

EL18/2016
GLADSTONE, TASMANIA

FIRST ANNUAL REPORT
FOR THE YEAR ENDED
12 JULY 2018

LICENSEE:
KINGFISHER EXPLORATION PTY LTD
A.C.N 169 842 728

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EXECUTIVE SUMMARY

EL18/2016 covers 227 square kilometres of ground near Gladstone in NE Tasmania that is considered prospective for primary tin mineralisation as well as orogenic gold style deposits. EL18/2016 was granted to Kingfisher Exploration Pty Ltd (Kingfisher or KFE) on 12th July 2017. This report documents exploration activities carried out during the first year of tenure.

Exploration activity undertaken during the year included:

- Collation, review and assessment of historical mining and exploration information;
- Development of priority exploration targets for primary tin and gold;
- Field reconnaissance visits and sampling at selected target areas;
- Planning for exploration activities at priority target areas.

The completed work has advanced understanding the geology and mineralization styles within the tenement and has facilitated district to prospect scale targeting, particularly for primary tin mineralisation. The area is assessed to be highly prospective for greisen and quartz-greisen style primary tin deposit styles associated with late stage fractionated granites, as well as for orogenic gold style mineralisation hosted within the Mathinna beds.

Six priority target areas have been identified, including the Hardens Ravine, Star Hill, Woods Flat-Eastern Terrace and Wyniford Zones (for primary tin) and the Popes and McGowans prospect areas (for gold).

Exploration field work is planned to commence on these targets in the summer of 2018/19. Recommendations for ongoing exploration work in the second year of tenure include:

- Hand-auger soil sampling over the Hardens Ravine Zone, with possible follow-up trenching and drilling;
- Reconnaissance mapping and sampling at remaining tin target areas with possible soil sampling grids depending on depths of Quaternary/tertiary cover;
- Hand-auger soil sampling over the Popes and McGowans gold prospect areas, with possible follow-up trenching and drilling;
- Prospect-scale geological mapping and rock sapling over all priority target areas;
- Possible geophysical surveys over selected areas to be assessed based on exploration results.

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1 INTRODUCTION

This report is the first Annual Report for EL18/2016 located in NE Tasmania (Figure 1), granted to Kingfisher Exploration Pty Ltd (Kingfisher or KFE) on 12th July 2017. EL18/2016 covers 227 square kilometres of ground that is considered prospective for primary tin mineralisation as well as orogenic gold style deposits.

This report documents exploration activities carried out between the dates 12 July 2017 and 12 July 2018 (the Reporting Period).

All maps and location coordinates contained within this report are presented in GDA94 datum format unless otherwise noted.

1.1 EXPLORATION RATIONALE

The main exploration target models for the licensed area are for primary vein and greisen hosted tin, and orogenic gold style mineralization. The potential for alluvial tin deposits is also noted but considered a secondary target.

Tasmania is a world-class tin-tungsten province with major skarn (western Tasmania) and vein-greisen (Eastern Tasmania) deposits associated with Devonian granitic plutons. EL18/2016 is located within the North Eastern Tin Province of Tasmania, from which historical tin production has been derived mainly from alluvial palaeo-placer deposits including both Tertiary “deep leads” and shallow Quaternary deposits, while smaller scale primary deposits of vein tin-tungsten and tin greisen types have also been exploited at numerous localities.

The largest and most productive placer tin deposits in the Derby and Gladstone districts of NE Tasmania are typically located on deep leads or terrace deposits of Tertiary age along the palaeo-water courses of the Ringarooma and Mussel Roe river systems. Most of the larger Tertiary placer deposits are spatially associated with late-phase, highly fractionated, muscovite-biotite tin-mineralised granite intrusive rocks (the so called “tin-granites” of the Blue Tier batholith) and some directly overly in-situ primary tin mineralisation and associated eluvium. Quaternary tin-bearing placer deposits have also been worked but are generally of smaller tonnage compared to the older tertiary deposits.

Within the EL numerous past-producing alluvial tin mining areas occur but there are very few examples of primary hard rock hosted tin deposits being exploited on any significant scale, despite their obvious potential. This is considered to be due to previous miners and explorers focusing on alluvial deposits and not the bedrock tin sources.

Kingfisher Exploration Pty Ltd also currently holds EL11/2012 which is located immediately to the north adjacent to and continuous with EL18/2016. KFE is actively exploring EL11/2012 for orogenic style gold mineralization and has identified key structural trends that extend south from EL11/2012 into the northern extents of the EL18/2016 area. KFE considers this southern extension into northern EL18/2016 to be prospective for gold mineralization. Apparent mag-destructive alteration in an area of historical gold prospects (around McGowan’s workings) is of particular interest, as well as the historical Popes gold prospect NE of Gladstone.

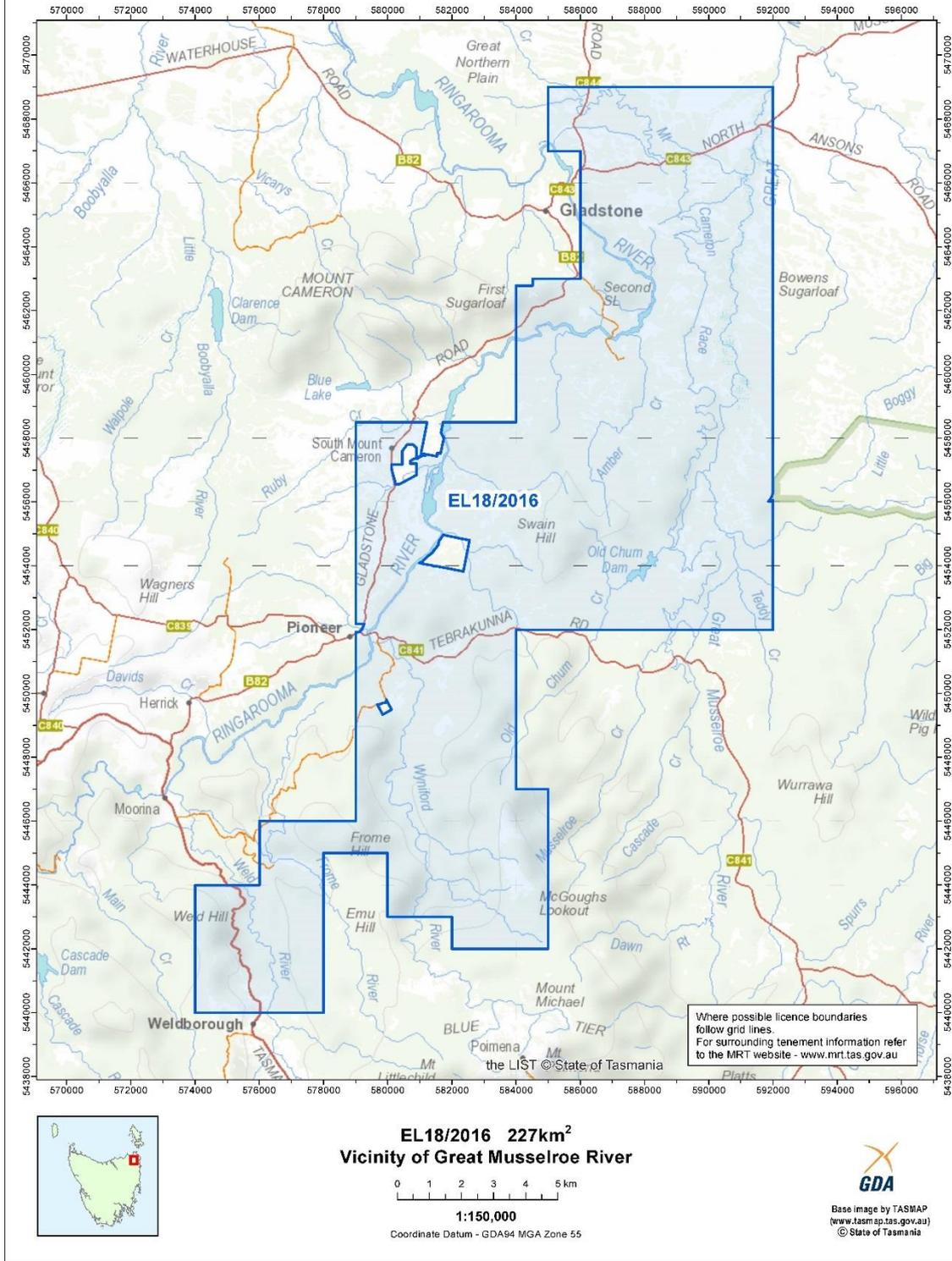


Figure 1. Location plan showing the EL18/2016 tenement area. Datum used is Map Grid of Australia 1994 (MGA94), Zone 55, GDA94.

1.2 GEOLOGY

Figure 2 shows the geology of the EL18/2016 tenement area.

The regional geology of NE Tasmania is dominated by an extensive basement of granitoid batholiths that were intruded into Ordovician-Lower Devonian aged marine sedimentary sequences of the Mathinna Supergroup (commonly known as the “Mathinna beds”) during Devonian times (between 395 and 368 Ma). The granitoids post-date regional folding of the Mathinna beds, which is correlated with the Tabberabberan deformation of eastern Australia. Emplacement was at a high level, with narrow metamorphic aureoles around the granites. The granitoids have been identified into four main sub-types: granodiorite, biotite adamellite, biotite-garnet adamellite, and alkali-feldspar-(biotite-muscovite) granite. The last type is strongly fractionated and commonly hosts tin (cassiterite) mineralisation. Field relations indicate that, generally, the granodiorite plutons are the oldest and the alkali-feldspar granite plutons the youngest.

The granitoid and Mathinna bed basement is unconformably overlain by flat-lying Permo-Triassic rocks of the Parmeener Supergroup. Exhumation and weathering during the Tertiary period resulted in widespread cover of Tertiary sand, gravel and clay deposits, accompanied by local basaltic volcanism. Sills of dolerite locally intruded the older rocks during the Jurassic.

The Poimena pluton is the largest pluton of the Blue Tier Batholith and forms the dominant bedrock type within EL18/2016 south of Gladstone (Figure 2). Considering its size, the Poimena pluton is remarkably homogeneous, consisting of porphyritic biotite granite/adamellites throughout. The normal granite/adamellite is pale grey with large K-feldspar phenocrysts, generally about 5 cm in length, set in a medium-grained groundmass of quartz, K-feldspar and biotite. Minor biotite schlieren and rare biotite-rich enclaves have also been identified. Within the pluton, special variations occur in the proportion of phenocrysts (5-50%), and biotite (5-15%), and in the grain size of the groundmass. In places the granite/adamellites have a well-developed foliation defined by the planar alignment of tabular K-feldspar phenocrysts (Groves et al, 1977).

Late stage leucocratic “tin granites” of the Lottah and Mount Cameron sheets intrude the older granites in the south and north of EL18/2016. These muscovite-biotite granites typically form as sheet-like bodies with feeder dykes and are confined to the upper levels of the batholith that are presently exposed. They are commonly enriched in Sn, W, F, Rb and Li relative to the earlier-formed granodiorites and granite/adamellites. Their high Sn contents appear to be due to partitioning of Sn into residual liquids during fractional crystallisation of the magma (Groves et al, 1977).

The Lottah sheets of the Blue Tier in the south of the EL, are composed of equigranular fine grained muscovite-biotite granites, granite porphyries, leucogranites, aplites, pegmatites and greisens. The greisens typically consist of aggregates of quartz and muscovite with minor albite. They are coarser grained (up to four millimetres average grain size) than the greisenized granites and almost invariably contain abundant coarse grained fractured cassiterite crystals. Pale green biotite and carbonate are present in some greisens and topaz is more common than muscovite. Minor chalcopyrite, bornite, molybdenite and fluorite have been identified in some greisen samples.

The Mount Cameron tin-granite sheets occur in the north of the EL around Gladstone, Hardens Ravine and Mt Cameron, and appear to show many similarities to the Lottah sheets. Similar late phase leucocratic biotite-muscovite granites are also mapped occurring in the vicinity of Woods Flat – Eastern Terrace (with greisen and pegmatite veins also reported in the area).

Towards the eastern margin of the northern part of the EL, hornblende biotite granodiorite of the Gardens Pluton occurs in contact with the Poimena Pluton (Figure 2 & 3). The Gardens pluton western contact is quite linear in the north / south orientation and for most of its length is commonly separated from the Poimena Pluton by a thin screen of hornfelsed Mathinna Beds, particularly in the south. To the north and east, the Gardens pluton abuts broad tracts of hornfelsed Mathinna Beds. Porphyritic biotite granite/adamellites similar to those of the Poimena Pluton occur within the northern part of the Gardens pluton east of Gladstone, but extensive Tertiary and Quaternary alluvial cover in the area precludes a clear interpretation of their relationships (Groves et al, 1977).

Mathinna Bed rocks outcrop in the far north of EL18/2016, east and northeast of Gladstone, where they are typically contact metamorphosed to hornfels and quartzite in a zone extending up to 1.3km from contact with the granites (Figure 2, a legend of the Geological map in Figure 2, appears in Figure 3).

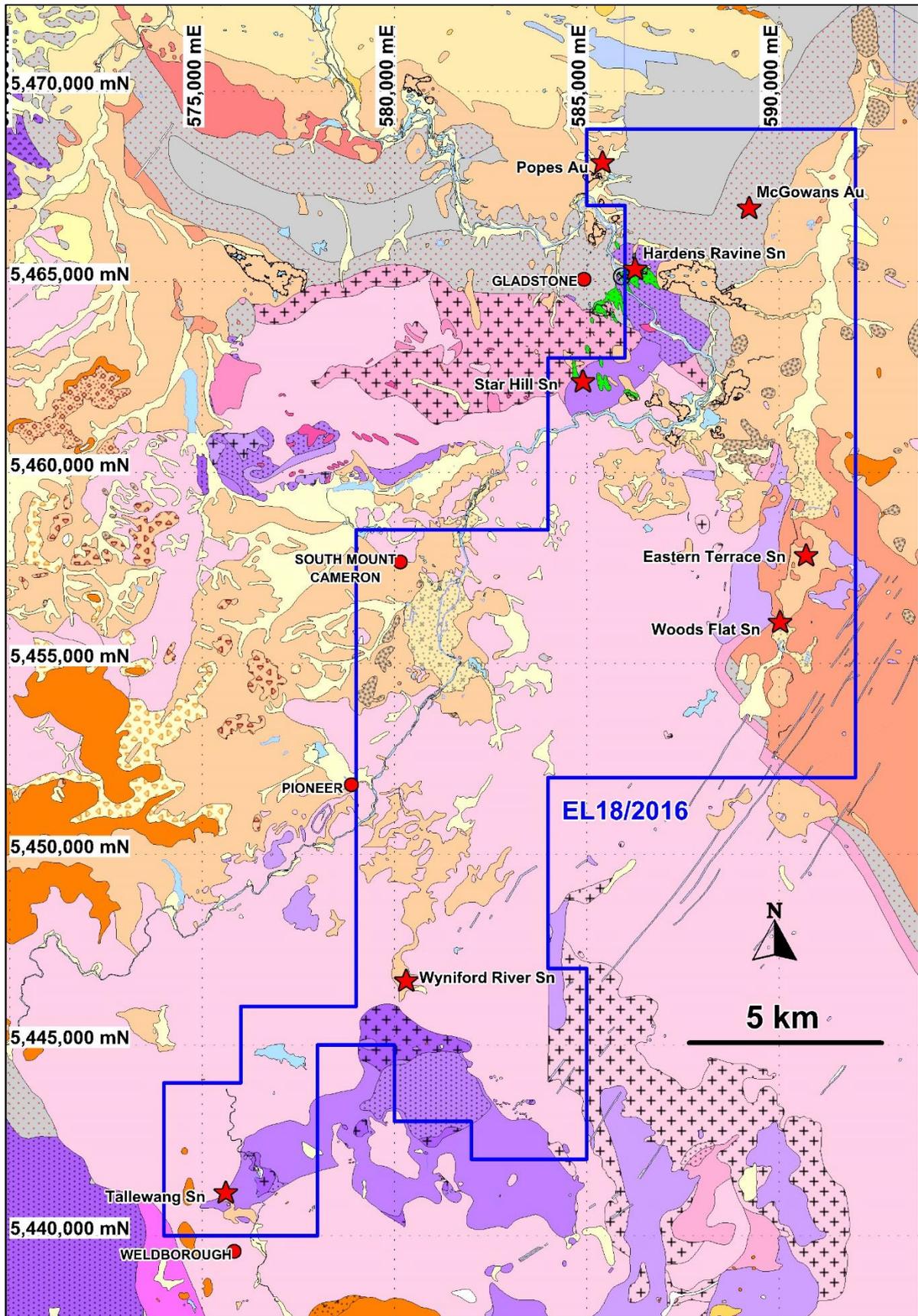


Figure 2. Geology map of the tenement area (adapted from the MRT 1:25,000 scale digital geology). See Figure 3 for the legend.

1.3 MINERALISATION

Primary tin and tin-tungsten mineralisation in NE Tasmania generally shows a close spatial relationship to the late-stage, fractionated muscovite-biotite granite bodies (“tin-granites”) of the Blue Tier batholith. Styles of granite-related tin-(tungsten) mineralisation of NE Tasmania can be broadly classified into three groups which are discussed below: 1) Greisen veins, pipes and sheets within granite; 2) Cassiterite stockworks in Mathinna Beds proximal to granite contacts; and 3) Quartz-wolframite-cassiterite veins in Mathinna Beds.

1.3.1 GREISEN VEINS, PIPES AND SHEETS

Steeply-dipping greisen veins and pipes occur within and adjacent to the roof contacts of muscovite-biotite granites of the Lottah and Mt Cameron Sheets, and the Mt Paris Mass, particularly in association with roof irregularities (Groves et al, 1977). They are variable in width and lateral extent, but generally occur as clusters. The smaller greisen veins commonly have a central fracture or quartz vein, about which the greisen is symmetrical. The greisens consist of quartz and muscovite in granular intergrowths, with no relict granitic textures preserved where the alteration is intense. Cassiterite is intergrown with quartz and muscovite but is more abundant as coarsely crystalline aggregates on fracture surfaces within the greisen veins and associated quartz veins. Sulphides occur in places.

