



## **Exploration Permit for Minerals**

### **EPM 18850**

#### **Mt Surprise Project**

#### **Year 3**

### **Partial Relinquishment Report**

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Date of report: **5/12/16**  
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**Distribution:**

- Queensland Department of Natural Resources and Mines
- Orion Metals Limited
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## EXECUTIVE SUMMARY

Exploration Permit for Minerals (EPM) 18850, covering 100 sub-blocks was granted on the 21st of October 2013 for a period of five years to Orion Metals Limited. Unfortunately, due to cost driven tenement rationalisation, on the 30<sup>th</sup> October 2015, 50 sub-blocks were relinquished.

The tenement is located 40km north of the township of Mt Surprise by road and unsealed roads and tracks, or 16km north via helicopter from Mt Surprise. This EPM, along with EPM18449 and EPM18331, comprises Mount Surprise Project.

The area covered by EPM 18850 has been held by numerous mining and exploration companies, as well as prospectors, since the late 1950's. Alluvial tin was mined north of EPM 18850 as far back as 1899. Much of the Fulford River system within EPM 18850 has been explored for alluvial tin and numerous waste dumps are present to this day, evidence of the treatment of hundreds of thousands of cubic meters of alluvial material. Intermittent alluvial tin mining continues to this day on long term Mining Leases surrounded by EPM 18850.

The local geology lends itself to potentially hosting a wide range of commodities and mineralisation styles, including precious metals, base metals, uranium and rare earth elements. Apart from the alluvial mining, numerous "anomalous" surface samples have been obtained over the years by explorers, however no significant hard rock discoveries have been made in the EPM 18850 area.

EPM 18850 was selected by Orion Metals Limited for its potential to host commercial quantities of rare earth elements (REE) in the heavy mineral sands contained within the vast array of alluvial channels within the tenement. The potential also exists for a tin-tungsten-REE bearing greisen and vein/vein-set style deposits.

There were 43 stream sediment and rock chip samples collected from within the 50 blocks relinquished.

Overall, the results were considered not significant for rare earth prospectivity, though the decision to relinquish blocks was primarily to satisfy cost cutting measures

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## **1. INTRODUCTION**

Orion Metals Limited (ORM) was granted Exploration Permit for Minerals (EPM) 18850, totalling 100 sub blocks on the 21st of October 2013 for a period of 5 years. This EPM was given the project name of Fulford Creek. During 2014, EPM 18850 and all other granted and pending ORM tenure in the Mount Surprise area (EPM 18449 and EPM 18331) were re-badged as the Mount Surprise Project.

During October 2015, 50 sub-blocks were relinquished, leaving a balance of 50 sub-blocks retained.

The tenement is located ~ 40 km's by road and track to the north of the Mount Surprise township, and ~300 km southwest of Cairns in North Queensland. ORM picked up the EPM to primarily explore for rare earth elements (REE) contained within the alluvial gravels and previously-worked heavy mineral sands of the various rivers and creeks in the area. As well, the geological setting suggests the area has the potential to host gold, tin and tungsten in granite-hosted greisen and vein/vein-set style deposits. This report covers exploration work on the relinquished portion of EPM 18850 up to and including Year 3 of tenure.

The 50 sub-blocks were relinquished as part of a voluntary surrender exercise.

## **2. LOCATION AND ACCESS**

Exploration Permit for Minerals (EPM) 18850 is located ~ 40 kms north by roads and tracks from the Mount Surprise township, and about 300 km southwest of Cairns, North Queensland.

The southern tenement boundary is only 16 km in a straight line from Mt Surprise.

Access to the tenement is via helicopter from Mount Surprise. Alternatively, by roads and tracks, using the sealed Gulf Developmental Road for 14 km east from Mt Surprise, then north along unsealed roads and bush tracks for 25 km, arriving into the SE portion of EPM 18850 (Figure 1, Figure 3).

The tenement sits entirely within the Atherton 1:250,000 map sheet (SE55-05) and Lyndbrook 1:100 000 geology sheets (No 7762) and lies approximately between the latitudes of 17° 46'S and 18° 00'S and the longitudes of 144° 11'E and 144° 25'E.



