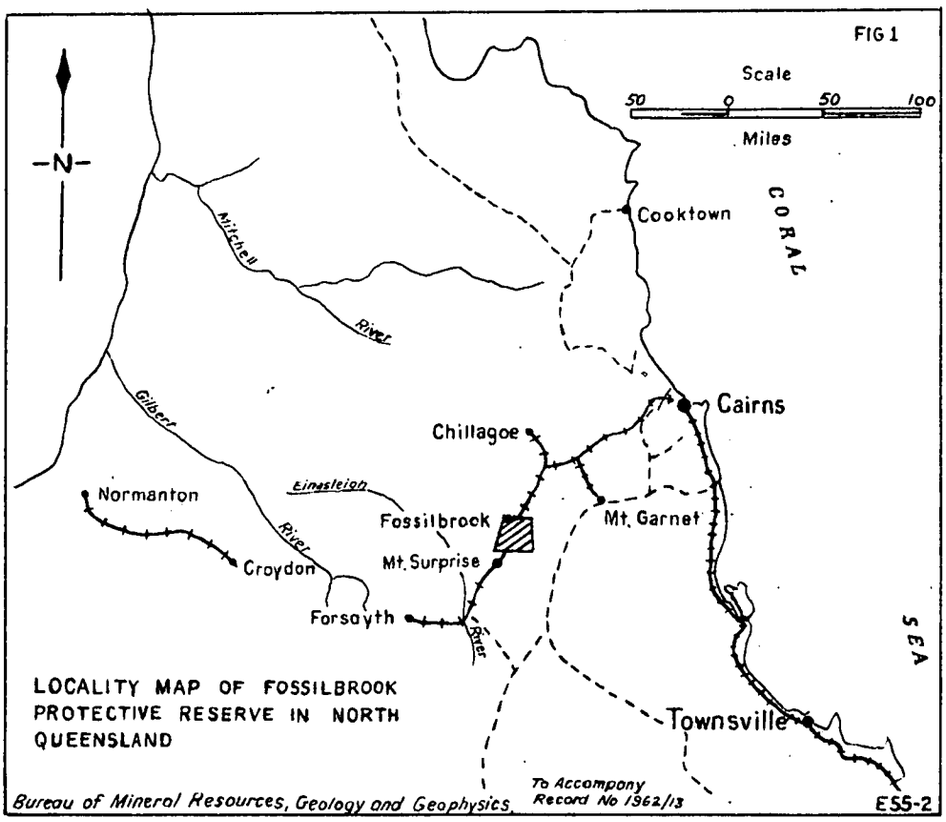
FIG 1
Scale
50 0 50 100
Miles
N
Cooktown
CORAL SEA
Mitchell River
Gilbert River
Einasleigh River
Cairns
Chillagoe
Normanton
Fossilbrook
Mt. Garnet
Mt. Surprise
Croydon
Forsayth
Townsville
LOCALITY MAP OF FOSSILBROOK PROTECTIVE RESERVE IN NORTH QUEENSLAND
Bureau of Mineral Resources, Geology and Geophysics
To Accompany Record No 1962/13
ES5-2

GD 122

ROCK UNITS AND GEOLOGICAL HISTORY

The geology of the Atherton and Einasleigh 1:250,000 sheet areas, of which the Fossilbrook area forms part, has been briefly described by Best (1961) and White (1959).

The oldest rocks in the area are Archaean meta-sediments, migmatites, grey muscovite granite, intermediate to acid volcanics, and at least one horizon of tuffaceous limestones. Some of the intermediate volcanics appear less metamorphosed than others, and may be of Proterozoic age. The Precambrian rocks generally crop out poorly and form the valley floors in the area. Creek sections show that, although outcrops are sparse, the alluvial cover is generally very thin - commonly less than 3 feet deep, though it is over 30 feet thick in one area (Messmate Creek).

In the late Palaeozoic or early Triassic the Elizabeth Creek Granite intruded the Precambrian rocks. It commonly crops out as rugged hills and as less prominent isolated hills consisting of tors. Rhyolite and ignimbrite genetically related to the granite (Branch, 1961) are represented by the Cumbana Porphyry, the Kallon Volcanics, and the Scardons Volcanics. Pink rhyolite dykes commonly intrude the granite, and, in the Fulford Creek area, these form a north-trending dyke swarm. Quartz--muscovite-chlorite greisen lodes are common in some parts of the granite, and these appear to be the source of cassiterite in the area; wolframite has been found in some of these lodes, as well as in quartz veins in the granite.