The greisen veins are fracture-controlled, sub-vertical and commonly sheeted, appearing to have formed by alteration of granite along the pre-existing fractures. These fractured controlled systems commonly trend NNW subparallel to the elongation of the batholith and individual plutons, although approximately E-W trending veins also occur (Groves et al, 1977). Although the contacts of the greisen with granite are relatively sharp, the granite is commonly bleached or altered for several centimetres from the contact. Fracture-controlled zones of kaolinite alteration accompany the greisen locally within the Mt Paris Mass and also in the Fly-by-Night – Hardens Ravine area near Gladstone.

Sub-horizontal “sheets” of greisenised granite and greisen may occur within irregularities of the roof zone of muscovite-biotite granite-sheets either at the contact with other typically older granites and or at the roof contact with overlying Mathinna beds. Significant tin mineralisation roughly overlaps the limit of greisenisation and is associated with minor molybdenite, chalcopyrite and fluorite. The main deposit of this type is at the Anchor mine at Blue Tier, with other deposits in the Blue Tier tin field include the Crystal Hill, Liberator, North Liberator, Don, Australia, Summit, Mount Michael, New Moon, Cream Creek and Kent deposits.

At the anchor mine, greisen is confined to a flat-lying, undulating part of the domed upper contact of the muscovite-biotite granite sheet and extends to a depth of about 40 m below the upper contact. The upper contact is marked by a discontinuous pegmatite band up to 0.3 m in thickness. Mineralised greisen zones average around 5 m thick but thicker zones occur from 15 m up to 68 m thick. Average grades are 0.2 to 0.4 % Sn, with localised richer zones averaging 0.5% Sn. The porphyritic granite/adamellite above this contact is typically unaltered except for a slight pink colouration of the feldspars for a few metres above the contact. Greisen below the upper contact is variable with alternating sub-horizontal lenses of muscovite-biotite granite, greisenised granite retaining granitic textures, and greisen in which no relic textures remain.

Cassiterite distribution at the Anchor deposit is consistent with the maximum intensity of greisenisation, and some mineral zoning is evident with molybdenite in the north-west succeeded by overlapping zones of cassiterite and chalcopyrite in the east and south (Groves et al, 1977). Other associated minerals include bornite, fluorite, and molybdenite. The mineralized zones also typically carry several grams per tonne of silver (Fulton, 2013). Typical levels of associated metals at Anchor are (Fulton, 2013):

- Zn: average 785 ppm, maximum >1%;
- Cu: average 621 ppm, max 0.43%;
- W: average 115 ppm, maximum 0.13%;
- Bi: average 37 ppm, maximum 370 ppm;
- Mo: average 25 ppm, maximum 216 ppm;
- Ta: average 13 ppm, maximum 27 ppm;
- In: average 2 ppm, maximum 28 ppm;
- Ag: up to 22 ppm.

Restricted occurrences of greisen with associated tin mineralisation in the roof zone of the younger, more fractionated biotite-muscovite granites at Anchor is a common feature among many other tin deposits in the area. The chemical changes that occurred during greisenisation are consistent with the idea that the fluids responsible were essentially non-renewable, and this combined with the above evidence strongly suggests that alteration of the granite has occurred late in the crystallisation history, as the result of an essentially *in situ* reaction between crystals and late-stage residual fluids (Groves et al, 1977). The general absence of alteration in the older granite phases suggests that this rock was impermeable to alteration fluids or that the greisenisation-mineralisation processes were related to internal processes of crystallisation in the younger granite and did not occur deeper within the older granite suite. There is also generally no sharp distinction between zones of relatively unaltered granite and greisenised granite, and commonly the unaltered granite shows evidence of incipient greisenisation.

The dominant nature of mineralisation in a particular area appears to depend on the permeability of the capping rocks, and the formation or otherwise of jointing in the roof zone of the mineralising granite. Where extensive fractures existing in the roof zones, aqueous fluids have access and may escape upwards, possibly with dilution from circulating meteoric waters, into the country rocks to form sheeted or stockwork vein deposits. The formation of joint systems in the muscovite-biotite granites prior to release of aqueous fluids may depend on the thickness of the emplaced bodies, and their depth of emplacement which will affect the onset of pressure related second boiling and the rise of aqueous fluid towards the roof (Groves et al, 1977). The larger and thicker Mt Paris Mass appears to be dominated by greisen vein mineralisation, whereas the smaller and probably thinner Lottah Sheets are characterised by lensoid sheets of greisen altered granite and rocks fully altered to greisen (Groves et al, 1977).

1.3.2 CASSITERITE STOCKWORKS

The main cassiterite stockwork deposit is the Great Pyramid Tin Mine in the Upper Scamander area (Groves et al, 1977). Here fine grained cassiterite occurs in small fractures, and as the matrix to breccias in localised fault zones. The cassiterite is concentrated in fractured sandstone-quartzite beds in a faulted anticlinal structure. The deposit is probably genetically related to the Constable Creek Sheet to the north-west (Groves et al, 1977).

Similar, but smaller, deposits are present in the roof zone of the Mt Paris Mass to the north of Legunia. The deposits appear to occur in more competent beds within the Mathinna Beds, where discrete anastomosing fractures allowed the ready passage of mineralising fluids.

1.3.3 QUARTZ-WOLFRAMITE-CASSITERITE VEINS

Vein-like deposits of quartz-wolframite-cassiterite in NE Tasmania occur mainly above the roof of muscovite -biotite granite sheets or cupolas. The major deposits of this type in eastern Tasmania are at Aberfoyle (total production 2.1 Mt at 0.91 % Sn and 0.28 % WO₃) and Story's Creek (total production 1.1 Mt at 1.09% WO₃ and 0.18% Sn), but small deposits are also known at Upper Scamander and Gladstone. The veins appear to occupy discrete fractures in the contact aureole of the underlying granites.

1.3.4 OROGENIC GOLD

Structurally controlled orogenic style gold mineralisation occurs hosted in the folded Mathinna bed rocks throughout NE Tasmania. Locally there are historical goldfields west of the Gladstone township and extending north to the Cape Portland - Rushy Lagoon area.

A revised structural interpretation of the area by Kingfisher Exploration suggests that known historical gold mines in the Gladstone-Portland goldfields are situated on or adjacent to district-scale NNE-trending axial planar structures and are intensified at intersections with NW trending structures. These structures have rarely been explored beyond the immediate historical mine areas and are considered to represent a significant opportunity for discovery of new gold deposits across the goldfield. Major structures within this area are seen to trend south into EL18/2016 as defined by regional magnetics.

At least two historical gold prospects occur within EL18/2016 but very little has been undertaken and very little is known about them.

2 REVIEW OF PREVIOUS WORK

2.1 HISTORICAL MINING & PROSPECTING (1870-1960)

Prospectors first worked the ground within and surrounding the project area in the northeast of Tasmania in the late 1800's. The first documented discovery of tin in NE Tasmania was by George Renison Bell at several locations in the Boobyalla River catchment in 1874. Prospecting in the ensuing years explored most of the region's waterways and identified the bulk of the region's major alluvial tin deposits. The early 1900's saw the development of many large placer tin mining operations in NE Tasmania - the Arba, Briseis and the deposits along the Lower Ringarooma River including Pioneer, Endurance and Scotia / Lochaber, all helped add to a total tin production of in excess of 40,000 tonnes of concentrates. Most of the mining was by hydraulic sluicing but some dredges were used including the Dorset dredge which operated from 1944 to 1971.

The largest producing deposit in the NE of Tasmania was the Briseis, located south (outside) of the Tin Dragon tenements at Derby, which produced 18,600 tonnes of cassiterite concentrate in the period 1876-1960 from the Cascade Lead. More recent estimates on total production at Briseis were estimated at 21,120 tonnes (Newton-Smith, 1983). The next largest production deposits were from Pioneer (estimated 10,814 tonnes cassiterite concentrate) and Endurance near South Mount Cameron (6,240 tonnes of cassiterite concentrate). It is noted that historical production estimates from the mines should generally be treated with caution as, especially before 1900, the production figures were poorly recorded or incompletely compiled.

Within the EL18/2016 area, significant alluvial tin mining occurred at several zones including the South Mount Cameron zone (Dorset Dredge and surrounds), Star Hill-Enterprise-Olgilvies-Edina-Jewles Flats zone (South of Gladstone), Empress-New Esk-Garfield-Cybele zone (east of Gladstone), Garbaldi (Wyniford River), and the Musselroe River zone (Woods Flat-Eastern Leads-North Mussel Roe-Traceys. Records of tin production are incomplete and very often only rough. Documented estimates come from early Department of Mines annual reports. The main period of operations from the deep leads appears to be around 1900-1930 with the most productive mine during this time being the Edina which was producing about 1.5 tonnes of concentrate per month in 1901. The richest mine in the 19th century was evidently the Empress, which at its peak produced 100 tonnes of tin (at least) for 1885-1886.

The early miners did not have access to drilling equipment or funds to assist in the discovery of new leads or accurately delineate extensions of those they were working. As early as 1901 Twelvetrees recommended that the Mines Department provide assistance in the drilling of bores and in 1904, Cybele Tin Mines mounted a drilling programme on Garfield Ridge of 142 Bores. Then a more extensive government campaign was mounted in 1916 with 515 bores for 2,810m (Blake 1937). This drilling was undertaken by the government with the prospector paying half the cost of the programme. Further programmes by the Mines Department took place in 1937, 1945, and 1953 and other forms of assistance were also given to miners, including cash to purchase equipment.

2.1.1 AMBER HILL

Historical workings at Amber Hill, located 1 km SW of Ogilvie's Bridge, were developed in an elevated remnant terrace of Tertiary alluvial mineralization that sits some 70 to 90 m above the current level of the adjacent Ringarooma River. Twelvetrees (1916) and Keid (1945) report that prior workings were represented by three extensive open-cut pits developed in tin-bearing gravels to depths upwards of 18m, with grades of around 600 g/m³ tin concentrate. The Tertiary alluvial deposits at Amber Hill are typically hardened by ferruginous cement and high water pressures were required for effective hydraulic mining. For this reason and because of irregular water supplies, mining operations at Amber Hill were only carried out during periods of high rainfall.

A 1937 Government drilling program consisting of 53 holes for 962m, spaced 20m apart on lines 40m apart, tested a section of the Tertiary lead between the central and east open-cuts on the north side of Amber Hill. The drilling identified a narrow but high-grade NW-trending deep lead between the pits, with intersections including 3.2m of 3.6 kg/m³ from 13.4m, 1.5m of 8.4 kg/m³ from 10.2m, and 3.0m of 11.2 kg/m³ from 15.9m. The high-grade lead was apparently open to the NW where it was not tested by drilling. It is currently unclear how much of this high-grade material still remains or was mined out. Production from 1950 to 1952 is recorded as 14.14 tonnes of cassiterite concentrate. Limited records show the recovered grades varied between 255 and 420g/m³ (Keid, 1952). Mining ceased in 1952 due to narrowing of the lead and unsafe overburden heights.

The 1937 Government drilling at Amber Creek are of some interest for future investigation of alluvial Sn potential. Although only 17 of the holes intersected "wash" (cassiterite bearing gravel) at the base of the gravel profile, some substantially high grades were identified. Portions of the Amber Creek deposits have been mined but it is not known whether any part of the high-grade deep lead remains after mining operations prematurely ceased in 1952 due to unsafe working conditions. Shallow high grade mineralization may remain with historical reports indicating mineralization is potentially open to the NW prompting interest for current and future exploration investigative efforts.

2.1.2 WYNIFORD RIVER

Tin mining was commenced in the Wyniford area in the 1870s by Chinese miners. Companies operating in the area included the Garibaldi Tin Mining Company (reporting in local newspapers in 1876) The South Garibaldi Tin Mining Co NL operating in the 1880s). By the year 1888 a town had become well established at Garibaldi on the western bank of the river some 3km south of Pioneer. Mining appears to have peaked in the area in about 1891 but by 1893 was in decline as most of the easily worked ground had become exhausted. Subsequently European miners constructed water races throughout the area, particularly around Garibaldi and worked extensions to the older workings. The Rajah Tin Mining Company operated from before 1928 to at least 1935. In the mid-1970s several small machine mining operations commenced in the upstream areas (such as the Wildcat workings). For a short period, B.M.I Mining held a small 10-acre lease in the upstream section but did not conduct any work on the ground. By the early 1980s all mining activity had ceased.

2.1.3 MUSSELROE RIVER LEADS

Alluvial tin occurs in the Musselroe River system for an extraordinary strike length exceeding 14 km. Where drilling has been done in the past, grades locally are encouraging though the known better areas are probably inaccessible for mining due to environmental concerns and making the area likely to be restricted on environmental conservation grounds.

The earliest recorded mining in the southern Musselroe River area was at the Eastern Terrace with mining reported to have commenced as early as 1890 with operations documented until 1959. The upper shallow stanniferous ground was worked intermittently to a maximum of 4 m. The principal operator was the Great Mussel Roe Proprietary Company, who abandoned the area in 1901. From the size of the pits it has been estimated that approximately 575,000 m³ of material was mined though the grade of this material is unknown (Appleby, 1964).

At Wood's Flat, the first recorded mining activity was by M.H. Groves and F.D. Richardson, who held the ground in 1946 (Keid, 1946). No production figures are given by Keid, but a recovery of 590 g/m³ is quoted. In the period 1948-1957 the property was leased by the Lanka Tin Mining Company who treated around 205,000 m³ of material before abandoning the property due to difficulties in handling the large amount of log debris overlying the ore zone (Howard, 1963). In 1957 Dunn and Park began operating Pit No.1 and treated around 17,000 m³.

In 1959 Wood and Bartels acquired the Wood's Flat property and from 1960 operations continued under the sole ownership of V. Wood to at least the mid-1960's. A calculation based on pit surveys carried out by Utah Development Company showed that to February 1964 Mr Wood worked 330,000 m³ of material from two pits with an estimated recovered cassiterite grade of 255 g/m³ (Howard, 1963). Average mine grades were reportedly maintained by the balance of low-grade sheets of basal gravel with richer patches contained in small depressions and gutters. The depths of the Wood's Flat pits varied from 5 to 10 m. Mining was by water cannon and sluicing methods.

At the North Mussel Roe Proprietary workings, around 2.3 km north of the Eastern Terrace workings, the Musselroe Lead system crosses to the west side of the present river where two small faces were worked in the early days by the North Mussel Roe Proprietary company. Early records show that the southern face, developed to a granite bedrock base at about 6 m depth was the principal producer. Along the shallow eastern edge, the tin values were payable, but the deeper ground was found to be poor (Twelvetrees, 1901). The tin-bearing wash is described as a granitic sand composed of sub-angular quartz, feldspar, yellow clay, cassiterite and mica.

At the Elizabeth workings to the north, Reid (1952) reported that the first two clean ups produced about 2 t of cassiterite concentrate but no full records of production are known.

East Cybele Terrace, located NE of Traceys on the east side of the Musselroe River, was drilled in 1953 by the Department of Mines (99 holes at 30m spacings on three lines 80m apart). Utah Development Co reviewed the data in the 1960's and calculated a possible resource of 68,500m³ at 180g/m³.

2.1.4 SOUTH MOUNT CAMERON (DOREST DREDGE)

In the early 1900's attempts were made by several companies to recover tin by dredging from alluvial flats of the Ringarooma River east of South Mount Cameron. These dredges were steam-driven and used sluice boxes to recover tin and gold. In the Dorset Flats area, two dredges operated in the early 1900's. These were the Ringarooma Bucket Dredging Company and the Dorset Bucket Dredging Company. Records indicate that the Ringarooma dredge produced 116 tonnes of tin and 210 ounces of gold during 1907-1909 (Neal, 1980).

The Dorset Bucket Dredging Company was formed in March 1906 and at first instigated a boring campaign. Forty-seven bores were drilled on three lines, the bores being approximately 15 metres apart. The average depth of the ground was 4.8 metres and the average grade was 706 g/m³. Values ranged up to 2.8 kg/m³. A further thirty-three bores were put down towards the high ground to the west. The average depth was 5.8 metres and the average cassiterite content was 356 g/m³. Besides tin, gold was also indicated. The Dorest dredge commenced operations in 1907 and for the 4 or so years up to and including part of 1910 it produced 159 tonnes of tin and 239 ounces of gold.

In 1910 a new company, the South Mount Cameron Tin Dredging Company was formed from the Dorset Bucket Dredging Company and the plant was altered and repaired. The Company however had very disappointing results. In 1911, according to the Annual Report of the Secretary of Mines, 4.93 tonnes of SnO₂ and 303 grams of gold were obtained. In 1912, the company evidently ceased operations however 2.75 tonnes of tin and 46.6 grams of gold were won in the first quarter of that year (Neal, 1980).

During the Second World War when tin was in short supply because of the occupation of the major tin-producing nations in South-East Asia by the Japanese, the Minerals Production Committee of the Department of Supply and Shipping carried out a survey of Australia's tin resources. In 1942 the Mineral Production Committee carried out a boring program and combined results with previous drilling to identify an area of 9.7 ha having an average depth of 8.8 metres and comprising approximately 8.6 million m³ with an average grade of 196 g SnO₂/m³. The tin and accessory gold were restricted to the basal gravel wash with the overlying alluvium identified as being barren.

In 1943-1944 the Commonwealth Government obtained a gold dredge from Redbank in Victoria and dismantled, redesigned and re-erected it on the Dorset Flats. Operations commenced in October 1944. Mining of Dorset Flats was completed by July 1959. The area yielded just over 2000 tonnes of tin concentrate assaying 75% Sn and 171 kg of gold with an estimated total throughput of 19 million m³ at 105g SnO₂/m³.