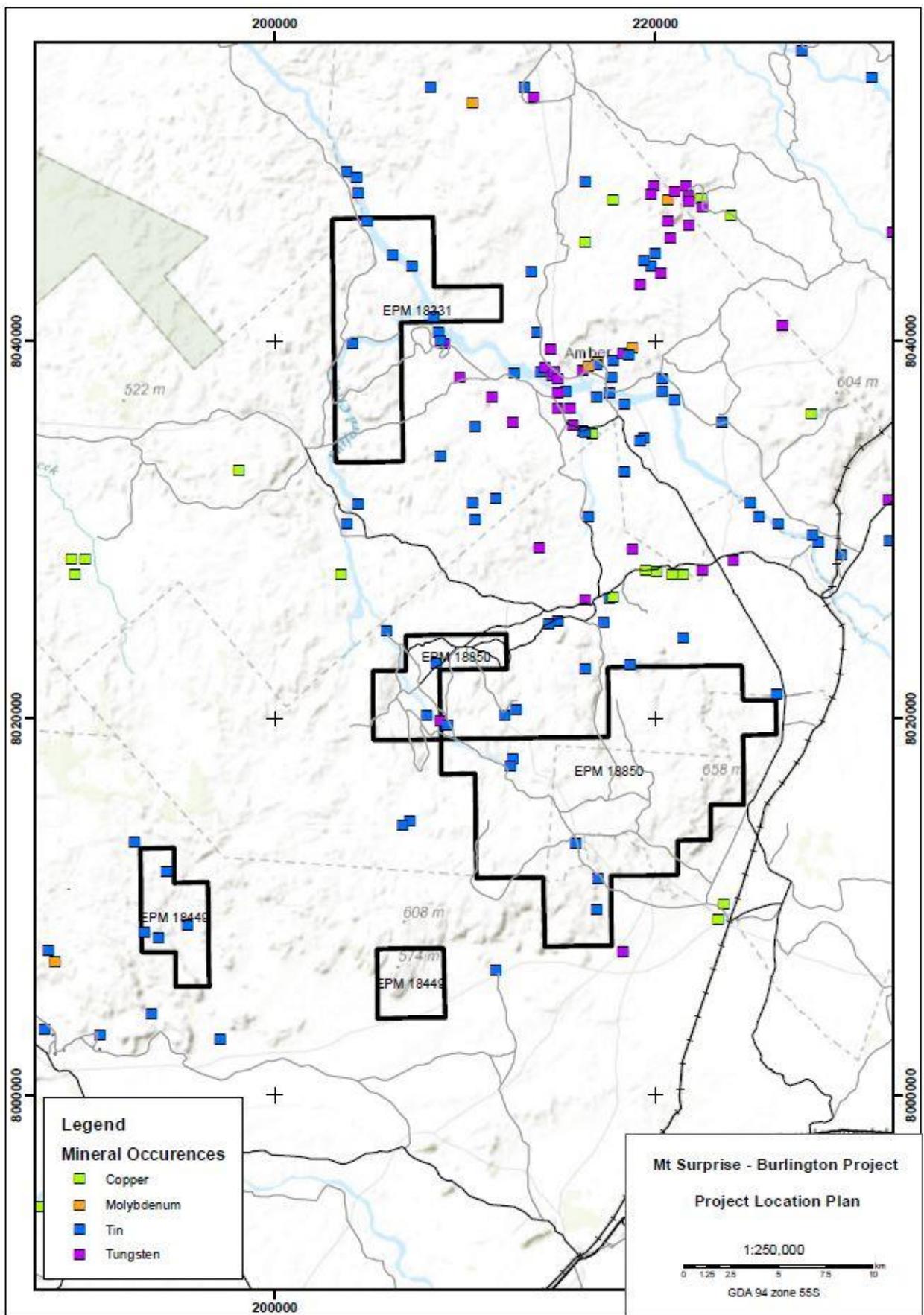


Figure 3. Orion Metals Mt Surprise Project area following tenement relinquishments. EPM 18850 is centrally located, showing the retained 50 sub-blocks. Orion tenure is presented as heavy black outlines. The backdrop is a 1:250,000 topographic image.

### 3. TENURE

Exploration Permit for Minerals (EPM) 18850 originally encompassed 100 sub-blocks. Since 30<sup>th</sup> October, 2015, only 50 sub-blocks were retained from the original 100 granted on the granted 21<sup>st</sup> of October 2013 for a period of five years to Orion Metals Limited.