A small remnant of Cretaceous sediments occurs at Mount Bridge, near the Lynd River, at a lower level than the top of the granite, and larger areas of Cretaceous sediments overlap the granite, the volcanics, and the Precambrian rocks near the western limit of the area mapped.

During the Tertiary, basalt flowed down the valleys from the south-east, and forced the major streams — Lynd River and Elizabeth Creek — to follow the edges of the basalt mass. New streams — e.g., Fossilbrook and Saltwater Creek — are fed by water held in the basalt.

PHYSIOGRAPHY AND GEOMORPHOLOGY

The area had reached physiographic maturity before the Cretaceous sedimentation began, and alluviation and eluviation have proceeded slowly ever since. Nearly all of the thin cover of Cretaceous rocks has been removed.

The broad, north-west-trending valley containing the Lynd River and Fossilbrook is separated from the westerly-flowing Elizabeth Creek to the south by a low, basalt-covered plateau. The Lynd valley is bounded by rugged granite hills rising 400 to 500 feet above the general valley level. The lowlands consist either of poorly-outcropping Precambrian rocks generally covered by one or two feet of alluvium, or of basalt flows. The alluvium is thickest around the edges of the granite masses, rather than along the major stream valleys. These areas of deeper alluvium are generally small, and rarely attain a thickness of more than 10 feet. For these reasons alone the Fossilbrook area as a whole is quite unsuitable for large-scale mining, and is made even more so by lack of permanent water in those places where the alluvium is deepest.

ECONOMIC GEOLOGY OF THE TIN DEPOSITS

In the Fossilbrook area cassiterite occurs in quartz-muscovite-chlorite greisen lodes developed in the Elizabeth Creek Granite at a late stage of its crystallization. Wolfram is a common associate, e.g., at Granite Knobs. Consequently, when searching for alluvial prospects, greisen rubble is a useful guide to detrital cassiterite, but old alluvial tin workings and unworked gravels containing cassiterite are found in areas where greisen rubble is absent.

Alluvial tin deposits were examined in the following areas: Truxillo, Granite Knobs, Four Mile Camp, Fulford Creek, Nuggety Creek, Blackfellow Creek, Durbin's Creek, and Messmate Creek.

1. Truxillo:

Several areas of workings occur towards the head of ange Gully, 2¼ miles north of the site of the old Truxillo township. The workings are in thin (less than 3 feet) alluvial cover over Elizabeth Creek Granite, near the centre of the valley. Further upstream the valley is filled with cemented quartzose wash, and has some workings along its western edge, where gullies debouch from the granite. The cemented wash contains minor amounts of cassiterite, and would be very difficult to treat. A considerable quantity of alluvium lies downstream from the workings on the eastern side of Range Gully, although it is usually underlain by cemented wash at a depth of 4 to 10 feet. A conservative estimate of the volume of alluvium in this area would be 300,000 cubic yards.

A small supply of permanent water is available at Black Springs, 2 miles south of the old workings. Abundant supplies are available in Fossil Brook, 3½ miles to the east.

Alluvium occurs seven miles downstream from the Truxillo workings, along Black Spring Creek. This deposit is on the fringe of the area mapped, and has not been examined in detail.

There are about 15,000,000 cubic yards of alluvium in an embayment 2½ miles north-east of Truxillo workings. The alluvium has an average depth of about 15 feet, and generally contains few of the cemented horizons which are so common elsewhere in the area. Only one very small group of workings was found in a creek draining into the embayment, and this suggests that most of the alluvium contains very little cassiterite. Although this body of alluvium is the largest found in the area, it still falls far short of the quantity required for economic dredging, even on a very optimistic supposition of grade.

2. Granite Knobs:

This area is 2 miles north-east of White Chalk homestead (formerly Byrimine). It consists of small pinnacles of Elizabeth Creek Granite surrounded by alluvium, which is largely bordered by basalt flows. Two distinct granite types are evident; one is the normal pinkish, unstrained, strongly-outcropping Elizabeth Creek granite, and the other is a finer, greyish rock which is strongly fractured and partly greisenised. The grey granite has a characteristic pattern on air photographs, and contains numerous small cassiterite-wolframite lodes; these minerals are found in about equal proportions in the alluvium bordering the granite.