The Dredge was then transferred to an area known as the Dorset Extended Flats approximately 1.6 kilometres downstream from previous workings at Dorset Flats. Productive operations on Dorset Extended commenced in August 1959 and were completed in May 1963. Dorset Extended Flats yielded approximately 432 tonnes of tin concentrate assaying 75% Sn and 43.5 kg of gold with an estimated total throughput of 3.98 million m³ at 100 g SnO₂/m³.

Small scale alluvial mining has apparently been undertaken by several workers up until recent years. There is sparse information available on these activities and further research is required.

2.1.5 EAST GLADSTONE WORKINGS

The East Gladstone workings occur on the eastern side of the Ringarooma River east of Gladstone and comprises historical mine workings of the (from west to east), Murrays Reward, New Esk, Empress, Hardens Ravine, Mallinsons, Tamar, Eureka, New Star Hill, Garfield and Cybele. Historical mining was predominantly on Tertiary gravel terraces and deeper lead deposits with some primary tin greisen-related mineralisation also reportedly mined.

2.1.5.1 EMPRESS

The Empress zone is defined as the area containing historical workings of the Murrays Reward, New Esk, Empress, Hardens Ravine, Tamar and western Garfield. It contained scattered Tertiary alluvial deposits that rest on a granitic basement that contains primary tin mineralised greisen and quartz veins adjacent to a contact with metamorphosed Mathinna Beds. The area is first mentioned in a report by Montgomery (1891).

The Empress lead lies on the north side of Hardens Ravine in a roughly N-S trending saddle gully that cuts through granite forming the locally high ground of Empress Hill. The gully preserves a stranded Tertiary gravel lead that sits some 20 to 30m above the course of the present-day Hardens Ravine creek. Reid (1928) supposed the remnant lead to mark the course of a joining tributary of the Garfield lead. The Empress lead is described as being narrow, some 135 m wide at its top and 50 m wide at its base, and about 12 m deep. Tertiary gravels are described as lying on soft greisenised granite and its associated elluvium, with the high-grade cassiterite content within basal beds attributed to the presence of the tin-bearing greisen (Reid, 1928). A typical section of the lead is described by Reid (1928) and Twelvetrees (1901) as:

- 0 to 7.5 m: Ferruginous sandy clay underlain by white feldspathic sands;
- 7.5 to 11 m: Alternate bands of fine gravel and feldspathic sands with occasional large boulders of decomposed granite (upper fine gravels);
- 11 to 12 m: Coarse quartz and greisen boulder gravels (basal wash);
- >12 m: soft coarse biotite granite merging into stanniferous quartz-mica greisen.

The upper fine gravels overlying the basal wash consist of white vein quartz and rounded smokey quartz crystals with lesser pebbles of aplite and greisen. Reid (1928) noted these to be “exactly similar in nature and appearance to the gravels of the Garfield lead”, although some of the stones are relatively less-worn. The basal wash is comprised of mostly boulders or quartz, greisen and granite that generally show little evidence of attrition, indicating that they have not travelled far from source.

Twelvetrees (1901) reported the Empress lead to have yielded excellent tin, coarse in character with cassiterite nuggets weighing up to one ounce.

2.1.5.2 TAMAR

The Tamar workings, developed in Tertiary gravel near the head waters of Hardens ravine (north side), around 800 m east of the Empress workings, are bounded by a north face of Mathinna beds which Twelvetrees (1901) interpreted should be underlain by a biotite granite that outcrops south and west of the workings. The gravel wash at the Tamar workings

comprised a clayey, often iron-stained compacted sand containing abundant grey sandstone and granite pebbles

2.1.5.3 NEW ESK

Historically the New Esk-Mallinsons area was worked for very rich but narrow gravel runs in gutter deposits draining into the Hardens Ravine creek. Some of these gutters appear to be a southern extension of the Empress lead system. It has been noted as early back as 1891 (Montgomery, 1891) that at least part of the tin in these gutters was derived from the local bedrock, having shed from greisen veins in the proximal granite.

At the New Esk workings, shallow coarse boulder gravel wash, believed to be the southern continuation of the Empress lead, overlies fine grain to porphyritic granite, veined with tin-bearing greisen. Some of the greisen vein were worked from surface to depths of around 3m. The greisen veins were reportedly up to 1 m wide and some could be traced for up to 100m along strike (Reid, 1928). The system of sheeted NNW-trending greisen veins was proven to extend westwards of New Esk to the Ringarooma river, a distance of around 150m. These veins were opened at a number of points by pits and trenches and an adit was driven eastwards from the river for 30m and intersected “several” greisen veins. The adit is over 30m below the summit of the New Esk hill and so confirms that the greisen veins extend to at least this depth below surface. Reid (1928) reported that examination of the greisen ore from the dump of this adit and at the other openings shows that “it is everywhere tin-bearing” but the grade varies greatly from point to point.

2.1.5.4 MALLINSONS

At the Mallinsons working (about 700 m east of New Esk), sheeted tin-bearing quartz-mica greisen veins in decomposed granite were historically worked for tin (Reid, 1928). The veins, which varied in width from 0.2 to 2 m, were able to be traced up to 180 m along strike to the SE.

2.1.5.5 MURRAYS REWARD

Continuing around 800m NNW along the strike if veins from New Esk is the Murrays Reward (aka Murrays Tin Lode) workings on the western end of Empress Hill. Here a 0.3-0.5m wide greisen vein hosted in metamorphosed Mathinna Beds were worked by trenching and a shallow shaft during the late 1890's / early 1900's. Greisen on the dump shows coarse disseminated cassiterite mineralisation.

2.1.5.6 GARFIELD

The Garfield workings were developed in Tertiary gravels are situated on high ground between the Ringarooma River to the west and the Musselroe River to the east. The Tertiary gravels on the ridge are mapped as being some 1500 to 2000 m long (E-W) and 750 to 900 m wide (N-S). In the eastern section the gravels are bounded by metamorphosed Mathinna beds, while to the west granitic bedrock surrounds. Historical mining intermittently worked Tertiary gravel leads on the hill but often succumbed to high water pumping costs required for the hydraulic mining and sluicing methods employed. The west face which was around 5 m high comprised alternating layers of loose sand and quartz gravel.

Twelvetrees (1901) noted that the Garfield workings had been profitable but pumping costs had caused the mine to close. In 1904-6 The Cybele Tin Mines NL drilled 142 holes

indicating enough material to commence mining but there were doubts over the reliability of the work.

Mining by Garfield Tin Mining Co recommenced in 1926 but ceased in 1929. Drilling was undertaken and showed the main alluvial lead extended over 2km. Although the greatest thickness of alluvium was 20m, commercial concentrations of tin were only present in the uppermost bed which is less than 6m thick. In addition to drilling a number of shafts were sunk to more accurately assess the grades of the wash. A total of 1,350,000m³ was estimated to be available for sluicing from the top bed. No grades were quoted.

McIntosh Reid (1928) notes that the No.9 pit and 2 prospecting shafts in the western area of the Garfield lease exposed greisen veins which are apparently a southern continuation of those at the Mallinsons workings.

In the early 1960s the Star Hill Syndicate mined the resource at Garfield (New Star Hill). Utah Development Co, exploring here at the time noted production of 25 tonnes of cassiterite concentrate per year, and in 1962, 20 tonnes from 73,000m³ for 275g/m³. Utah attempted a few exploratory drill holes at Garfield in 1964 but was considered unsuccessful as holes failed to reach bedrock.

2.1.6 STAR HILL

At the old Star Hill workings, south of Gladstone, historical mine workings exploited deep lead alluvial and eluvial tin deposits that overly an apparently sheeted mineralized quartz vein system in granite. Bedrock geology is described as weathered coarse grain biotite-muscovite pink granite hosting numerous tin-bearing veins. Cassiterite-bearing white quartz veins occur hosted in coarse grain biotite±muscovite pink granite. The quartz veins vary in thickness from 5 to 10 cm (Twelvetrees, 1901). Tungsten, chalcopyrite and other sulphides also reported in quartz veining in the area.

Hydraulic mining and sluicing of material comprised of part alluvial drift and gravel and part weathered porphyritic granite commenced by the Star Hill Syndicate in 1935 until 1939 due to unreliable water supply. The manager at the time considered that the grade of ore remaining was sufficient to warrant further exploitation provided an assured supply of water was available (Keid, 1952).

2.1.7 OLGILVIES FLATS

Production from Purdue, Jewel Flats, Edina and Dawes, worked from before 1901 to 1921, was calculated by Utah [64-0381] to total 1,180,000m³; grade not known except that at Purdue 300,000 m³ was at about 600g SnO/m³. Limited drilling by Utah Development Company in the 1960's indicated that these were Quaternary terrace deposits of the present Ringarooma River with little tonnage potential (in the areas drilled).

2.1.8 BLUE TEIR TIN FIELD

Modern exploration has been carried out, mainly around the Anchor mine, by various companies since the 1960's. The Anchor mine historically produced about 3,800 tonnes of tin from treatment of about 2 Mt of ore at a recorded grade of 0.2% tin. Mineralization is hosted by several relatively flat-lying deposits associated with granitic contacts. The extent of mineralization has attracted several drilling phases over the years and a pre-JORC

resource estimate of 8.8Mt @ 0.18% tin was made. A higher grade zone was subject to shallow but unsuccessful underground mining efforts in 1990-91 and 1995-96.

Between 1989 and 1991 Spectrum Resources Pty Ltd is estimated to have mined 124,000t at 0.61% tin and Mancala Pty Ltd 91,000t at 0.40% tin in 1995-96. Spectrum developed an underground mine and gravity concentrator at Anchor during 1988-89 with a capacity of 100,000 t/y and a projected a mine life of six years. Their project was commissioned in January 1990 but unfortunately, tin prices fell dramatically from over US\$10,000/t in 1988 to less than US\$6,000/t in 1991. Operations were suspended in December 1991 in response to grade problems, an under-performing mill, and the weak tin price. In July 1994 Spectrum was purchased by Mancala Pty Ltd (Mancala) after a feasibility study of the Anchor Mine had been completed. Additional metallurgical testing was carried out and this company undertook some modifications to the mill. Mancala re-opened the mine during 1995-96 and also retreated some tailings but the mill still under-performed and head grades were below expectations so the operation was again suspended. In 2001 the mine was formally closed and rehabilitation work was carried out during the year. This included the sealing of underground workings, the dismantling of the concentrator and transport of it from site, and the disposal of rubbish. The tailings dam wall was stabilized and re-contoured and disturbed areas were seeded and fertilized.

2.1.9 VAN DIEMAN MINES PTY LTD

In more recent times, during 2014 Van Dieman Mines Pty Ltd (VDM) entered into an option to purchase from Mineral Holdings Australia Pty Ltd (MHAPL) tenements containing all or part of the Scotia, Central Ringarooma, (Pioneer, Endurance, Monarch), Great Northern Plains, Wyniford and Ringarooma offshore alluvial tin resources. Despite successfully applying for a mining license over the Scotia deposit and subsequently securing off-take agreements for the sale of tin concentrate and gem quality sapphires as well as construction of a processing plant and commencing trial mining, VDM failed to successfully develop the projects and entered into administration during 2009 and was eventually liquidated in 2010 due to a deterioration in the Company's cash position and short-term projections. The failure of the company to successfully develop the Scotia mining operations has been attributed to a number of poor management decisions, including:

- Failure to validate the resource before committing to infrastructure expenditure;
- Commencing mining operations in an area where little information regarding the resource exists;
- Designing and sizing the processing and tin dressing plants without sufficient knowledge of the nature of the resource;
- Proposing an unsuitable mining method for the mining conditions likely to be encountered;
- Sourcing a processing plant from overseas that was impractical to operate and did not meet usual Australian safety standards.

2.2 HISTORICAL GOLD MINING

2.2.1 POPES PROSPECT

Nye (1933) described Popes prospect as a numerous group of workings comprising trenches and shafts along a general NE trend. A grab sample of quartz taken from the dump of the

main shaft by Nye yielded 10.3 g/t Au and 4 g/t Ag. No further record of the workings has been found.

2.2.2 MCGOWANS PROSPECT

Keid (1946) reported McGowans prospect as comprising a shaft approximately 20m deep that was developed on a free-gold bearing zone of NEE trending quartz veins, 0.3 m wide, hosted in slate. The sampled veins returned 6.8 g/t Au (Keid, 1946), which was considered low grade at the time. Several test trenches were also reported in the area but apparently no profitable ore was identified within them.

2.3 PREVIOUS EXPLORATION

Previous exploration within EL18/2016 has been carried out numerous groups since the early 1960's. Most of these efforts were focused on alluvial tin resources with very little done in the way of primary tin or gold exploration.

2.3.1 UTAH DEVELOPMENT COMPANY 1963-64

Utah Development Company Pty Ltd (Utah) which was granted an Exploration Licence (EL6/1963) over a large area of tin potential in NE Tasmania. Ten areas were selected by Utah for detailed follow-up assessing placer alluvial deposits. Utah also secured a six-month option agreement with Mr V Wood over his Wood's Flat/Eastern Terrace properties. During 1963, Utah carried out field investigations and appraisal of the alluvial tin potential of Quaternary and Tertiary leads in the vicinity of the Woods Flat workings and the area extending north from Woods Flat through the Eastern Terrace and the Edina, Cybele and Garfield workings. Work included review of previous prospecting, preliminary mapping, study and measurement of the alluvium profile in workings along the Musselroe Valley around Wood's Flat-Eastern terrace area and further field reconnaissance of all the larger mining operations and abandoned workings to the north of Wood's Flat (Howard, 1963).

In his review, Howard (1963) reports that the Endurance Tin Mining Company drilled 80 bore holes on eight traverses spread over a strike length of 1.8km between Wood's Flat and the Eastern Terrace workings in the South Musselroe area during 1951. Holes varied in depth from 1.5 to 19 m. Results included seven holes that returned grades varying from 785 to 4000 g/m³ of tin concentrate occurring in a well-defined stanniferous channel. This area also included an additional 43 holes varying in grade from trace to 700 g/m³ cassiterite (Howard, 1963). From these figures, an estimated available resource of between 2.4 and 3.3 million cubic meters grading 265 to 239 g/m³ of cassiterite was calculated (Howard, 1963).

Following the estimated placer tin potential reported by Howard (1963), in 1964, Utah carried out boring tests along eight traverses spaced at 600m intervals along the Musselroe River, between Wood Flat and Eastern Terrace workings (80 holes totalling 628 m, with an average depth of 8m). Results from the boring indicated that the Wood's Flat area contained 941,000 m³ of material, averaging 7.5 m deep, with a tin grade of 160 g/m³, and that the unworked ground in the Eastern Terrace aggregated to approximately 383,000 m³ of material, averaging 3 m deep, with a tin grade of 167 g/m³ (Appleby, 1964). These tonnages and grades were below the feasibility expectations and no further work was carried out. It is important to note that these historical resource calculations were based on whole-of-hole tin grades, i.e. no cut-off grade applied.

Utah (Appleby, 1964) noted that the drilling had clearly indicated that for the greater part, at least of Tertiary time, the two deposits were separate entities. The Eastern Terrace area contains a deep (16-27m below surface) lead resting on the granite basement, typically containing low grade tin but large quantities of nodular and disseminated marcasite, and a series of shallower leads formed in narrow gutters that drain the weathered granite and eluvium. In comparison the Wood's Flat lead is broader (average 300 m wide) in cross section and its floor has a less marked slope in long section. The Wood's Flat alluvial contains little marcasite and its basal wash contains tin with an approximately equal quantity of ilmenite and small amounts of garnet. The difference in the heavy mineral makeup of the two areas suggests the two leads had markedly different primary sources.

Interestingly, Appleby (1964) notes that the tin concentrate from worked pits in the shallow gutters of the Eastern Terrace area is coarse and nuggety in nature, containing a high proportion of chats (small nuggets attached to quartz) and minor ilmenite. Tin-bearing gravels in these gutters varies to 2m in thickness but are mostly thin. Tin grades of up to 1.2 kg/m³ were recorded in such gutter deposits. Low grade cassiterite was also reported from eluvial material in the headwaters of some of the gutters. These observations caused Appleby (1964) to consider the source area for this tin to be the exposed granite immediately surrounding the Eastern Terrace. Despite this, and observations of quartz and pegmatite veins as well as greisen in the exposed bedrock of the Woods Flat workings, there appears to have been no effort to assess the potential of primary tin mineralisation in the area.

Utah also tested the potential of a 3 km zone along the Musselroe River between Traceys and North Musselroe (north of Eastern Terrace) which they referred to as Test Area 5. This was tested by a drilling programme of approximately 500 metres in 69 holes but only 11 holes contained tin values above 100g/cu m (whole-of-hole grades). The tin was found to be isolated to thin, discontinuous basal gravels and it was decided that because of its swampy nature and the lack of encouraging results, no further work would be undertaken in the area.

Utah also drilled east of the Musselroe River, south of the Anson's Bay Road in 1966. It was speculated that a series of generally linear disconnected reed swamps might indicate an ancestral drainage. A total of 32 reconnaissance auger holes were put down on three lines and defined a broad flat floored channel approximately 1200m wide, and in excess of 1km in length, containing a maximum of 40m of sediments. 19 sample holes were drilled to test the section, which consists of an upper and lower sand and gravel horizon, separated by a continuous blanket of carbonaceous siltstone.

2.3.2 TEXINS DEVELOPMENT PTY LTD 1968-1974

In 1968 Texins Development Pty Ltd were granted an exploration Licence over the Wyniford and surrounding areas (EL 6/68). In 1973-1974 Geophoto Resources Consultants, for Texins, conducted reconnaissance field work, pitting and sampling of alluvial deposits along the river terraces flanking the Wyniford River. 172 backhoe pits were dug, 152 of which were channel sampled, and a total of 300 samples processed. As a result of this activity, Texins established two discrete resource volumes, which were recalculated in 2006 by VDM (Kinnane, 2007) after metric conversions and bulk sampling from 4 test pits to be (JORC Inferred):

- **311,712 bcm at an average grade of 318 g/bcm containing 99 t SnO₂.**

The average resource thickness at the Wyniford Project is reported as 1.8 m and no deeper than 6m.