EPM 18850 (Figures 1 & 2) present the original 100 sub-blocks. Figure 3 presents the current tenement outlines for the project area. Figure 6 outlines in red the relinquished sub-block outlines. Table 1 below lists the relinquished sub-blocks identified from the Townsville Block Identification Map of the Georgetown mining district.

Table 1: List of Relinquished Sub-blocks, EPM 18850

<b>BIM</b>	<b>Block</b>	<b>Sub – Blocks</b>
TOWN	1515	B,E,G,H,J,K,M,N,O,P,R,S,T,U,X,Y,Z
TOWN	1516	A,F,G,L,M,Q,R,V,W
TOWN	1587	C,D,E,H,J
TOWN	1588	A,B,C,D,E,H,J,K
TOWN	1659	U,Z
TOWN	1660	A,F,L,Q,R,S,V,W,X

EPM 18850 overlies the Ewamian People native title determination area QCD2013/007, and was granted via a Section 31 Deed under the Native Title Act, 1993.

### 4. REGIONAL and LOCAL GEOLOGY

The Mt Surprise Project is located centrally within the Etheridge Province of the Georgetown Region of Northern Queensland (Figure 4). The Georgetown Region itself occupies about 50,000 km<sup>2</sup> of the Cairns - Townsville hinterland, and consists of variably metamorphosed and deformed sedimentary and volcanic rocks of Palaeo- to Mesoproterozoic age (Einasleigh Metamorphics).

The Palaeoproterozoic rocks (Etheridge Province) of the Georgetown Region have been subjected to several phases of granitoid emplacement. The first phase ranges from Silurian to Early Devonian and includes mainly I-type granites. The second phase intruded from Carboniferous to Permian and consists mainly of I-type and A-type plutonic rocks.

The Georgetown Region is bound in the east by a faulted contact with the Hodgkinson and Broken River Provinces of the Tasman Orogen, and to the west, is overlain by Mesozoic sediments. As with many other Australian Proterozoic terranes, the Georgetown Region has suffered repeated tectonic reactivation with both compressional deformation and extensional deformation, bringing with them mafic and felsic volcanism and granitic magmatism (Wyborn et al. 1992).

The oldest rocks in the region are the Palaeoproterozoic Einasleigh Metamorphics of Gneiss/Migmatite Facies. Intruding these older metamorphics are units of the poorly exposed Proterozoic Blackman Gap Complex, consisting of leucogranite, granodiorite and amphibolites (Figure 5).

Late Carboniferous granitoids have extensively intruded the older strata throughout the Georgetown Region. The O'Briens Creek Supersuite granites outcrop over much of the region and comprise pale pink-white alkali feldspar-rich biotite granites, leucogranites, and microgranites. Alteration of these granites is extensive, particularly griesenisation, and most host some Sn, W, Bi, Mo, and F mineralisation. These granites are also characterized by their generally high

fractionation with SiO<sub>2</sub> content ranging from 74-78%, high Zr, Y, Nb, Th, and anomalous REE. The high K<sub>2</sub>O, Th, and U give these granites a distinct white-pale pink X-ray spectrometric signature enabling easy identification when using airborne geophysical methods (Donchak and Bultitude 1994).

Other granites in the region form part of the Ootann Supersuite of granitoids and include the Charlies Knob Granite, the Pat and Peter Creek Granite and the Bonner Creek Granite, along with several smaller, unnamed granitoids. The Ootann granitoids are less felsic and more varied than their O'Brien Supersuite counterparts, and range from hornblende-biotite granodiorite to biotite leucogranite (Donchak and Bultitude 1994).

By far the dominant granite within EPM 18850 is the Late Carboniferous Burlington Granite, which outcrops over much of the central and southern portion of the EPM 18850. The Burlington Granite is a generally coarse grained, often porphyritic K-feldspar-quartz-plagioclase-biotite granite and exhibits an orange pink colour in its unaltered phase. A finer grained phase of the granite was also observed during field mapping. The Burlington Granite generally forms boulder like outcrops with high hills to several 10's of metres in height. Weathering of the granite exhibits a classic "onion skin" pattern in outcrop.

The Burlington Granite has intruded the older Palaeoproterozoic Lyndbrook Complex granites and slightly older Ootann Supersuite granites. The Lyndbrook Complex is prevalent in the northern portion of EPM 18850 and consists of variably foliated, micaceous leucogranite, pegmatite, schists and lesser gneisses and migmatite.