/Evidence...

2. Granite Knobs: (continued)

Evidence from the contact between the two granites suggests that the pink granite is the younger, although the two granites may be related, and the grey phase may represent an altered shell of the batholith.

Alluvium adjacent to the grey granite covers about one half of a square mile, and is up to 12 feet thick in places. A conservative estimate of volume, based on an average thickness of 3 feet, would be about 1,500,000 cubic yards. Abundant permanent water is available 1 mile to the south-west in Craigie Burn.

3. Four Mile Camp: This area is situated 2 miles north of Lyndbrook siding on the eastern side of the Lynd River. Thin alluvium, derived partly from Elizabeth Creek Granite which crops out 4 miles to the north and east, rests on Precambrian basement. Most of the gullies between Lyndbrook and Square Rock have been worked for tin. The concentrate from the alluvium consists of cassiterite, hematite, magnetite, and bismutite. Some small areas of unworked ground were found to contain cassiterite, and two prospectors were working the gullies with a dry blower at the time of the mapping. The total volume of workable ground available over the whole area is probably not more than a few thousand cubic yards. Permanent water is available in Fossil Brook, 2½ miles west of Four Mile Camp.

4. Fulford Creek:

Extensive old workings occur along Fulford Creek, upstream from its junction with Growler Creek. However, the terrain is rugged, and the areas of workable ground are very small. Below the junction Fulford Creek forms a braided stream, up to 400 feet wide in places; linear islands separate the various channels. Cassiterite was found in the alluvium for at least 5 miles downstream from the Fulford-Growler Junction, and intermittent workings are scattered along the first 3½ miles of this distance.

The islands in the centre of the creek have been worked in some places. The largest island would contain not more than 5,000 cubic yards of alluvium, and the other islands are generally much smaller than this.

There are about 4,500,000 cubic yards of alluvium containing horizons of cemented wash on the east bank of Fulford Creek, from ¾ to 1¼ miles downstream from the junction with Growler Creek. The thickness of alluvium here ranges from 10 to 25 feet, and probably averages little more than 10 feet over an area of about ½ square mile. The thin horizons of cemented wash would add to the difficulty of treatment, and lack of water is also a problem. The nearest permanent flowing water is in Fossil Brook, 16 miles to the east. There are small springs in Fulford Creek about ¾ mile upstream from the Growler Junction.

5. Nuggety Creek: Extensive workings exist in the gullies forming the headwaters of Nuggety Creek. Workings begin within the granite, and extend downstream for up to one mile from the contact between Elizabeth Creek Granite and the Precambrian rocks. The areas of alluvium now available total some thousands of square feet, but are seldom more than 3 feet thick. The nearest permanent water is in Fossil Brook, some 9 miles to the east.

6. Blackfellow Creek:

Extensive workings occur over granite along the valley of Blackfellow Creek. However, available yardages of alluvium are very small, and the country is rugged. Downstream from the Granite-Precambrian contact the topography is more even, and old workings continue intermittently downstream for 2 miles. Extensive workings also occur in a small creek ¼ mile west of Blackfellow Creek along the granite contact. Most of the areas of alluvium are small — a few hundred square feet — and less than 5 feet thick, although locally they may be 10 feet thick; i.e., workable ground is small in yardage, and scattered over a wide area. The nearest permanent water is in Fossil Brook, 5 miles to the east.

7. Durbin's Creek and Messmate Creek:

These creeks are tributaries of Elizabeth Creek close to Billgolla homestead. Several groups of old workings have been found in shallow alluvium over Elizabeth Creek Granite; some thin alluvium remains unworked, but panning shows that values are low.

About 6,500,000 cubic yards of alluvium occur on Durbin's Creek, south-west of its junction with Whitewater Creek. It covers about ½ square mile, and its average thickness is about 12 feet. Much of the wash is cemented, and it would, therefore, be very difficult to treat. Messmate Creek has a similar alluvial flat where it joins Elizabeth Creek; in places the alluvium is more than 30 feet thick, but it covers areas of the order of only 1,000 square feet, - i.e., each would contain about 1,200 cubic yards.

Water is available some 4 miles downstream in Elizabeth Creek. However, Mount Surprise township takes its water supply from Elizabeth Creek, and operators might have the additional expense of avoiding pollution of this water supply.