2.3.3 B.M.I. 1971

During 1971 B.M.I. Mining Pty. Ltd. conducted an exploration programme along a 4km section of the Mussel Roe River from north of Eastern Terrace in the south to Tracey's workings in the north. The programme involved the drilling of 90 percussion drill holes for a total of over 945 meters of drilling. The drilling was completed over 8 lines spaced roughly 2000 ft (600m) N-S with drill holes located on 100 ft (30m) centres along the lines. Drill holes were sampled and assayed on 5 ft (1.5m) intervals with tin grade results calculated on a whole-of-hole basis.

BMI concluded that the drilling program did not encounter sufficient resources to warrant mining operations and relinquished their interest in the ground. It was noted that the tin grade results were not consistent in either length or width along the system. Review of the BMI results indicates that some narrow, generally thin, high-grade basal wash zones were intersected during the drilling and it is unsurprising that these could not be traced given the very widely spaced drill lines. Any alluvial tin resources along the Musselroe River system are likely to be of small tonnage given their generally limited thickness (mostly less than 2m of tin-bearing basal gravel).

2.3.4 AUSTRALIAN ANGLO AMERICAN 1980/81

In 1980/81 Australian Anglo American Limited (AAAL), under agreement with Amdex Mining Limited, carried out a review and assessment of the alluvial tin potential of the Ringarooma valley (Newton-Smith, 1981). AAAL developed a conceptual model for the accumulation of alluvial tin in the Ringarooma Valley based on an interpretation of the Cainozoic geology and existing geomorphic features. This model was then applied to the search for extensions of known reserves and to the search for new reserves. It was concluded that while a single large-scale dredging operation of AAAL's target parameters was not identified, the Ringarooma Valley remained prospective for small scale tin dredging operations as well as for several deep lead situations. It was considered that small scale dredging operations with a throughput of about 1M cu m per year may be worthy of some consideration in the lower Ringarooma and Great Northern Plain area. Prospects of extending known reserves in deep lead situations were considered good with a reasonable likelihood of locating virgin leads, particularly in the Boobyalla area. It was further considered that three or more of these deep leads could be worked in rotation to provide reserves in excess of 50M cu m. No placer deposits of significant size or grade were identified within the current area of EL18/2016 (only the Dorset Dredge area is mentioned).

The eastern leads of the Musselroe River section were broadly prospected by Utah Development Co in the 1960's. Utah carried out ground assessment work followed by very broad-spaced boring over the extensive Musselroe Lead system. Results were characterised by low tin grades and narrow wash intervals and little follow-up work was carried out.

2.3.5 GEOPEKO 1978-79

Geopeko carried out exploration activities aimed towards assessing the shallow bulk mining potential of tin-bearing greisen at the Fly-by-Night prospect near Gladstone. Initial work

consisted of reconnaissance geological mapping, bulk sampling of greisen and greisenised granite, assaying, heavy mineral separation, mineralogical and petrological examinations. The results of this work indicated that there was potential for 4.5 million tonnes of greisen of a grade that was interpreted to be potentially economic.

Geopeko followed up the preliminary works with a program involving gridding (6 line-kms), surveying, geological mapping (1:1000 scale), reverse circulation drilling on 50m centres (95 holes totalling 536 metres with average depth 5.6m with the deepest hole being 15m. Drilling undertaken consisted on percussion drilling (2 holes of 14m and 10m depth), diamond drilling (1 hole of 24.38 m depth), with assaying and computation of estimated resource tonnages and grade. Based on the results of this work, a probable shallow reserve of 658,000 tonnes grading 290 ppm Sn (± 50 ppm), and a possible reserve of 2.6 million tonnes of 110-316 ppm Sn was estimated. Geopeko concluded that insufficient tonnage, low cassiterite grades and inhomogeneous distribution of cassiterite within the greisen body rendered this resource uneconomic at the time of investigation. However, given the very shallow depths and wide spacing of the drill holes, it is unsurprising that such a result was obtained. There appears to have been no specific targeting of high-grade greisen veins.

2.3.6 SANTOS 1981-82

In 1981 Santos carried out a programme of rock chip sampling (143 samples) at the historical Fly-by-Night hard rock tin workings and drilled two drill holes (DFBN4 and BFBN5) totalling 150.5 metres in depth. Three other drill holes had been planned but were not drilled.

Results of the rock chip sampling indicated that locally higher grades of tin occur in greisen alteration in a cupola-like contact with the overlying Mathinna Bed rocks. Anomalous tin grades varying between 0.12 % and 1.0 % Sn were received from 9 rock samples. All other samples returned elevated tin values, generally between 100 and 990 ppm Sn.

Drill hole DFBN4 (86m) intersected variably altered granite over its entire length, comprising alternating bands of hard siliceous quartz-mica greisen with associated quartz veins, and kaolinite altered partly greisenised granite. A zone of widely spaced (1 to 3 m) sheeted 0.1 to 0.3 m thick quartz veins was noted at 30 to 58 m depth downhole. No visible cassiterite was observed. It is noted that the hole diameter was HQ from surface to 39m and then NQ for the remainder of the hole. Core samples were assayed for Sn, Ag, Ta, Mo, W and Au.

Best assay results from DFBN4 were:

- 2m @ 0.9 % Sn from 81m in grey-quartz veined soft clay-mica-quartz rock.
- 2m @ 0.1% Sn from 49 m in kaolinized granite with minor quartz veining.
- Note: Sn values were consistently elevated in the altered granite, averaging 500 ppm Sn over the whole drill hole and typically ranging between 150 and 550 ppm Sn.

Drill hole DFBN (64.5m) intersected spotted siltstone and mudstone hornfels to 14m, followed by a 1.5m contact zone comprising soft kaolinized greisen altered granite and then variably greisen altered and kaolinized medium grain granite with minor quartz veining to 42m. No core was returned past 42m apparently to due extreme softness of the altered granite and only sludge samples were collected.

Best assay results from DFBN5 were:

- 3m @ 0.1 ppm Sn from 58.5m.

- Note: Sn values were consistently elevated in the altered granite, averaging 200 ppm Sn over the whole drill hole and typically ranging between 100 and 500 ppm Sn.

Santos followed up the drilling with a wide-spaced (200m spaced lines with 50m sampling centres) gridding program in an 8.4 Sq.km area immediately east, south and southeast of Gladstone, covering the Gladstone goldfield area and extending south and southeast over the Star Hill and Enterprise prospects and eastwards to the New Esk – Garfield areas, that included geochemical hand auger soil sampling, geological mapping (1:5000 scale) and trenching. While, the results of the program proved interesting for primary tin mineralisation potential, several anomalous gold-in-soil results saw subsequent activities being directed towards gold exploration.

Tin analyses from the surface geochemical sampling grid showed some degree of correlation with rock type e.g. in the east-northeast sector, a large area of anomalously low tin values (<10ppm Sn) corresponded with mapped Poimena pluton granite whilst the later stage equigranular biotite-muscovite “tin granites” and associated greisen units typically had anomalously high tin geochemistry (+100ppm). Santos also noted an apparent structural control of tin values showing a distinct northwest-southeast trend related in part to late stage quartz veining and faulting. Based on these results, Santos identified four prospective areas for significant tin mineralisation:

1. **Hardens Ravine:** Two of four samples from a quartz-muscovite greisen body, some 200m wide and of undefined strike extent returned anomalously high values of 300 and 580 ppm Sn in the areas of the historical New Esk workings. Only one grid line passed into the southern part of the Hardens Ravine area and the anomaly remained untested/open to the north.
2. **Fly-by-Night:** An area of greisen and kaolinite altered granite located adjacent to the contact with Mathinna Bed rocks, at least 200m wide and elongated northwest-southeast returned eight assays in the range 210-460 ppm Sn. Santos’ geologists considered this area to hold significant exploration potential given the preliminary results and relative lack of modern exploration.
3. **400m west of Fly-by-Night:** Here a 250m wide roughly circular area of +200ppm Sn overlaps greisen developed at a tri-contact between older porphyritic feldspar granite, younger altered granite and highly altered Mathinna Beds. The geology and geochemistry is further complicated by a Tertiary gutter (defined by +500ppm Sn contour) and shallow eluvial wash. It was speculated that this area maybe an extension of the Fly-by-Night system beneath shallow Mathinna Beds and older porphyritic feldspar granite cover.
4. **Star Hill:** A 200m wide and at least 300m long elongate zone is defined by elevated +200ppm Sn values and within which a higher grade zone is defined by +500ppm Sn. This zone lies in an area of NW-SE trending quartz and rare greisen veins. To the south and southwest this zone is covered by Tertiary alluvials and perched river terraces. The host rock is a medium grain equigranular biotite-muscovite granite lying beneath and in near proximity to older porphyritic feldspar granite. Santos speculated that the stanniferous quartz and greisen veins may represent leakage from a larger greisen body within a blind cupola at depth and as such constitutes a target worthy of further exploration.

Review of the Santos surface geochemical and mapping data indicates that the anomalous zone, represented by tin values of +100ppm at Star Hill is up to 650m wide (E-W) and some 800m long (N-S). The anomaly occurs within the younger equigranular tin granite at the southern contact of the older porphyritic granite. The Fly-by-Night and Fly-by-Night West anomalies are situated on the exposed northern contact with the older porphyritic granite. The general NW-SE trend of veining and surface geochemical anomalies would support an interpretation that the Star Hill mineralisation is a southern extension of the Fly-by-Night mineralisation. If this is the case, then there is an obvious exploration target under the porphyritic granite which outcrop between the two areas. Zones of intermittent greisen alteration have also been mapped in porphyritic granite cover rocks, further suggesting it is forming a roof over the below greisen altered and tin mineralised (?) equigranular biotite-muscovite granite.

2.3.7 VAN DIEMAN MINES 2003-2009

Probably the most comprehensive exploration effort within the EL18/2016 boundary since the early 1980's occurred in the Wyniford River area where in 2002 Mineral Holdings Australia Pty Limited were granted EL 1/2003, which was transferred to Van Dieman Mines (VDM) in 2004. VDM conducted exploration until 2009 which included collection of four bulk samples by excavator, of about 30 m³, from three areas. One bulk sample from the south, Sample 3, in the area of the Wildcat Workings, had coarse cassiterite, in sizes up to 10 mm, much of it being locked on greisen or quartz fragments. This suggests that a bedrock source could be nearby and a wide area of anomalous tin in stream sediment sampling at the headwaters of the Wyniford River, over an area 1 to 3 km south of the Wildcat workings seems to lend additional support to this idea.

Significant quantities of sapphire averaging >3 g/bcm (30% gem quality) were noted from samples collected in the Wyniford River drainage.

VDM spent some time carrying out, but did not complete, surveying field locations of earlier Geophoto pits, so that more accurate resource calculation could be made. They discovered a previously unrecognized older Tertiary lead to the west of the river, but apparently carried out no sampling there.

Kinnane, (2006) notes that the calculated Wyniford resource estimate only covers the central area where Geophoto conducted pitting, and considerable potential remains untested in Tertiary alluvium to the south and to the north.

2.3.8 MACQUARIE HARBOUR MINING 2007-2010

Macquarie Harbour Mining (MHM) carried out limited tin and gold exploration as part of their North East Tasmania Project under EL's 3/2007, 2/2007 and 66/2007. HMM were targeting placer tin deposits and planned to carry out a program of bulk sampling using a trailer-mounted tin sampling plant. However, these plans were postponed due to restrictions placed on the extent and volume of bulk sampling pertaining to the conditions of the Exploration Licence and difficulty of access to the areas of interest.

Exploration carried out by MHM was generally reconnaissance in nature. At the old Star Hill workings Richardson (2009) reported on the reconnaissance of an adit about 20m long, striking 330 degrees and follows a thin subvertical vein carrying cassiterite, chalcopyrite,

wolframite and other minor sulfides and associated secondary minerals. The vein is between 5 and 10 cm wide.

Richardson (2009) also commented on visiting an abandoned road gravel quarry between the old Chum Dam and the Musselroe River (along Tebrakunna Road?) in which outcrop of decomposed granite with a greisen appearance (comprised almost entirely of quartz and muscovite with minor tourmaline) was noted but apparently not sampled.

MHM engaged Geological Consultant Revel Munro to investigate the economic potential of alluvial tin deposits on MHM's Gladstone tenements and provide a report that was able to rank their relative prospectivity. This review involved sourcing literature not only in the public domain but also from Munro's personal collection and included old mining plans, company correspondence and uncirculated reports. A third of his time was spent in the field using a 4WD and "Quad-bike". Munro complained that "access to the many mines on the eastern side of the Ringarooma River are now slow tedious journeys over non-maintained degrading tracks restrictive to vehicle type and weight. Five out of the eight significant bridges servicing the area are now gone, while the other three have weight limits". Apparently walking was not a favoured option. Munro concluded that only two localities hold sufficient alluvial tin potential for further serious investigation - the Cybele-Tracey's and Amber Hill areas.

2.3.9 TIN DRAGON PTY LTD 2011-2015

In 2011-2012 Tin Dragon Pty Ltd applied for and was granted a series of Exploration Licences in the NE Tasmania. Tin Dragon carried out extensive data compilation and review but carried out very little actual field exploration activity. After failing to on-sell the tenements, Tin Dragon eventually relinquished most of their EL's but applied for Retention Licences over known deep lead placer deposit resources at Pioneer, Endurance and Scotia in 2016 (despite having contributed nothing in the way of work or expenditure towards these resources). It is understood that these Retention Licences are still under application.

2.3.10 GOLD EXPLORATION

No records of modern-era exploration for gold in EL18/2016 has been located during Kingfishers literature reviews.

3 EXPLORATION COMPLETED DURING REPORTING PERIOD

Exploration activity undertaken during the first year of tenure of EL18/2015 included:

- Collation, review and assessment of historical mining and exploration information;
- Development of priority exploration targets for primary tin and gold;
- Field reconnaissance visits and sampling at selected target areas;
- Planning for exploration activities at priority target areas.

3.1 COLLATION AND REVIEW OF PRE-EXISTING DATA

Collation of historical mining and exploration data continued with a focus on identifying key prospective areas for primary tin mineralisation within the EL. Sections 2.1, 2.2 and 2.3 of this report summarise the results of the review. Tables summarising historical mining and prospecting, previous exploration, geology, mineralisation, resource estimates and key exploration results for individual prospect areas are attached in Appendix I of this report.

3.2 RECONNAISSANCE FIELD VISITS

Reconnaissance field visits were carried out to selected target areas, including the Hardens Ravine area (historical Empress, New Esk and Garfield workings), the Popes gold prospect, and the McGowan's gold prospect area. Assay results of 25 rock chip grab samples from the visited areas are tabled in Appendix II.

3.2.1 HARDENS RAVINE

Around 1 week was spent investigating the Hardens Ravine area around the historical New Esk, Empress, Mallinsons, Garfield and Murrays Reward workings. Outcrop in the area is dominated by variably greisen and kaolin altered medium to coarse grain equigranular quartz-muscovite-biotite granite. A distinguishing feature noted within this granite type is abundant grey, semi-transparent smokey quartz phenocrysts. The presence of outcropping cassiterite-bearing quartz-greisen and greisen veins was confirmed at both the Mallinsons, New Esk and Murrays Reward workings. These occur as sub-vertically dipping, NNW trending (around 330° to 350°), close to widely spaced sheeted vein sets, with individual veins varying from 0.1 to +2m wide. Several small alluvial workings occur in washed out gullies between Mallinsons and New Esk and exposed bedrock typically shows strong clay alteration with variable intensities of quartz veining. Kingfishers early work here leads to an interpretation that the whole area between Mallinsons and New Esk is prospective for greisen hosted tin.

The adit8+ at New Esk was successfully located (585920mE/5465130mN). It was not entered due to it being flooded with water but inspection of the rock dumps at its entrance confirmed the presence of cassiterite bearing greisen. Sparsely disseminated purple fluorite was also observed.

The Empress workings are currently heavily overgrown, and no good outcrop could be located.

Twenty grab samples were taken from outcrop and float in the Hardens Ravine area, however, assays are still pending at the time of reporting. Photos of some of the collected samples pending results appear in Figure 6.

3.2.2 POPES

Reconnaissance was successful in locating the historical Popes gold mine working located in EL18/2016, near the Scotia tin mine. Reported gold grades from this mine were around 10 g/t Au. The workings consist of a now collapsed shaft and several trenches into quartz veining over around 100 m of northeast strike along a small ridge of the same trend.

Quartz veining picked from the old workings looks very prospective with classical orogenic gold style textures including laminated and stylolitic laminations of fine black (graphite/chlorite?) material in arsenopyrite bearing quartz (see Figure 7 and Figure 8) being identified. The veins are typically strongly fractured and iron oxide rich. Several grab samples were collected from rock dumps at Popes, most of which returned elevated gold levels with the best assay result being 1.25 g/t Au associated with 555 ppm As.

Table 1 shows a summary of rock sample assay results taken from the Popes prospect area to date.

Sample ID	Sample Description	Area / Prospect	Au g/t	Ag g/t	As ppm	Bi ppm	Pb ppm	Sb ppm	Te ppm
GR162	grab sample laminated white-pink bucky qtz veining from old trenches. Weathered fg sst and black shale hostrock	Popes	0.15	0.06	180.5	0.49	7	1.58	<0.05
GR163	grab sample qtz veining from mullock heap next to shaft, feox stained bucky to laminated quartz vein, trace fg sulphides	Popes	1.25	0.28	555	0.23	12.1	2.58	0.05
GR164	grab sample from shaft mullock heap, dk gy-bk sst, feox altd with qtz veinlets	Popes	0.09	0.11	328	0.22	15	2.59	0.05
GR165	grab sample from massive quartz bolders - laminated to massive white bucky qtz with abundant aspy and scorodite 5-10% as laminated and dissem, late fractures throughout the qtz.	Popes	0.31	0.21	2620	1.78	8.6	5.76	0.18
GR166	grab sample of various qtz vein rocks from mullock heap at shaft - white bucky qtz with 1% aspy and scorodite, minor dk gy laminations, common feox on fractures	Popes	0.1	0.08	690	0.12	6.6	2.48	<0.05

Table 1. Summary rock sample details and assay results from the Pope's prospect area.