The Late Carboniferous – Early Permian Warby Volcanics form an extensive ring complex to the west of EPM 18850 (Figure 5). The ring complex is composed of rhyolitic flows, pyroclastics and andesitic tuff. The southern portion of the ring complex also contains Early Permian A-type granite. The Warby Volcanics are present in the very NW corner of EPM 18850.

Unconformably overlying these Proterozoic and palaeozoic sequences are Cainozoic sediments, usually consolidated colluviums and ferricrete. Quaternary olivine basalt (the Undara Basalt), unconformably overlies all the preceding sequences. It flowed along the Lynd and Rocky Tate Rivers and their tributaries forming valley fills, although is only rarely visible within EPM 18850.

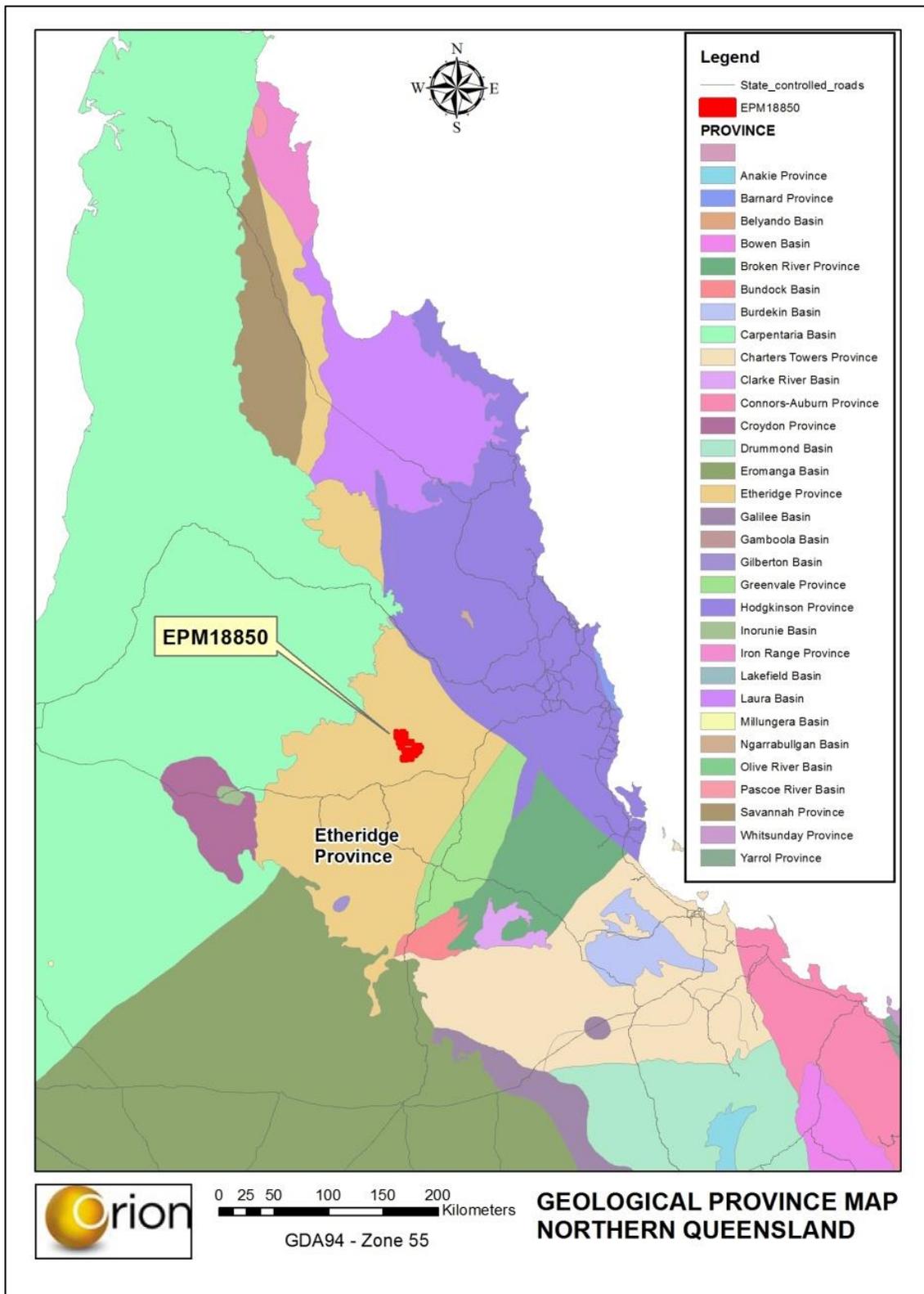


Figure 4. Province map of the Northern Queensland region

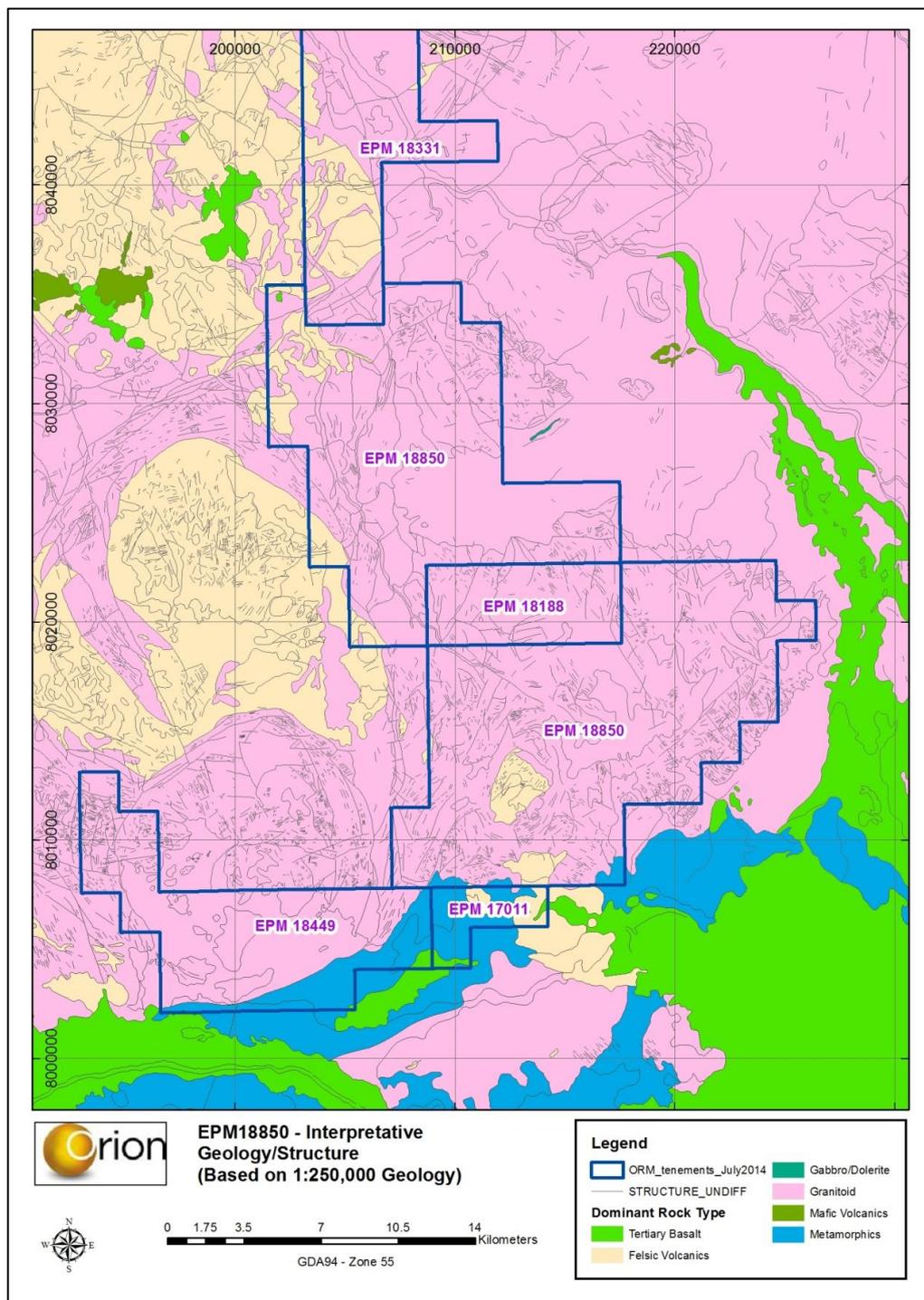


Figure 5. Regional Geology surrounding EPM 18850 (Based on 1:250,000 DNRM Geology). Note modified tenement boundaries not adjusted in this plan. Technical geology remains unchanged.

