ECONOMIC & GENERAL GEOLOGY

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1. Gemstone occurrences at Sisters Creek.

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A brief inspection was made of two gemstone (zircon and sapphire) occurrences at Sisters Creek. The areas are held under prospectors licences by C. Webster of Rosetta (fig. 1).

PREVIOUS LITERATURE

Twelvetrees (1906) reported on the deposits and indicated fairly widespread occurrences of similar material in neighbouring areas, *e.g.* in a tributary of the Inglis River south of Wynyard and in creeks at Detention. Petterd (1910) refers to sapphire, zircon and pyrochlore occurring in the area. Gee (1971) discusses the deposits and suggests two possible origins.

GEOLOGY

The area has been mapped by Gee (1966) and exposures consist of Precambrian quartzite and siltstone of the Rocky Cape Group, Tertiary sand and gravel, Tertiary basalt and Quaternary alluvium. The Tertiary sand and gravel are of pre-basalt age and are derived from the weathering and erosion of the older rocks in the area and probably also partly from material transported from a distance. The sand and gravel are probably terrace and river bed deposits associated with Tertiary streams. Flows of basalt filled these valleys and covered the gravel and sand deposits. Subsequent erosion has begun to expose them again. Quaternary deposits occur around present day streams.

GEMSTONE DEPOSITS

The zircon and sapphire appear to be contained in the Tertiary gravel and sand. They are found in the beds of several creeks in the Sisters Creek area but there are two main areas where the deposits have been worked: in the headwaters of Cassidys Creek and in the headwaters of another creek which rises about 1 km south of the Cassidys Creek area. Both areas appear to be some distance from the centre of the pre-basalt valley, suggesting that these deposits were laid down early in the formation of the pre-basalt landsurface. Where the gemstones occur, the gravel and sand deposits are thin ('from a few inches to a foot' according to Twelvetrees) and consist mainly of vein quartz, quartzite fragments and quartz sand. Concentration of the denser material in the sand and gravel reveals abundant zircon and spinel crystals and fragments and occasional pieces of sapphire.

The zircon is semi-transparent to translucent, light yellow-brown to dark red-brown in colour, and ranges up to 20 mm across. There is usually some rounding of the edges but crystal faces can be seen in most cases. Occasional specimens show no signs of rounding and have sharp edges.

Sapphire (corundum) is much less common than zircon. It is semi-transparent to almost opaque and varies in colour from blue, yellowish green to green. Some specimens have the crystal form clearly retained but others occur where rounding has obliterated the crystal faces. Pieces up to 20 mm across have been found but they are rarely of gem quality.

A brown to black mineral in fragments up to about 10 mm, is common in the denser concentrates. It is opaque, has a conchoidal fracture and a vitreous lustre, and when analysed was thought to be pyrochlore. The analysis shows significant quantities of uranium and some thorium. A large sample of the concentrated denser material shows no signs of abnormal radioactivity. In the revised edition of Petterd (1971), the identification as pyrochlore is regarded as invalid. From microscopic examination and determination of physical properties it is apparent that the mineral is a spinel intermediate between pleonaste and picotite (G.B. Everard).

ORIGIN

The origin of the zircon and sapphire is uncertain. Twelvetrees suggests an origin more distant than the 'Sisters Quartzite' because the crystals are water-worn. Petterd believed that the zircon is a product of contact metamorphism in granite country and these deposits resulted from the erosion of these rocks. Gee suggested two possible origins:

(1) The material forming these deposits was shed from the Devonian Housetop Granite during Tertiary times.

(2) The material is derived from the erosion of local rocks. He states that the quartzites contain accessory zircon although no large grains with good crystal faces were observed.

The fact that most of the grains of zircon and sapphire show some rounding suggests that they have been transported for some distance from their original source. The occasional non-rounded crystals are difficult to explain. Isotopic age determinations would indicate whether the zircons are associated with Devonian granite or whether they were deposited during deposition of the Precambrian rocks.