3.2.3 MCGOWANS

1 to 2 days were spent on reconnaissance in the McGowans prospect area, however, the old working could not be located. Float rock in the area is predominantly spotted hornfelsed siltstone and quartzite. Only very sparse quartz vein float was observed.

3.3 EXPLORATION TARGETING

Priority target areas were generated from assessment of the historical mining and previous exploration data and in part from observations made during the reconnaissance field visits. These areas, which will be the focus of ongoing exploration activities in the EL, are discussed in Section 4.

4 DISCUSSION OF RESULTS

Assessment of the compiled historical mining and previous exploration activities resulted in several key target areas being identified for primary tin and gold mineralisation within EL18/2016. Table 2 and Table 3 summarise the key tin and gold target areas identified to date by KFE.

Kingfisher Exploration's main exploration focus in EL18/2016 is for primary tin mineralisation associated with greisen and quartz-greisen veining in and immediately surrounding the late phase "tin-granites" of the Blue Tier batholith. These tin-granites occur in localised zones throughout the EL yet have remained largely unexplored to date. The majority of historical mining, prospecting and exploration within the EL was focussed on alluvial-hosted placer tin deposits and very little has been done in the way of exploring for primary tin by previous workers. Nonetheless, there is sufficient evidence to support an assessment that there remains excellent potential for the discovery of primary tin resources within EL18/2015.

It is also worthy of noting that in NE Tasmania, there are four major areas of alluvial cassiterite deposits, all of which show a close spatial association to the fractionated tin-granites. One of these areas surrounds Mt Cameron, extending for a radius of approximately 16 km from the Mt Cameron peak. A second area extends between Branxholm and Derby (and includes the Briseis workings). The third area occurs near Pioneer, and the fourth area between Goshen and St Helens. All these major alluvial deposits flank highland areas containing fractionated muscovite-biotite granite bodies with partial roof exposure (e.g. Lottah Sheets and Mt Paris Mass), or granites with similar geochemical characteristics to those from the roof zones of muscovite-biotite granites (Mt Cameron Sheets). It therefore appears that significant alluvial cassiterite deposits are closely spatially related to partly unroofed and eroded muscovite-biotite granite bodies which are almost certainly the primary source to the alluvial cassiterite.

Review of primary tin mineralisation styles in NE Tasmania shows that within and immediately surrounding EL18/2016, tin mineralisation occurs in greisen veins and pipes and greisen sheets associated with late phase S-type medium grained muscovite-biotite granite plutons (i.e. Dg1 of Groves et al, 1977).

Potential for the discovery of hard-rock tin deposits associated with greisen veins and alteration near Gladstone has been recognized in the Hardens Ravine (northern EL18/2016). Field reconnaissance shows that intensive kaolinite (argillic) alteration, quartz-greisen veins and greisen alteration occurs over a 2 sq. km area at Hardens Ravine – in the area of the historical Empress, New Esk, Garfield and Murray's Reward workings. Coarse grain cassiterite in quartz and greisen veins can be picked from outcrop and float throughout this area. Macquarie Harbour Mining sampled quartz-muscovite-cassiterite greisen float at Hardens Ravine in 2008 that assayed 8.9% Sn demonstrating the existence of high grade zones within then greisen, however, no follow-up work was carried out.

Coarse cassiterite in a quartz-muscovite greisen lode at Murrays Reward occurs within Mathinna Group sediments. This suggests good potential for discovery of further high-grade greisen mineralisation developed along the granite/Mathinna contact in the area.

The relatively simple mineralogy and coarse-grained nature of this style of tin mineralisation (i.e. low sulphide, cassiterite dominant) is very favourable in terms of development capex, mining and processing i.e. shallow open-cut mining with crushing-grinding and gravity beneficiation to recover cassiterite concentrates.

The areas of greisen alteration around Gladstone (including the greater Fly-by-Night and Hardens Ravine area) appears to show an elevated thorium response in radiometric images. Some areas of Mathinna Group bedrock also show elevated radiometric responses which is interpreted to be indicative of contact metamorphism but also possible greisen development at depth. This is particularly evident in the McGowans prospect area – which also has a coincident magnetic low / elevated radiometrics signature that looks to be hydrothermal alteration in style (i.e. magnetite destructive alteration) although simple contact metamorphism cannot be ruled out entirely.

In summary, there is ample evidence to suggest that the selected target areas within EL18/2016 contain good early stage prospects for the discovery of significant primary tin resources. These targets will be the focus of ongoing exploration activities within the EL.

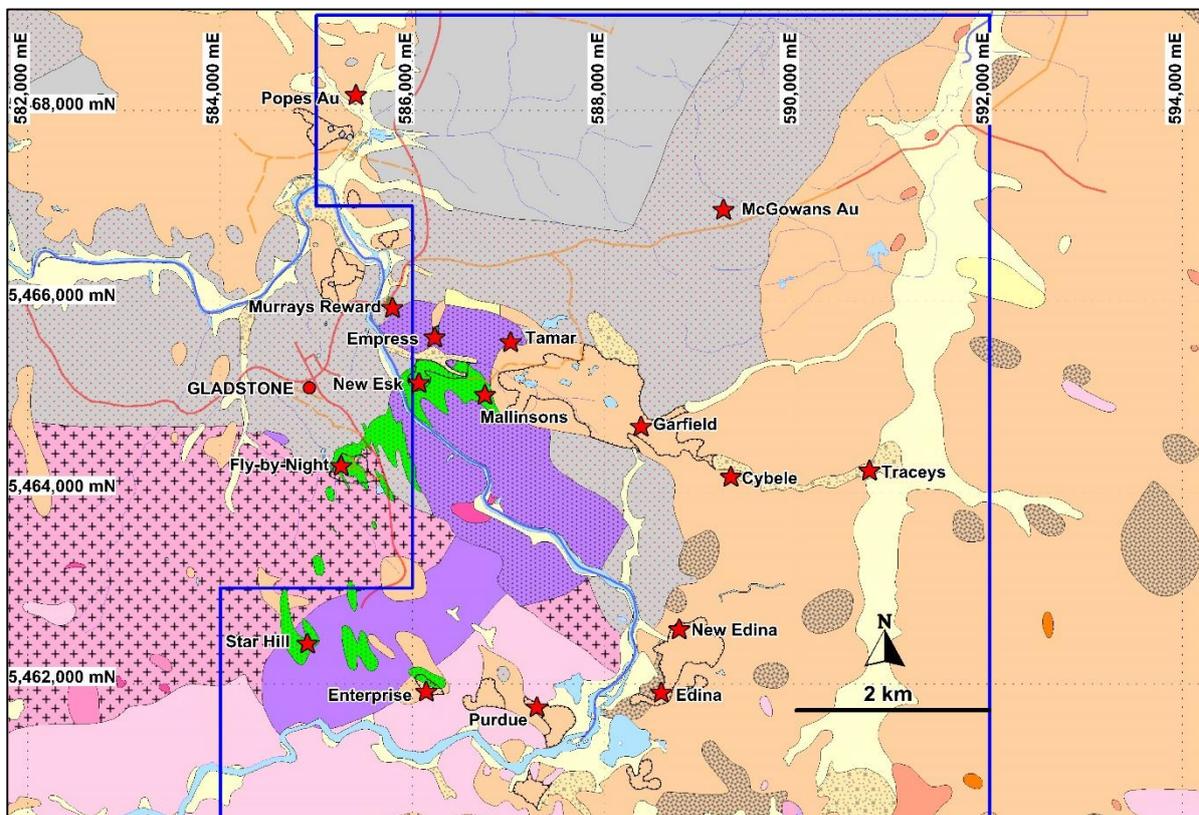


Figure 4. Plan showing locations of key prospects and geology of the Hardens ravine area east of Gladstone.

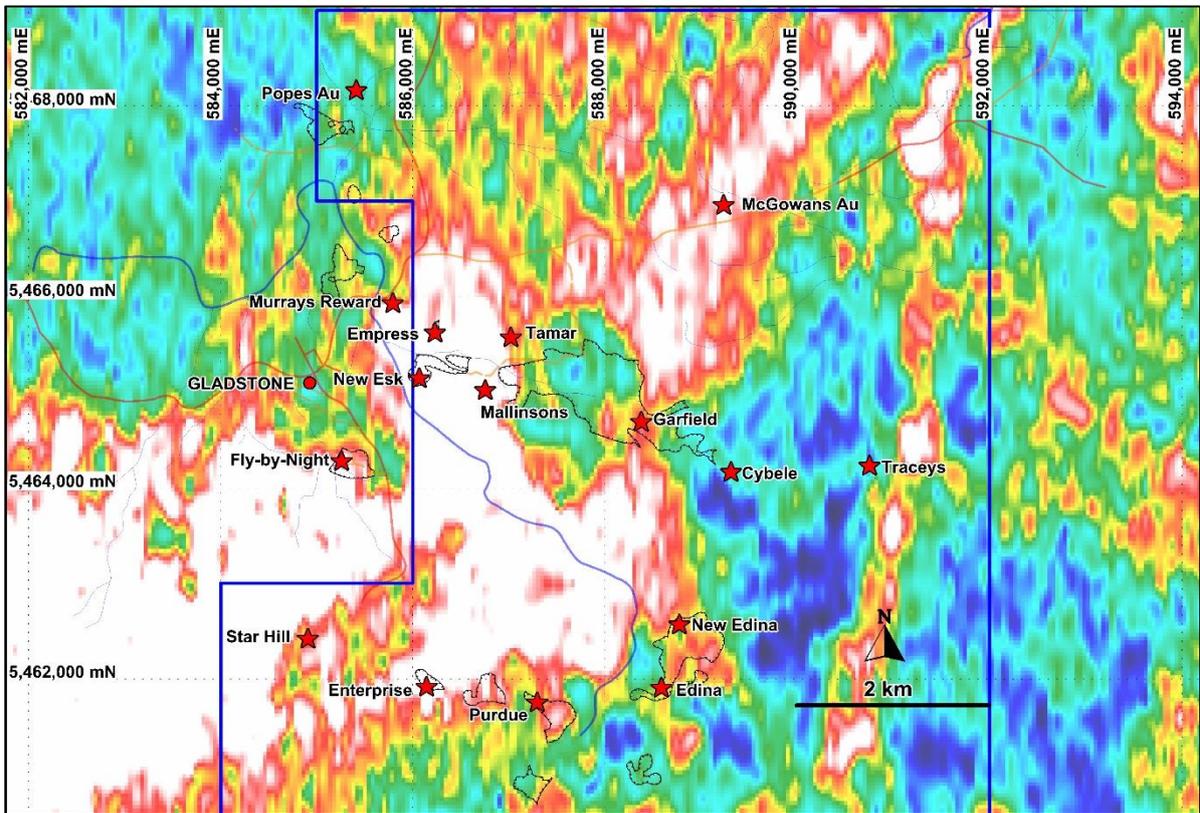


Figure 5. Plan showing the same area as for Figure 4 with overlay of regional radiometrics Thorium image.



Coarse cassiterite in qtz vein, New Esk area, Hardens Ravine.



Disseminated cassiterite in greisen, Hardens Ravine.



Coarse grain cassiterite picked off the ground surface, New Esk area, Hardens Ravine.



Greisen dumps, Mallinson's prospect, Hardens Ravine.



Pervasively kaolinite altered granite, New Esk Area, Hardens Ravine.



Coarse cassiterite in greisen, Hardens Ravine.

Figure 6. Selected photographs of cassiterite mineralization and greisen alteration from the Hardens Ravine area.



Figure 7. Photograph showing historical working at Popes gold prospect. Trenches are in the foreground while the mullock heap from the shaft is the background.



Figure 8. Photograph showing stylolitic laminated quartz veins consistent with classic Orogenic gold textures from Popes gold prospect.

Table 2. Key Primary Tin Exploration Target Areas, EL18/2016.

TARGET	DESCRIPTION	PREVIOUS RESULTS
<p>Hardens Ravine Zone</p>	<ul style="list-style-type: none"> • 1 x 1 km area (at least) of outcropping tin-bearing greisen and sheeted quartz-greisen veining hosted in fine to coarse grain, equigranular quartz-muscovite-biotite granite that intrudes older porphyritic adamellite and contact hornfels Mathinna beds. Wider prospective area of up to 2 x 2 km. Common kaolinization of granite in the area. • Numerous historical alluvial workings, including Empress, New Esk, Mallinsons and Garfield, exposed greisen-hosted tin mineralisation in bedrock beneath the alluvial deposits. The greisen and quartz-greisen veins varied from 0.2 up to +2m wide and were commonly traceable at surface for up to 180m and in some cases were worked to shallow depths along their strikes. An adit driven under the New Esk area confirmed depth continuation of the greisen veins to at least 30m below surface. • Tin mineralisation occurs as generally coarse grain (commonly 2-20 mm) cassiterite hosted in quartz-muscovite greisen and associated quartz veins. Tin grades are locally very high. • At Murray's Reward prospect, tin-bearing greisen occurs hosted in Mathinna bed outcrop suggesting good potential for preserved mineralisation along the granite-mathinna contact. • No systematic exploration of the primary mineralization potential to date. 	<ul style="list-style-type: none"> • A bulk sample from a shaft at Mallinson's working returned 12.5% of tin concentrate, suggesting a tin grade of around 8.75% Sn (assuming 70% Sn in cassiterite). • MHM (2009) reported 8.9% Sn from quartz-muscovite-cassiterite greisen float south of New Esk workings. • Northern-most soil grid line of Santos (1983) sampled ground over the New Esk workings area, returning up to 300 and 580 ppm Sn in soils coincident with greisen alteration over a 200m wide zone.
<p>Star Hill Zone</p>	<ul style="list-style-type: none"> • Historical mine workings (1935-39) exploited deep lead alluvial and eluvial tin deposits that overly an apparently sheeted mineralized quartz vein system in granite. Workings were abandoned due to water supply issues. • Possible southern extension of the Fly-by-Night mine mineralization located 1.8 km to the north. Zones of intermittent greisen alteration mapped in older porphyritic granite cover between Star Hill and Fly-by-Night workings suggesting the older granite forms a roof over greisen alteration and the tin mineralised (?) equigranular biotite-muscovite granite below. • Richardson (2009) reported on the reconnaissance of an adit at Star Hill that is about 20m long, striking 330 degrees and follows a thin subvertical vein carrying cassiterite, chalcopyrite, wolframite and other minor sulphides and associated secondary minerals. The vein is between 5 and 10 cm wide. • Highly prospective for primary tin mineralization in sheeted quartz/greisen veins. • No systematic exploration of the primary mineralization potential to date. 	<ul style="list-style-type: none"> • Santos (1983) surface geochemical and mapping data indicates that an anomalous zone, represented by tin values of +100ppm at Star Hill is up to 650m wide (E-W) and some 800m long (N-S) occurs over the Star Hill area. • Santos speculated that the stanniferous quartz and greisen veins may represent leakage from a larger greisen body within a blind cupola and as such constitutes a target worthy of further exploration.

<p>Woods Flat – Eastern Terrace Zone</p>	<ul style="list-style-type: none"> • Historical mine workings exploited shallow and deep lead alluvial deposits. Possible local cassiterite source with biotite-muscovite granite and tin-bearing greisen and quartz veins reported to be exposed by the mine workings. No systematic exploration of the primary mineralization potential to date. • Coarse and nuggety cassiterite, and common “chats” (small cassiterite nuggets attached to quartz) were noted in the Eastern Terrace area, suggesting a near-by primary source. • No systematic exploration of the primary mineralization potential to date. 	<ul style="list-style-type: none"> • No exploration activity for primary tin mineralisation reported.
<p>Wyniford Zone</p>	<ul style="list-style-type: none"> • Historical mine workings exploited tin-bearing alluvial deposits. Coarse grain cassiterite associated with quartz-greisen veins suggests a local source. • Sn-anomalous stream sediment geochem in the headwaters of the Wyniford River in creeks draining bedrock of the late phase muscovite-biotite granites. 	<ul style="list-style-type: none"> • No exploration activity for primary tin mineralisation reported.

Table 3. Key Primary Gold Exploration Target Areas, EL18/2016.

TARGET	DESCRIPTION	PREVIOUS RESULTS
Pope's Prospect Area	<ul style="list-style-type: none"> • Historical gold workings including shallow underground development and surface trenching. • Reported gold grades from historical mining were around 10 g/t Au. The workings consist of a now collapsed shaft and several trenches into quartz veining over around 100 m of northeast strike along a small ridge of the same trend. • Quartz veining in the old workings area looks very prospective with classical orogenic gold style textures including laminated and stylonitic graphitic crack-and-seal texture in arsenopyrite bearing quartz veins. The veins are typically strongly fractured and iron oxide rich. • Results from five reconnaissance samples collected by KFE around the workings all returned low level to anomalous gold values, up to 1.25 g/t Au. 	<ul style="list-style-type: none"> • No previous exploration activity for primary gold mineralisation reported.
McGowan's Prospect Area	<ul style="list-style-type: none"> • Historical gold mine workings included a reported shaft to 20m depth on a free-gold bearing zone of quartz veins, 0.3 m wide, hosted in slate. • Sampled veins historically returned 6.8 g/t Au (Keid, 1946), which was considered low grade at the time. • Located on the same gold mineralised structures as Big M, Ross' Reef and Windy Ridge gold prospects to the north. • Airborne magnetics TMI indicates significant magnetite-destructive alteration in the prospect area. 	<ul style="list-style-type: none"> • No previous exploration activity for primary gold mineralisation reported.