8. Deep Lead Tin:

Exploration for deep leads in the Fossilbrook area seems unwarranted for the following reasons:

(a) The basalt in most places overlies Precambrian rocks, and the present study has shown that the Precambrian is rarely overlain by appreciable thicknesses of alluvium.

(b) Nearly all springs and permanent streams in the area are fed by water flowing from under the basalt. This implies that a huge underground reservoir exists within the basalt, and that any alluvium buried there would be saturated with water.

9. Adjacent areas:

Other small tin-bearing areas, not considered in the present study, but fringing the Fossilbrook area, occur at Round Mountain (near Amber homestead), Deaf Teddys Creek, Cumbana, Lancewood, and Angor. Two small groups of miners are at present working alluvial tin at Round Mountain; their concentrating plants are on Fossil Brook. Prospectors were active around Cumbana at the time of the investigation.

CONCLUSIONS

Although the Elizabeth Creek Granite and the tin-bearing lodes associated with it had been exposed by erosion before the Cretaceous, no body of alluvium deep and extensive enough for large-scale mining has been deposited — or preserved — in the Fossilbrook area. For this reason the Protective Reserve has been relinquished. If a large mass of alluvium was deposited further to the west or north-west in the early stages of denudation, it would now be covered by Cretaceous and later sediments.

Some of the prospects examined during 1961 could support small parties during the wet season, when sufficient water for hydraulic treatment is usually available. However, any cassiterite which has been naturally transported over the Precambrian basement would have associated with it other heavy minerals derived from the older rocks (e.g., at Four Mile Camp), and these would add to the difficulty and cost of preparing marketable concentrates.

ACKNOWLEDGEMENTS

The help and hospitality of the residents of the Fossilbrook district, and their readiness to volunteer information, are very much appreciated.

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THE FOSSILBROOK AREA

Scale

2 0 2 4 6 Miles

Map compiled from uncontrolled air photograph overlays

Geology by D.O. Zimmerman & R.A. Ruker

144°15′ 144°30′ 17°45′ 18°S

Magnetic North 16° True North

REFERENCE

CAINOZOIC

QUATERNARY

- Qa — *Alluvium, including alluvium over cemented wash and soil.*
- Qa/Czm — *Alluvium over Mc Bride Basalt*
- Qa/Pgz — *Alluvium over Elizabeth Creek Granite*
- Qa/p€ — *Alluvium over undifferenciated granite and metamorphics*

PLIOCENE
PLEISTOCENE

- Czm — **Mc Bride Basalt** *Olivine basalt*

MESOZOIC

CRETACEOUS

- K — **Gilbert River Formation** *Conglomerate, sandstone, siltstone.*

PALAEOZOIC

PERMIAN
TRIASSIC

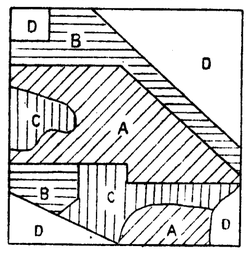
- Pm — **Cumbana Porphyry** *Porphyritic rhyolite*
- Ps — **Scardons Volcanics** *Pink rhyolite and ignimbrite*
- Pk — **Kallon Volcanics** *Rhyolite and ignimbrite*
- Pgz — **Elizabeth Creek Granite** *Pink porphyritic granite, with rhyolite dykes in places.*

PRECAMBRIAN

- p€ — **Undifferenciated** *Grey granite metamorphics and intermediate volcanics.*

- Geological boundary - position accurate
- " " - position approximate
- " " - inferred
- Fault - position accurate
- Quartz vein
- Sn Tin occurence - not worked
- X Sn Tin mine - alluvial workings
- X Sn Tin mine - alluvial not working
- X Cu Copper mine - not working
- X F Fluorite mine - not working
- X W Wolframite mine - not working
- X Pb Lead mine - not working
- Alluvial tin treatment plant
- Road or vehicle track
- Telephone line
- Windmill
- Windmill - not working
- M Mineral spring
- Homestead
- Yd Yard
- Fence
- Landing Field
- W.H. Water hole
- P.O. Post Office

RELIABILTY DIAGRAM



A Detailed mapping
B Photo interpretation with few traverses
C Photo interpretation with few or no traverses
D Not examined

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