EXTENT OF DEPOSITS

Although material bearing zircon is widespread, its extent in any one locality is unknown. The deposits are usually found in creek beds where the stream has cut through the basalt. In the two areas examined, the beds containing the zircon and sapphire are thin and may wedge out completely or thicken in any direction. Grain size may also vary rapidly laterally. Only drilling through the basalt could determine these factors and this could prove expensive if the basalt is unweathered as it is in a quarry immediately south of these areas.

PRODUCTION

Twelvetrees reported that late in the nineteenth century 'a ton or two' of the washed sand was sent to Melbourne and its use in gas mantle manufacture was investigated but the use of zirconia for this purpose was replaced by other material about this time and work ceased. Later, some work was done on production of gemstone quality zircon and sapphire. In recent years with the growing interest in lapidary and mineral collecting as a hobby, many people have visited the area and collected specimens of zircon and occasionally of sapphire.

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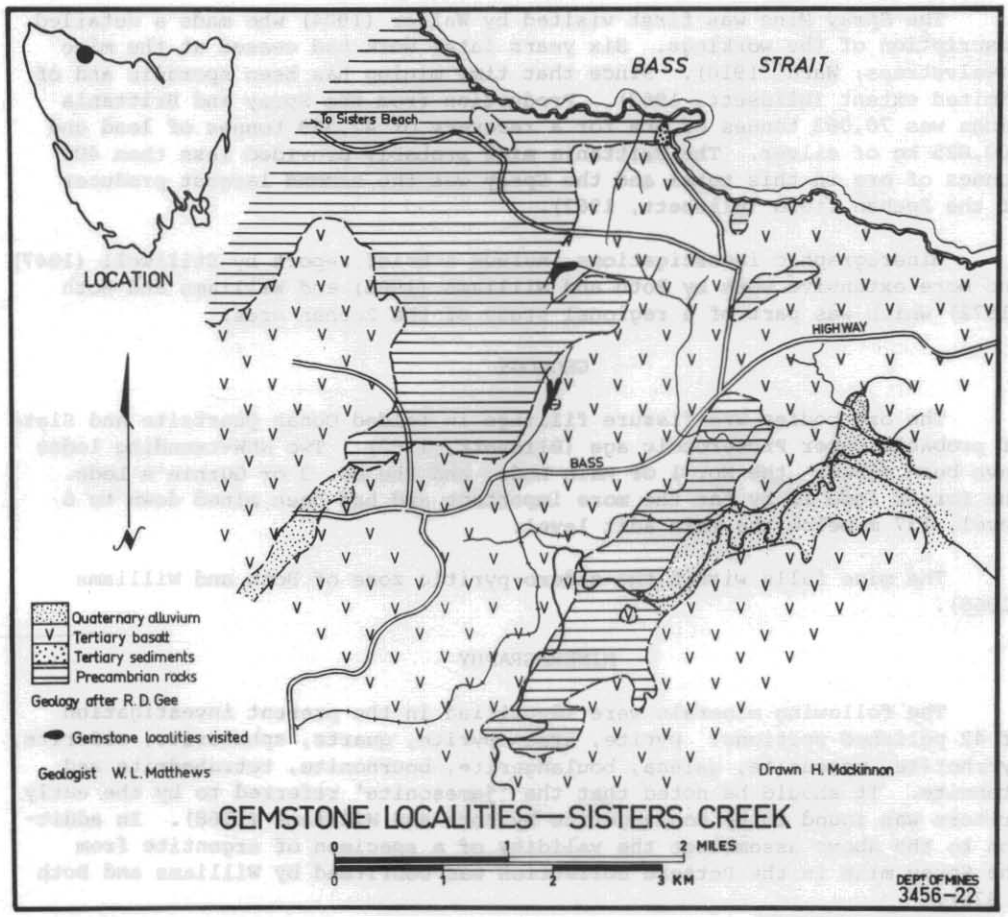

Figure 1.

5 cm