5 CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

Kingfisher Exploration is encouraged by the results of data compilation/review work and preliminary field investigations completed during the first year of tenure of EL18/2016. Work to date on the project has advanced understanding the geology and mineralization styles within the tenement that has facilitated district to prospect scale targeting, particularly for primary tin mineralisation.

Several key exploration targets have been generated and follow-up exploration field work, is planned to commence on these targets in the summer of 2018/19.

The area is assessed to be highly prospective for greisen and quartz-greisen style primary tin deposits styles as well as for orogenic gold style mineralisation within the Mathinna beds. Six priority target areas have been identified for exploration field activities, including the Hardens Ravine, Star Hill, Woods Flat-Eastern Terrace and Wyniford Zones (for primary tin) and the Popes and McGowans prospect areas (for gold).

Recommendations for ongoing exploration work in the second year of tenure include:

- Hand-auger soil sampling over the Hardens Ravine Zone, with possible follow-up trenching and drilling;
- Reconnaissance mapping and sampling at remaining tin target areas with possible soil sampling grids depending on depths of Quaternary/tertiary cover;
- Hand-auger soil sampling over the Popes and McGowans gold prospect areas, with possible follow-up trenching and drilling;
- Prospect-scale geological mapping and rock sapling over all priority target areas;
- Possible geophysical surveys over selected areas to be assessed based on exploration results.

6 ENVIRONMENT

There was no environmental disturbance from exploration activity during the reporting period.

7 EXPENDITURE

Exploration expenditure over the reporting period for EL18/2016 is summarized in Table 4.

	ITEM	EXPENDITURE (AUD)
	GEOSCIENTIFIC COSTS	
1.	Geology	\$ 36,000
	Geochemistry	\$ 1,375
	Geophysics	\$ 0
	Remote Sensing	\$ 0
	DRILLING AND GRIDDING COSTS	
2.	Gridding	\$ 0
	Drilling	\$ 0
3.	LAND ACCESS COSTS	\$ 0
4.	REHABILITATION COSTS	\$ 0
5.	FEASIBILITY STUDY COSTS	\$ 0
6.	OTHER COSTS	
	Rental Fees	\$ 6,500
7.	ADMINISTRATION COSTS	
	Legal	\$ 0
	Administration	\$ 1,000
	Total Expenditure	\$ 44,875

Table 4. Exploration expenditure on EL18/2016 during the reporting period.

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APPENDIX I

PROSPECT NAME/ZONE	EMPRESS PROSPECT / HARDENS RAVINE ZONE
LOCALITY	Empress Hills, 1.3km NE of Gladstone, north side of Hardens Ravine
COMMODITY	Tin
STYLE	Alluvial, eluvial and primary cassiterite in greisen
STATUS	Greenfields
PROSPECTIVITY RATING	High

SUMMARY:

Historical mine workings exploited deep lead alluvial and eluvial tin deposits that overly mineralized greisen altered granite. No systematic exploration of the primary mineralization potential to date.

GEOLOGY:

The Empress alluvial lead lies in a roughly N-S trending saddle gully that cuts through granite forming the locally high ground of Empress Hill. The gully preserves a stranded Tertiary gravel lead that sits some 20 to 30m above the course of the present-day Hardens Ravine creek. Reid (1928) supposed the remnant lead to mark the course of tributary of the Garfield lead. The Empress lead is described as being narrow, some 135 m wide at its top and 50 m wide at its base, and about 12 m deep. The Tertiary gravels are described as lying on soft greisenised granite and its associated eluvium, with the high-grade cassiterite content of its basal bed due to the presence of the tin-bearing greisen (Reid, 1928).

A typical section of the lead is described by Reid (1928) and Twelvetrees (1901) as:

- 0 to 7.5 m: Ferruginous sandy clay underlain by white feldspathic sands;
- 7.5 to 11 m: Alternate bands of fine gravel and feldspathic sands with occasional large boulders of decomposed granite (upper fine gravels);
- 11 to 12 m: Coarse quartz and greisen boulder gravels (basal wash);
- >12 m: soft coarse biotite granite merging into stanniferous quartz-mica greisen.

The upper fine gravels overlying the basal wash consist of white vein quartz and rounded smokey quartz crystals with lesser pebbles of "alaskite" (aplite?) and greisen. Reid (1928) noted these to be "exactly similar in nature and appearance to the gravels of the Garfield lead", although some of the stones are relatively less-worn. The basal wash is comprised of mostly boulders or quartz, greisen and granite that generally show little evidence of attrition, indicating that they have not travelled far from source.

MINERALISATION:

Primary mineralization is cassiterite disseminated in greisen and quartz veins. Twelvetrees (1901) reported the Empress lead to have yielded excellent tin, coarse in character with cassiterite nuggets weighing up to one ounce.

HISTORICAL MINING / PROSPECTING:

Development of the alluvial deep lead was by hydraulic mining and sluicing. Worked since at least the 1890's. Production records not available.

PREVIOUS EXPLORATION:

No modern exploration activity to date.

KEY RESULTS/FINDINGS:

No modern exploration activity to date.

MINERAL RESOURCES:

Greenfield prospect – no mineral resources estimated.

NOTES / RECOMMENDATIONS:

Highly prospective for primary tin mineralization in greisen. Appears to be northern extension of greisen vein system as seen on the south side of Hardens Ravine. Geological reconnaissance and soil sampling recommended.

REFERENCES:

PROSPECT NAME/ZONE	NEW ESK PROSPECT / HARDENS RAVINE ZONE
LOCALITY	1.1 km east of Gladstone, south side of Hardens Ravine
COMMODITY	Tin
STYLE	Alluvial, eluvial and primary cassiterite in greisen
STATUS	Greenfields
PROSPECTIVITY RATING	High

SUMMARY:

Historical mine workings exploited alluvial and eluvial tin deposits that overly mineralized greisen altered granite. No systematic exploration of the primary mineralization potential to date.

GEOLOGY:

At the New Esk workings, shallow coarse boulder gravel wash, believed to be the southern continuation of the Empress lead, overlies medium grain, equigranular to porphyritic granite veined with tin bearing greisen zone. The granite contains abundant smokey quartz.

The greisen veins are reportedly up to 1 m wide and some could be traced for up to 100m along strike (McIntosh Reid, 1928). The system of sheeted NNW-trending greisen veins was proven to extend westwards of New Esk to the Ringarooma river, a distance of around 150m. These veins were opened at a number of points by pits and trenches and an adit was driven eastwards from the river for 30m intersected "several" greisen veins. The adit is over 30m below the summit of the New Esk hill and so confirms that the greisen veins extend to at least this depth below surface. Reid (1928) reported that examination of the greisen ore from the dump of this adit and at the other openings shows that "it is everywhere tin-bearing" but the grade varies greatly from point to point.

MINERALISATION:

Primary mineralization is cassiterite disseminated in greisen and quartz veins. Kaolinisation of the host granite is common.

HISTORICAL MINING / PROSPECTING:

Development of the alluvials was by hydraulic mining and sluicing. Some of the greisen vein were worked from surface to depths of around 3m. Worked since at least the 1890's. Production records not available.

The greisen veins were prospected by way of trenching and an adit was driven into the hill from just above the Ringarooma River (see Geology section).

PREVIOUS EXPLORATION:

Very limited modern exploration activity to date. The most northern line of a soil auger sampling grid done by Santos Ltd in the early 1980's (Whitehouse, 1983) covered the southern margin of the New Esk workings. Macquarie Harbour Mining Ltd carried out limited reconnaissance work in the Hardens Ravin area during 2008/09 (Richardson, 2009).

KEY RESULTS/FINDINGS:

Up to 300 and 580 ppm Sn in soils coincident with areas of greisen alteration over a 200m wide zone. Soil anomaly open to the north. No further work conducted.

Macquarie Harbour Mining sampled quartz-muscovite-cassiterite greisen float south of the New Esk Workings that assayed **8.9% Sn** demonstrating the existence of high grade mineralisation within the greisen, however, no follow-up work was carried out.

MINERAL RESOURCES:

Greenfield prospect – no mineral resources estimated.

NOTES / RECOMMENDATIONS:

Highly prospective for primary tin mineralization in greisen. Appears to be southern extension of the greisen vein system on Empress Hill, north side of Hardens Ravine (Empress and Murrays Reward workings). Geological reconnaissance and soil sampling recommended. Possible follow-up trenching and geophysics(?).

REFERENCES:

McIntosh Reid, A. 1928. Report on Some Tin Ore Deposits in Gladstone District. Mines Department, Hobart. UR1928A/76-86
 Richardson, J. 2009. Annual Report for the Year Ended 27 April 2009. EL66/2007, Gladstone, NE Tasmania. Macqaurie Harbour Mining Limited.
 Whitehouse, L.E. 1983. Gladstone/Fly-by-Night Leases Progress Report, May 1983. Santos Limited. 83-2056.

PROSPECT NAME/ZONE	EAST ESK (MALLINSON'S) PROSPECT / HARDENS RAVINE ZONE
LOCALITY	1.8 km east of Gladstone, south side of Hardens Ravine. 700m east of New Esk workings.
COMMODITY	Tin
STYLE	Alluvial, eluvial and primary cassiterite in greisen
STATUS	Greenfields
PROSPECTIVITY RATING	High

SUMMARY:

Historical mine workings exploited alluvial and eluvial tin deposits that overly mineralized greisen altered granite. No systematic exploration of the primary mineralization potential to date.

GEOLOGY:

Bedrock is fine to medium grain, equigranular smokey quartz-muscovite-biotite greisen and clay altered granite with sheeted NNW-trending, steeply dipping quartz-greisen veins. The mineralised bedrock is exposed in historical workings where hydraulic mining of alluvial deposits exposed the outcrop. Elsewhere, bedrock is under 2-5 m of cover.

Greisen veining and alteration system is open in all directions and there is reasonable evidence that it may extend through to the New Esk workings, 700m to the west.

MINERALISATION:

Primary mineralization is cassiterite disseminated in greisen and quartz veins. Kaolinisation of the host granite is common. Montgomery (1891) reported that a bulk sample from a shaft at Mallinson's working returned "12.5% of dressed tin ore". This suggests a tin grade of around 8.75% Sn (assuming the cassiterite concentrate contains 70% Sn). It should be noted that this is probably from a higher-grade zone and the average bulk minable grade are likely to be lower, however, it does indicate the potential of the system.

HISTORICAL MINING / PROSPECTING:

At the Mallinson's workings, sheeted tin-bearing quartz-mica greisen veins in decomposed granite were historically worked for tin (Reid, 1928). The veins, which varied in width from 0.2 to 2 m, were able to be traced up to 180 m along strike to the SE.

PREVIOUS EXPLORATION:

Very limited modern exploration activity to date. The most northern line of a soil auger sampling grid done by Santos Ltd in the early 1980's (Whitehouse, 1983) covered the southern margin of the East Esk workings.

KEY RESULTS/FINDINGS:

Up to 810 and 360 ppm Sn in soils over a 200m long zone. Soil anomaly open to the north. Wide zone of elevated tin in soils between East Esk and New Esk to the west. Field reconnaissance has confirmed the presence of multiple quartz-greisen veins in altered granite in the area. Coarse grain, sub-rounded to crystalline cassiterite can be easily picked from surface eluvials.

MINERAL RESOURCES:

Greenfield prospect – no mineral resources estimated.

NOTES / RECOMMENDATIONS:

Highly prospective for primary tin mineralization in greisen. Appears to be eastern extension of the greisen vein system at New Esk which suggests an extensive system. Geological reconnaissance and soil sampling recommended. Possible follow-up trenching and geophysics(?).

REFERENCES:

McIntosh Reid, A. 1928. Report on Some Tin Ore Deposits in Gladstone District. Mines Department, Hobart. UR1928A/76-86
 Montgomery, A. 1891. Report on the General Geological Structure and Tin-Bearing Gravels of the Gladstone District. Geological Surveyor's Office, Launceston. OS-086.
 Twelvetrees, W.H. 1901. Report on The Tin Bearing Capabilities of the Gladstone District. Government Geologist's Office. OS-168.

PROSPECT NAME/ZONE	GARFIELD ZONE (TAMAR, EUREKA, NEW STAR HILL, GARFIELD, CYBELE)
LOCALITY	3.5 km East of Gladstone, from the headwaters of Hardens Ravine in the west, across the Garfield ridge to the headwaters of Cybele creek in the east.
COMMODITY	Tin
STYLE	Tertiary alluvial deposits and primary quartz-greisen
STATUS	Historical workings, Greenfields.
PROSPECTIVITY RATING	High

SUMMARY:

Historical tin mine workings exploited alluvial deposits with cassiterite probably sourced locally from greisen alteration/vein system. No systematic exploration of the primary mineralization potential to date. Area represents a possible eastern extension of the tin-bearing greisen altered granite at New Esk / East Esk.

GEOLOGY:

The Garfield workings were developed in Tertiary gravels are situated on high ground between the Ringarooma River to the west and the Musselroe River to the east. The Tertiary gravels on the ridge are mapped as being some 1500 to 2000 m long (E-W) and 750 to 900 m wide (N-S). In the eastern section the gravels are bounded by metamorphosed Mathinna beds, while to the west granitic bedrock surrounds.

McIntosh Reid (1928) described a typical Tertiary alluvium section as below. The upper 4.5m of material comprises the main cassiterite-bearing zone. The basal gravels may contain localised but small concentration of cassiterite. The alluvial vary in thickness up to 18m.

- 0 to 0.8m: Peat and sandy clay;
- 0.8 to 4.5m: Well sorted and well-rounded granitic pebble gravels. Main tin-bearing horizon;
- 4.5 to 6m: Compacted, evenly-assorted sands and kaolin;
- 6 to 7.6m: Compacted pyritic carbonaceous clay and fine-grained feldspathic sands;
- 7.6 to 9.5m: Very fine white sands with bands of kaolin;
- 9.5 to 11m: Lignitic sands, pyritic;
- 11to 11.6m: Lignite, drift sand, and coarse river gravel.

MINERALISATION:

Cassiterite in the upper alluvial beds described as occurring in a “uniformly fine state of division”. Coarse, angular and higher-grade cassiterite was noted in apparently younger deposits at the No. 7, No.8 and No.9 pits and was interpreted to be sourced from weathering of local greisen veins in the granite (McIntosh Reid, 1928). The No.7. pit occurs near the headwaters of Sawpit Creek, some 1.5km SE of the East Esk prospect. The No. 8 pit is not clearly marked on historical maps but assumed to be an area of workings around 300m east of East Esk. The No. 9 pit occurs at the East Esk prospect area and alluvial tin was described as coarse, angular and unassociated with other heavy minerals.

HISTORICAL MINING / PROSPECTING:

The Garfield Zone was one of the earlier alluvial tin mines in the Gladstone District, with Chinese miners believed to have been the first to exploit it. Montgomery (1891) describes the “old” workings of the tamar and Garfield companies. Twelvetrees (1901) later noted that the Garfield workings had been profitable but pumping costs had caused the mine to close. In 1904- 6 The Cybele Tin Mines NL drilled 142 holes indicating enough material to commence mining but there were doubts over the reliability of the work.

Mining by Garfield Tin Mining Co recommenced in 1926 but ceased in 1929. Drilling was undertaken and showed the main alluvial lead extended over 2km. Although the greatest thickness of alluvium was 20m, commercial concentrations of tin were only present in the uppermost bed which is less than 6m thick. In addition to drilling a number of shafts were sunk to more accurately assess the grades of the wash. A total of 1,350,000m³ was estimated to be available for sluicing from the top bed. No grades were quoted.

McIntosh Reid (1928) notes that the No.9 pit and 2 prospecting shafts exposed greisen veins which are apparently a southern continuation of those at the East Esk prospect.

In the early 1960s the Star Hill Syndicate mined the resource at Garfield (New Star Hill). Utah, exploring here at the time noted production of 25 tonnes of cassiterite concentrate per year, and in 1962, 20 tonnes from 73,000m³ for 275g/m³. Utah attempted a few exploratory drill holes at Garfield in 1964 but was considered unsuccessful as holes failed to reach bedrock.

PREVIOUS EXPLORATION:

No modern exploration activity assess primary mineralisation potential to date.

KEY RESULTS/FINDINGS:

No modern exploration activity to date.

MINERAL RESOURCES:

Greenfield prospect – no mineral resources estimated.

NOTES / RECOMMENDATIONS:

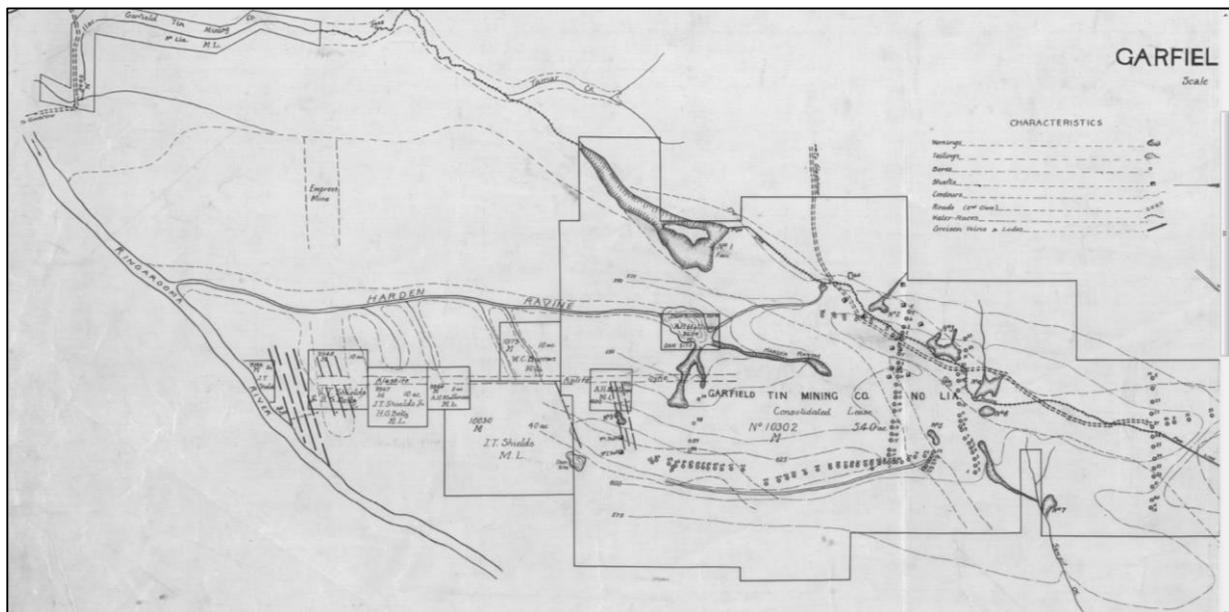
The apparent locally sourced (at least in part) cassiterite in alluvials indicates good prospectivity for primary tin mineralization associated with the greisen veins. The noted coarse and angular cassiterite in pit No.7 at Sawpit creek significantly extends the strike length of prospective ground. Reconnaissance to detailed mapping and sampling recommended with a focus to define the granite-Mathinna contact which represents a highly prospective zone for greisen development.

REFERENCES:

McIntosh Reid, A. 1928. Report on Some Tin Ore Deposits in Gladstone District. Mines Department, Hobart. UR1928A/76-86

Montgomery, A. 1891. Report on the General Geological Structure and Tin-Bearing Gravels of the Gladstone District. Geological Surveyor's Office, Launceston. OS-086.

Twelvetrees, W.H. 1901.Report on The Tin Bearing Capabilities of the Gladstone District. Government Geologist's Office. OS-168.



Plan of the Garfield tin mines from McIntosh Reid (1928).

PROSPECT NAME	MURRAY'S REWARD PROSPECT (HARDENS RAVINE ZONE)
LOCALITY	Empress Hills, 1km NE of Gladstone, north side of Hardens Ravine
COMMODITY	Tin
STYLE	Primary cassiterite in greisen
STATUS	Greenfields
PROSPECTIVITY RATING	High

SUMMARY:	Historical mine workings on tin-bearing greisen in Mathinna Bed sediments at the northern granite contact. No systematic exploration of the primary mineralization potential to date.
GEOLOGY:	Metamorphosed Mathinna Bed sediments with qtz-mica greisen lode, approximately 50m north of sediment-granite contact.
MINERALISATION:	Fine to coarse grain disseminated cassiterite in quartz mica greisen.
HISTORICAL MINING / PROSPECTING:	Historical (pre-1900) trenching and shaft developed on greisen lode.
PREVIOUS EXPLORATION:	No modern exploration activity to date.
KEY RESULTS/FINDINGS:	No modern exploration activity to date.
MINERAL RESOURCES:	Greenfield prospect – no mineral resources estimated.
NOTES / RECOMMENDATIONS:	Highly prospective for primary tin mineralization in greisen. Appears to be northern extension of greisen vein system as seen on the south side of Hardens Ravine. Ground is outside of EL18/2016 and currently under ERA as it has been for a long time. Recommendation is to apply for this ground when it becomes available under the ERA system.
REFERENCES:	Twelvetrees, W.H. 1901. Report on The Tin Bearing Capabilities of the Gladstone District. Government Geologist's Office. OS-168.

PROSPECT NAME/ZONE	STAR HILL PROSPECT
LOCALITY	2.7km south of Gladstone, headwaters of Pykes Creek
COMMODITY	Tin-(tungsten-copper)
STYLE	Alluvial, eluvial and primary cassiterite in quartz veins
STATUS	Greenfields
PROSPECTIVITY RATING	High

SUMMARY:

Historical mine workings exploited deep lead alluvial and eluvial tin deposits that overly an apparently sheeted mineralized quartz vein system in granite. Limited surface exploration during the 1980's delineated an anomalous Sn and Rb in soil zone. Possible southern extension of the Fly-by-Night mine mineralization.

GEOLOGY:

Bedrock geology described as weathered coarse grain biotite-muscovite pink granite hosting numerous tin-bearing veins.

MINERALISATION:

Cassiterite-bearing white quartz veins occur hosted in coarse grain biotite±muscovite pink granite. The quartz veins vary in thickness from 5 to 10 cm (Twelvetrees, 1901). Tungsten, chalcopyrite and other sulphides also reported in quartz veining in the area.

HISTORICAL MINING / PROSPECTING:

Hydraulic mining and sluicing of material comprised of part alluvial drift and gravel and part weathered porphyritic granite commenced by the Star Hill Syndicate in 1935 until 1939 due to unreliable water supply. The manager at the time considered that the grade of ore remaining was sufficient to warrant further exploitation provided an assured supply of water was available (Keid, 1952).

Richardson (2009) reported on the reconnaissance of an adit at Star Hill that is about 20m long, striking 330 degrees and follows a thin subvertical vein carrying cassiterite, chalcopyrite, wolframite and other minor sulphides and associated secondary minerals. The vein is between 5 and 10 cm wide.

PREVIOUS EXPLORATION:

Prospect area was covered by a wide-spaced soil/rock sampling and mapping grid by Santos Ltd in 1981-82 (Whitehouse, 1983).

KEY RESULTS/FINDINGS:

Santos surface geochemical and mapping data indicates that an anomalous zone, represented by tin values of +100ppm at Star Hill is up to 650m wide (E-W) and some 800m long (N-S) occurs over the Star Hill area. It is interesting to note that limited assaying for rubidium (restricted to samples along the grid base line) returned commonly anomalous values of up to 780ppm Rb. The anomaly occurs within the younger equigranular tin granite at the southern contact of the older porphyritic granite. Santos speculated that the stanniferous quartz and greisen veins may represent leakage from a larger greisen body within a blind cupola and as such constitutes a target worthy of further exploration.

The Fly-by-Night and Fly-by-Night West geochemical anomalies are situated on the exposed northern contact with the older porphyritic granite and the general NW-SE trend of veining and surface geochemical anomalies would support an interpretation that the Star Hill mineralisation is a southern extension of the Fly-by-Night mineralisation. If this is the case, then there is an obvious exploration target under the porphyritic granite which outcrop between the two areas. Zones of intermittent greisen alteration have been mapped in this porphyritic granite cover, further suggesting it is forming a roof over greisen alteration and tin mineralised (?) equigranular biotite-muscovite granite below.

MINERAL RESOURCES:

Greenfield prospect – no mineral resources estimated.

NOTES / RECOMMENDATIONS:

Highly prospective for primary tin mineralization in sheeted quartz/greisen veins. Possible southern extension of Fly-by-Night greisen hosted mineralization (located 1.8km to the north). Limited drilling at Fly-by-Night intersected 2m @ 0.9% Sn from 81m (Santos, 1982). Reconnaissance mapping and sampling recommended.

REFERENCES:

Richardson, J. 2009. EL3/2007 Gladstone, NE Tasmania, Annual and Partial Relinquishment Report for the Year Ended June 2009. Macquarie Harbour Mining Limited. 09_5885.
 Twelvetrees, W.H. 1901. Report on The Tin Bearing Capabilities of the Gladstone District. Government Geologist's Office. OS-168.
 Whitehouse, L.E. 1983. Gladstone/Fly-by-Night Leases Progress Report, May 1983. Santos Limited. 83-2056.

PROSPECT NAME/ZONE	WOODS FLAT – EASTERN TERRACE PROSPECTS (SOUTH MUSSELROE ZONE)
LOCALITY	10.5km SE of Gladstone, southern Great Musselroe River
COMMODITY	Tin
STYLE	Alluvial workings with possible local primary source
STATUS	Greenfields
PROSPECTIVITY RATING	Moderate to High

SUMMARY:

Historical mine workings exploited shallow and deep lead alluvial deposits. Possible local source with biotite-muscovite granite and tin-bearing greisen and quartz veins reported to be exposed by the mine workings. No systematic exploration of the primary mineralization potential to date.

GEOLOGY:

Howard (1963) described the basement geology in the greater area as consisting of Devonian granitic rocks with multiple intrusions of quartz-biotite granite, quartz muscovite granite, and medium to fine grained quartz-orthoclase granite or aplite. At the Wood's Flat workings and in old pits on the Eastern Terrace, quartz and pegmatite veins from 1 to 10 cm were noted cutting granite in outcrop exposures. At least one exposure of greisen was observed.

Geological maps for the area that show the granite is of a fine grained, equigranular biotite-muscovite type, consistent with being a late-phase "tin granite" of the Blue Tier Batholith. This intrudes older granites of the porphyritic Poimena Pluton and the Gardens Pluton in the east.

Richardson (2009) recorded visiting an abandoned road gravel quarry between the old Chum Dam and the Musselroe River (along Tebrakunna Road?) in which outcrop of decomposed granite with a greisen appearance (comprised almost entirely of quartz and muscovite with minor tourmaline) was noted but apparently not sampled.

MINERALISATION:

At Wood's Flat, the cassiterite-bearing wash is confined to a bottom quartz gravel layer of 0-1 m thickness resting on weathered granitic basement and overlain by barren alluvium that varies in thickness from 3.5 to 19 m.

The mineralogy of the alluvial tin ore was noted as consisting of cassiterite, ilmenite and tourmaline, both in the Quaternary and Tertiary leads. Cassiterite concentrates varied from black to ruby and were high quality, assaying in the order of 73% Sn. The grain size of cassiterite varies according to its distance from its primary source (i.e. coarser grain closer to the source). Coarse and nuggety cassiterite, and common "chats" (small cassiterite nuggets attached to quartz) were noted in the Eastern Terrace area, further indicating a near-by primary source.

HISTORICAL MINING / PROSPECTING:

The first recorded mining activity on Wood's Flat was by M.H. Groves and F.D. Richardson, who held the ground in 1946 (Keid, 1946). No production figures are given by Keid, but a recovery of 590 g/m³ is quoted. In the period 1948-1957 the property was leased by the Lanka Tin Mining Company who treated around 205,000 m³ of material before abandoning the property due to difficulties in handling the large amount of log debris overlying the ore zone (Howard, 1963). In 1957 Dunn and Park began operating Pit No.1 and treated around 17,000 m³.

In 1959 Wood and Bartels acquired the Wood's Flat property and from 1960 operations continued under the sole ownership of V. Wood to at least the mid-1960's. A calculation based on pit surveys carried out by Utah Development Company showed that to February 1964 Mr Wood worked 330,000 m³ of material from two pits with an estimated recovered cassiterite grade of 255 g/m³ (Howard, 1963). Average mine grades were reportedly maintained by the balance of low-grade sheets of basal gravel with richer patches contained in small depressions and gutters. The depths of the Wood's Flat pits varied from 5 to 10 m. Mining was by water cannon and sluicing methods. The Endurance Tin Mining Company drilled 80 bore holes on eight traverses spread over a strike length of 1.8km between Wood's Flat and the Eastern Terrace workings in the South Musselroe area during 1951. Holes varied in depth from 1.5 to 19 m. Results included seven holes that returned grades varying from 785 to 4000 g/m³ of tin concentrate occurring in a well-defined stanniferous channel which also included an additional 43 holes varying in grade from trace to 700 g/m³ cassiterite (Howard, 1963). From these figures, an estimated available resource of between 2.4 and 3.3 million cubic meters grading 265 to 239 g/m³ of cassiterite was calculated (Howard, 1963).

During 1963, the Utah Development Company (Utah) carried out field investigations and appraisal of the alluvial tin potential of Quaternary and Tertiary leads in the vicinity of the Woods Flat workings and the area extending north from Woods Flat through the Eastern Terrace and the Edina, Cybele and Garfield workings. Work included preliminary mapping, study and measurement of the alluvium profile in workings along the Musselroe Valley around Wood's Flat-Eastern terrace area and further field reconnaissance of all the larger mining operations and abandoned workings to the north of Wood's Flat (Howard, 1963).

In 1964, Utah carried out boring tests along eight traverses spaced at 600m intervals along the Musselroe River flat (80 holes totalling 628 m, with an average depth of 8m). Results from the boring indicated that the Wood's Flat area contained 941,000 m³ of material, averaging 7.5 m deep, with a tin grade of 160 g/m³, and that the unworked ground in the Eastern Terrace aggregated to approximately 383,000 m³ of material, averaging 3 m deep, with a tin grade of 167 g/m³ (Appleby, 1964). These tonnages and grades were below the feasibility expectations and no further work was carried out. It is important to note that these historical resource calculations were based on whole-of-hole tin grades, i.e. no cut-off grade applied.

Utah (Appleby, 1964) noted that the drilling had clearly indicated that for the greater part, at least of Tertiary time, the two deposits were separate entities. The Eastern Terrace area contains a deep (16-27m below surface) lead resting on the granite basement, typically containing low grade tin but large quantities of nodular and disseminated marcasite, and a series of shallower leads formed in narrow gutters that drain the weathered granite and eluvium. In comparison the Wood's Flat lead is broader (average 300 m wide) in cross section and its floor has a less marked slope in long section. The Wood's Flat alluvial contains little marcasite and its basal wash contains tin with an approximately equal quantity of ilmenite and small amounts of garnet. The difference in the heavy mineral makeup of the two areas suggests the two leads had markedly different primary sources. Interestingly, Appleby (1964) notes that the tin concentrate from worked pits in the shallow gutters of the Eastern Terrace area is coarse and nuggety in nature, containing a high proportion of chats (small nuggets attached to quartz) and minor ilmenite. Tin-bearing gravels in these gutters varies to 2m in thickness but are mostly thin. Tin grades of up to 1.2 kg/m³ were recorded in such gutter deposits. Low grade cassiterite was also reported from eluvial material in the headwaters of some of the gutters. These observations caused Appleby (1964) to consider the source area for this tin to be the exposed granite immediately surrounding the Eastern Terrace. Despite this, and observations of quartz and pegmatite veins as well as greisen in the exposed bedrock of the Woods

Flat workings, there appears to have been no effort to assess the potential of primary tin mineralisation in the area.
PREVIOUS EXPLORATION: No modern exploration activity to date.
KEY RESULTS/FINDINGS: No modern exploration activity to date.
MINERAL RESOURCES: Greenfield prospect – no mineral resources estimated apart from past alluvial resource estimates (see above) but it is unknown to what extent these may have been mined already.
NOTES / RECOMMENDATIONS: Prospective for possible primary tin mineralization in greisen systems. Geological reconnaissance and soil sampling recommended.
REFERENCES:

PROSPECT NAME/ZONE	MUSSELROE SWAMP, NORTH MUSSEL ROE PROPRIETRY (MIDDLE MUSSELROE ZONE)
LOCALITY	7.5km SE of Gladstone, southern Great Musselroe River
COMMODITY	Tin
STYLE	Alluvial workings with possible local primary source
STATUS	Greenfields
PROSPECTIVITY RATING	Low to Moderate

SUMMARY: Historical mine workings exploited shallow and deep lead alluvial deposits. Possible local tin source with biotite-muscovite granite and tin-bearing greisen and quartz veins reported to be exposed by the mine workings. No systematic exploration of the primary mineralization potential to date.
GEOLOGY: Around 2.3 km north of the Eastern Terrace workings, the so called Musselroe Lead system crosses to the west side of the present river where two small faces were originally worked by the North Mussel Roe Proprietary. Early records show that the southern face, developed to granite bedrock at about 6 m depth was the principal producer. Along the shallow eastern edge, the tin values were payable, but the deeper ground was found to be poor (Twelvetrees, 1901).
MINERALISATION: The tin-bearing wash is described as a granitic sand composed of sub-angular quartz, feldspar, yellow clay, cassiterite and mica.
HISTORICAL MINING / PROSPECTING: On adjacent terraces there has been in 1953 a boring program carried out by the Department of Mines, and near Anson's Bay Rd west of the River there was a program by Storey's Creek Tin Mining Co. N L, and east of the river by Utah; drilling in the swamp has been conducted only by Utah [66- 0430] and BMI Mining Ltd [72- 0843]. BMI did not produce a post- drilling resource calculation. They calculated whole- of- hole cassiterite grades and did not seem to have a concept that barren overburden should be separated from pay wash in their evaluation, and so reached a conclusion that no payable reserves existed. At that time, it is possible that the bottom wash, which does have some local very high values, could have been viable as a dredging operation. Utah calculated that their drilling potentially located two 1200m sections with resources of 587,000m ³ at 135g/m ³ and 553,000m ³ at 190g/m ³ .
PREVIOUS EXPLORATION: No modern exploration activity to date.

KEY RESULTS/FINDINGS: No modern exploration activity to date.
MINERAL RESOURCES: Greenfield prospect – no mineral resources estimated apart from past alluvial resource estimates (see above) but it is unknown to what extent these may have been mined already.
NOTES / RECOMMENDATIONS: Prospective for possible primary tin mineralization in greisen systems. Geological reconnaissance recommended.
REFERENCES:

PROSPECT NAME/ZONE	LANKA, ARCADIA, EDINA, NEW EDINA, DAWES, PURDUE / OGILVIES FLAT ZONE
LOCALITY	Jewells, Olgilvies and Edina Flats, Ringarooma River, 4.5 km SE of Gladstone
COMMODITY	Tin
STYLE	Alluvial tin workings
STATUS	Greenfields
PROSPECTIVITY RATING	Low

SUMMARY: Historical alluvial tin workings.
GEOLOGY: At New Edina cassiterite averaging 444 g/m ³ was worked from a basal gravel layer, up to 0.25 m thick overlain by 7-9m of soil, clay and granite drift overburden (King, 1963). Most workings are described as being developed in drift of granitic sand and rounded pebbles of quartz, quartzite, slate and jasper with frequently large water-worn and subangular stones of reef quartz (Twelvetrees, 1901). At Brown's Face, north of Olgilvie's Bridge, alluvial deposits of coarse river shingle (quartz, quartzite and sandstone) rest on coarsely porphyritic granite
MINERALISATION: Alluvial cassiterite. Alluvial gold grades up to one ounce to the ton of tin (Twelvetrees, 1901).
HISTORICAL MINING / PROSPECTING: Production from Purdue, Jewel Flats, Edina and Dawes, worked from before 1901 to 1921, was calculated by Utah [64- 0381] to total 1,180,000m ³ ; grade not known except that at Purdue 300,000m ³ was at about 600g/m ³ . Deposits considered to be mostly worked out.
PREVIOUS EXPLORATION: Limited drilling by Utah Development Co indicated that these were Quaternary terrace deposits of the present Ringarooma River with little tonnage potential (in the areas drilled). A line of government bores between the New Edina workings and the Ringarooma River intersected up to 16.5 m of barren alluvium.
KEY RESULTS/FINDINGS: Alluvial cassiterite in these workings mostly from Quaternary deposits, probably derived from re-working of older Tertiary deposits.
MINERAL RESOURCES: Greenfield prospect – no mineral resources estimated.
NOTES / RECOMMENDATIONS: Limited prospectivity in the remaining Quaternary alluvials. Location proximal to the Ringarooma River is probably unfavourable due to likely environmental issues.

REFERENCES:

King, D. 1963. Report on the Tin Resources of Tasmania. Utah Development Company. 63-0364

PROSPECT NAME	RIVERSIDE, DORSET FLATS/ SOUTH MOUNT ZONE
LOCALITY	South Mount Cameron, 8km SW of Gladstone
COMMODITY	Tin
STYLE	Alluvial
STATUS	Greenfields
PROSPECTIVITY RATING	Low-Moderate

SUMMARY:

Historical mine workings exploited alluvial tin deposits that contained significant accessory gold. No systematic exploration of the primary mineralization potential to date.

GEOLOGY:

The area is mostly covered by extensive alluvium material of sandy-clayey pebble gravels, sand and clay. Pebbles are predominantly of Mathinna Bed sandstone and siltstone, and vein quartz. Mined depths of the alluvium were historically in the order of 7-9m. Bedrock is mostly granitic, in places with extensive sheeted quartz microveinlets (Askins, 2013).

MINERALISATION:

Alluvial cassiterite with accessory gold.

HISTORICAL MINING / PROSPECTING:

In the early 1900's attempts were made by several companies to recover tin by dredging from alluvial flats of the Ringarooma River east of South Mount Cameron. These dredges were steam-driven and used sluice boxes to recover tin and gold. In the Dorset Flats area, two dredges operated in the early 1900's. These were the Ringarooma Bucket Dredging Company and the Dorset Bucket Dredging Company.

Records indicate that the Ringarooma dredge produced 116 tonnes of tin and 210 ounces of gold during 1907-1909 (Neal, 1980).

The Dorset Bucket Dredging Company was formed in March 1906 and at first instigated a boring campaign. Forty-seven bores were drilled on three lines, the bores being approximately 15 metres apart. The average depth of the ground was 4.8 metres and the average grade was 706 g/m³. Values ranged up to 2.8 kg/m³. A further thirty-three bores were put down towards the high ground to the west. The average depth was 5.8 metres and the average cassiterite content was 356 g/m³. Besides tin, gold was also indicated. The Dorset dredge commenced operations in 1907 and for the 4 or so years up to and including part of 1910 it produced 159 tonnes of tin and 239 ounces of gold.

In 1910 a new company, the South Mount Cameron Tin Dredging Company was formed from the Dorset Bucket Dredging Company and the plant was altered and repaired. The Company however had very disappointing results. In 1911, according to the Annual Report of the Secretary of Mines, 4.93 tonnes of SnO₂ and 303 grams of gold were obtained. In 1912, the company evidently ceased operations however 2.75 tonnes of tin and 46.6 grams of gold were won in the first quarter of that year (Neal, 1980).

During the Second World War when tin was in short supply because of the occupation of the major tin-producing nations in South-East Asia by the Japanese, the Minerals Production Committee of the Department of Supply and Shipping carried out a survey of Australia's tin resources. In 1942 the Mineral Production Committee carried out a boring program and combined results with previous drilling to identify an area of 9.7 ha having an average depth of 8.8 metres and comprising approximately 8.6 million m³ with an average grade of 196 g snO₂/m³. The tin and accessory gold were restricted to the basal gravel wash, the overlying alluvium being barren.

In 1943-1944 the Commonwealth Government obtained a gold dredge from Redbank in Victoria and dismantled, redesigned and re-erected it on the Dorset Flats. Operations commenced in

October 1944. Mining of Dorset Flats was completed by July 1959. The area yielded just over 2000 tonnes of tin concentrate assaying 75% Sn and 171 kg of gold for a total throughput of 19 million m³ at 105g SnO₂/m³.

The Dredge was then transferred to the Dorset Extended Flats approximately 1.6 kilometres downstream from the Dorset Flats. Productive operations on Dorset Extended commenced in August 1959 and were completed in May 1963. Dorset Extended Flats yielded approximately 432 tonnes of tin concentrate assaying 75% Sn and 43.5 kg of gold for a total throughput of 3.98 million m³ at 100 g SnO₂/m³.

Small scale alluvial mining has apparently been undertaken by several workers up until recent years. There is sparse information available on these activities and further research is required.

PREVIOUS EXPLORATION:

In 2008 Kangaroo Metals Ltd (KML) held, but failed to exercise, an option to purchase the Riverside Mining Lease 7M/2001 and the then surrounding EL21/2002. KML carried out testing over a 25 ha "Reference Site" area of which 10.6 ha was identified as prospective. The area was tested by 4 costeans at 100m intervals and 15 pits at 100m intervals and 50m centres by KML.

KEY RESULTS/FINDINGS:

KML noted that previous geological reports have highlighted the significance of the paleochannels within the South Mount Cameron region and their direct relationship to the locations of all significant leads identified in the region so far. Mapping of basement RL across the region assisted in identifying the location of paleochannels within the Ringarooma basin and allowed modelling of historic flows. The existence of a downwarp and marine inundation, RL of the current "ferricrete" layers across multiple locations versus basement RL, and placement of the lead locations currently known allowed predictive modelling of the regions with the highest probability of cassiterite mineralisation.

Based on results of the costeaning and pitting in the Riverside "Reference Site" area, KML estimated a wash volume of 530,000m³ over 10.6 ha with an average depth of 5m and a weighted average grade of 449 g/m³ of 70% SnO₂ for a prospective resource of 240 tonnes of cassiterite. This area is currently held under mine lease (ML7M/2001).

MINERAL RESOURCES:

Australian Anglo American Limited estimated a remaining resource of 4.6 M m³ grading 123 g SnO₂/m³ for a tin content of 396 tonnes Sn (Newton-Smith, 1981). It is unknown how much of this resource has been mined subsequently.

NOTES / RECOMMENDATIONS:

Many of the area prospective for alluvial tin in the South Mount Zone are currently held under mine leases. Historical large-scale dredging has worked most of the resources, although it is apparent that small tonnages still exist. These may be suitable for small scale mining operations, however, larger and/or higher-grade resources (or higher tin prices) are probably required in order to cover pre-production resource drilling, capital and operational costs.

There is some potential for primary mineralization in the area (sheeted veins noted by Askins, 2013) and reconnaissance mapping/sampling is recommended. There are also verbal reports of low-grade gold associated with quartz veinlets in the South Mount area, although no record of such veins have been found in the MRT database.

REFERENCES:

Askins, P, W. 2013. Annual Report for EL31/2011 Great Musselroe River, December 2013. Tin Dragon Pty Ltd.

Neal, T.I. 1980. Ore Reserves of Alluvial Tin Deposits In North-East Tasmania. Amdex Mining Limited. 80_1497.

Newton-Smith, J. 1981. A preliminary Review of the Alluvial Tin Potential of the Ringarooma Valley Including an Assessment of the Mineral Tenements Held by Amdex Limited. Australian Anglo American Limited. 81-1534

PROSPECT NAME	WYNIFORD, GARIBALDI, WILDCAT, SCHROEDERS / WYNIFORD RIVER ZONE
LOCALITY	Wyniford River
COMMODITY	Tin
STYLE	Alluvial
STATUS	Greenfields
PROSPECTIVITY RATING	Moderate-High

SUMMARY:

Historical mine workings exploited tin-bearing alluvial deposits. Coarse grain cassiterite associated with quartz-greisen veins suggests a local source. Stream sediment geochem shows highly anomalous tin values in creeks draining bedrock of the late phase muscovite-biotite granites.

GEOLOGY:

The Upper Devonian to Lower Carboniferous Blue Tier Batholith acid igneous intrusive rocks form basement throughout the Wyniford area. These intrusives are generally porphyritic, coarse grained biotite or biotite- muscovite granites and adamellites. Locally there are minor coarse to very coarse grained pegmatitic varieties. Cassiterite in the Wyniford River alluvials is considered to be possibly derived from these intrusives. Quartz-greisen boulders have been noted in the southern area.

In the southern area, on the northern slopes of the Blue Tier and around the Emu Hill-Schroeders Creek-Cotton Creek area late stage leucocratic tin granites of the Lottah Sheets intrude into older porphyritic granites of the Poimena Pluton. The Lottah Sheets are composed of equigranular fine grained muscovite-biotite granites, granite porphyries, leucogranites, aplites, pegmatites and greisen. The greisen typically consists of aggregates of quartz and muscovite with minor albite. They are coarser grained (up to four millimeters average grain size) than the greisenized granites and almost invariably contain abundant coarse grained fractured cassiterite crystals. Pale green biotite and carbonate are present in some greisens and topaz is more common than muscovite. Minor chalcopyrite, bornite, molybdenite and fluorite may be present.

At least four periods of alluvial deposition are observed within the Wyniford watershed. These consist of recent active stream deposits, Quaternary units and both younger and older Tertiary terrace deposits. The latter is a very old high-level alluvial deposit located well away from the present stream valley. The alluvial units are masked in many places by thick layers of old alluvial mine tailings particularly in the vicinity of Garibaldi Township. The younger Tertiary deposits have been noted to be the most significant of the cassiterite bearing deposits.

MINERALISATION:

Alluvial cassiterite. Coarse cassiterite with quartz-greisen veining noted in boulders at the southern Wildcat workings.

Tin mineralization within the Blue Tier Area occurs as three distinct types: 1) Steeply dipping greisen veins or pipes in tin bearing granite; 2) Flat lying greisen sheets in tin bearing granite; and 3) Quartz and quartz greisen veins in porphyritic adamellites.

Of these mineralization styles the capped greisen sheets have the greatest tonnage/grade potential to be economically attractive. The flat lying greisen sheets (greisenized granite and greisen) occur sub-parallel to the roof contact of fine grained muscovite - biotite tin granites (Lottah Sheets - Grove 1977) with the overlying porphyritic biotite granite/adamellite (Poimena Pluton- Grove 1977). The contact of the two granites is sharp and is usually marked by a barren zone of pegmatite. Significant tin mineralisation (coarse grained cassiterite) roughly overlaps the limit of greisenization and is associated with minor molybdenite, chalcopyrite and fluorite. The major deposit of this type is at the Anchor Mine on the Blue Tier.

The greisen sheet deposits appear to be local enrichments controlled by structural irregularities in the roof of the tin granite sheets. Greisenization is attributed to the development through extensive fractionation of a water saturated melt in which tin, fluorine and other incompatible elements are concentrated.

HISTORICAL MINING / PROSPECTING:

Tin mining was commenced in the Wyniford area in the 1870s by Chinese miners. Companies operating in the area included the Garibaldi Tin Mining Company (reporting in local newspapers in 1876) The South Garibaldi Tin Mining Co NL operating in the 1880s). By the year 1888 a town had become well established at Garibaldi on the western bank of the river some 3km south of Pioneer. Mining appears to have peaked in the area in about 1891 and by 1893 was in decline as most of the easily worked ground had become exhausted. Subsequently European miners constructed water races throughout the area, particularly around Garibaldi and worked extensions to the older workings. The Rajah Tin Mining Company operated from before 1928 to at least 1935.

In the mid-1970s several small machine mining operations commenced in the upstream areas (such as the Wildcat workings). For a short period, B.M.I Mining held a small 10 acre lease in the upstream section but did not conduct any work on the ground. By the early 1980s all mining activity had ceased.

PREVIOUS EXPLORATION:

In 1968 Texins Development Pty Limited were granted an exploration licence over the Wyniford and surrounding areas (EL 6/68). In 1973- 1974 Geophoto Resources Consultants, for Texins, conducted reconnaissance field work, pitting and sampling of alluvial deposits. 172 backhoe pits were dug, 152 of which were channel sampled, and a total of 300 samples processed. Subsequently Geophoto derived resource volumes and grades.

In 2002 Mineral Holdings Australia Pty Limited were granted EL 1/2003, which was transferred to VDM in 2004. VDM conducted exploration until 2009 which included collection of four bulk samples, of about 30 m³, using an excavator, from 3 areas were processed. One bulk sample from the south, Sample 3, in the area of the Wildcat Workings, had coarse cassiterite, in sizes up to 10 mm, much of it being locked on greisen or quartz fragments.

Significant quantities of sapphire averaging >3 g/bcm (30% gem quality) were noted from samples collected in the Wyniford River drainage.

VDM spent some time carrying out, but did not complete, field locations of earlier Geophoto pits, so that more accurate resource calculation could be made. They discovered a previously unrecognized older Tertiary lead to the west of the river but carried out no sampling there.

Kinnane in VDM report (Kinnane, 2006) noted that the Wyniford resource covered a central area where Geophoto conducted pitting, and considerable potential existed to the south and to the north.

KEY RESULTS/FINDINGS:

Coarse cassiterite, up to 1cm, associated with greisen and quartz fragments at the Wildcat Workings area identified by VDM suggests a locally derived primary source.

Askins (2013) noted an “extraordinary” area of tin anomalism in stream sediment data from the area south of the Wildcat Workings. Notably, these streams drain areas of bedrock consisting of biotite-muscovite “tin granite” variety. There is no reported exploration for primary tin in this area.

MINERAL RESOURCES:

During the period 1973 to 1974 Geophoto Resources as consultant to Texins Development Pty Limited conducted a comprehensive program of backhoe pitting and sampling along the river terraces flanking the Wyniford River. As a result of those works Texins established two distinct

resource volumes, which were recalculated in 2006 by VDM (Kinnane, 2007) after metric conversions and bulk sampling from 4 test pits to be (JORC Inferred):

- **311,712 bcm at an average grade of 318 g/bcm containing 99 t SnO₂.**

The average resource thickness at the Wyniford Project is reported as 1.8 m and no deeper than 6m (Kinnane, 2007).

NOTES / RECOMMENDATIONS:

Highly prospective for primary tin mineralization in greisen, particularly from the Wildcat Workings and south. Reconnaissance mapping and sampling recommended.

REFERENCES:

Askins, P, W. 2013. Annual Report for EL31/2011 Great Musselroe River, December 2013. Tin Dragon Pty Ltd.

Kinnane, N. R. 2007. EL 1/2003 – North East Tasmania. Annual Report on Exploration to 11th November 2006.

APPENDIX II

APPENDIX II – Rock Sample Locations and Assay Results, EL18/2016, July 2017 – July 2018.

Sample_Id	Easting	Northing	Elevation	Au_ppm	Ag_ppm	As_ppm	Bi_ppm	Cu_ppm	Pb_ppm	Sb_ppm	Te_ppm
GR011	588587	5467988	85	-0.01	-	-	-	-	-	-	-
GR012	588594	5467955	82	-0.01	-	-	-	-	-	-	-
GR013	587818	5468906	85	-0.01	-	-	-	-	-	-	-
GR027	588852	5468628	85	-0.01	-	-	-	-	-	-	-
GR028	588927	5468003	72	0.03	-	-	-	-	-	-	-
GR029	588809	5468263	68	0.05	-	-	-	-	-	-	-
GR030	588789	5468281	70	-0.01	-	-	-	-	-	-	-
GR031	589448	5468253	59	-0.01	-	-	-	-	-	-	-
GR032	586053	5467270	46	0.01	-	-	-	-	-	-	-
GR054	589660	5467740	77	-0.01	-	-	-	-	-	-	-
GR055	588835	5468720	92	-0.01	-	-	-	-	-	-	-
GR056	590070	5468674	65	-0.01	-	-	-	-	-	-	-
GR146	587655	5468947	88	-0.01	0.002	1.7	0.32	1.7	3.3	0.24	-0.05
GR161	587760	5468700	81	-0.01	0.05	15.6	0.58	7.1	7.8	0.53	-0.05
GR162	585346	5468226	47	0.15	0.06	180.5	0.49	11.1	7	1.58	-0.05
GR163	585365	5468237	51	1.25	0.28	555	0.23	11.7	12.1	2.58	0.05
GR164	585367	5468237	51	0.09	0.11	328	0.22	12.8	15	2.59	0.05
GR165	585361	5468240	52	0.31	0.21	2620	1.78	11.1	8.6	5.76	0.18
GR166	585376	5468230	52	0.1	0.08	690	0.12	10.2	6.6	2.48	-0.05
GR167	585376	5468232	55	0.31	0.46	1275	0.58	65.1	23.6	8.05	0.12
GR168	585374	5468229	52	0.43	0.19	2410	0.3	14.4	4.4	5.62	0.13
GR174	586233	5468003	59	0.02	0.02	1	0.11	13.3	4.9	0.21	-0.05
GR175	586139	5468302	78	0.01	0.05	2.6	0.22	14	13.5	0.36	0.07
GR176	586155	5468338	70	-0.01	0.02	1.5	0.5	9.8	7.7	0.43	-0.05
GR177	586294	5468703	72	-0.01	0.02	1.3	0.37	8.5	14.9	0.41	-0.05