## 5. PREVIOUS EXPLORATION

The area covering EPM 18850 has been held by numerous mining and exploration companies, as well as prospectors, since the late 1950's. The local geology lends itself to potentially hosting a wide range of commodities and mineralisation styles, including precious metals, base metals, uranium, and diamonds.

HDR Salva undertook a historic data search and cataloguing exercise for Orion Metals Ltd in early 2014 and the detail below is based on reports sourced from the QDEX system.

### ***Pre-1950's***

Tin was first discovered in the Tate River (north of EPM 18850) in the 1880's by a prospecting party under the leadership of a man named Halpin. The Tate Tin Mining Company worked this ground from 1899 to 1919 and extracted approximately 2160 tons of metallic tin from these alluvial deposits. During the peak years, the local population numbered up to 300 persons. Mining ceased in 1919 following the extraction of the high grade material and a fall in the tin price.

### ***Late 1950's - 1960; Rio Tinto Australian Exploration Pty Limited***

Alluvial tin exploration in a large area between Chillagoe and Mount Surprise. Conducted surface exploration and alluvial sampling (pit sampling) in Fulford Creek however the Sn grades were considered too low to warrant further work.

### ***Late 1960's; Mareeba Mining and Exploration Pty Ltd***

Tested areas of the Fulford and Blackfellow Creeks for alluvial tin opportunities using channel and pit samples and concentrate panning.

### ***Early 1970's; Amsil Mining Services Pty Limited***

Conducted rock chip sampling traverses in the NW portion of EPM 18850. Hampered by poor access, did not discover any significant mineralisation. Minor occurrences of chalcopyrite were seen.

### ***1975 - 1977; Agip Nucleare Australia Pty Ltd***

Warby Prospect covering much of the western portion of EPM 18850, looking for uranium. Conducted geological and structural mapping, heliborne spectrometer survey. No significant mineralisation identified.

### ***Late 1970's; Esso Exploration and Production Aust Inc***

Held the very northern portion of EPM 18850 looking for Uranium. Conducted helicopter supported airborne spectrometer and magnetic surveys followed by helicopter supported field checking of anomalies. Helicopter supported stream sediment samples were also taken, with approximately 50 samples taken from within EPM 18850, testing for U and base metals. Weakly anomalous U was discovered but no significant base metal assays were obtained.

### ***Late 1970's; CRA Exploration Pty Limited***

Diamond exploration - took 66 bulk samples weighing 20-30kg each, looking for kimberlitic indicator minerals. Approximately 20 samples were taken from within the EPM 18850 and analysed for base metals, Ti and Nb. No significant results and no kimberlite indicator minerals were discovered.

### ***1978 - early 1980's; Lamorna Mines Pty Ltd***

Held 4 sub-blocks of the NE portion EPM 18850 and conducted back-hoe test pitting testing for alluvial tin, as well as geological reconnaissance for base metals. They eventually operated an 800m<sup>3</sup> alluvial Sn plant on mining leases, however none of this work was carried out on EPM 18850.

### ***Early 1980's; Ravenshoe Tin Dredging Ltd***

Prospected the Fulford, Nuggety and Blackfellow Creeks for alluvial tin using grab samples of alluvial material, followed by panning of samples to determine grade.

### ***Early 1980's; AOG Minerals Ltd***

Held 2 sub-blocks in the NE portion of EPM 18850. Undertook rock chip sampling, analysing for Au, W and Sn. No significant hard rock occurrences were located.

### ***Early 1980's; White Industries (QLD) Pty Ltd***

Held most of the ground covered by EPM 18850 but only took a few rock chip samples from the Johnny's Camp prospect with weakly anomalous Sn and W.

### ***1984; Anmelka Pty Ltd***

Held 6 sub-blocks in the NE portion of EPM 18850. Conducted geological reconnaissance aimed at looking for economic alluvial tin deposits.

### ***1984; St Joe Australia Pty Ltd***

Held the north-western portion of EPM 18850 targeting epithermal gold deposits. Approximately 11 stream sediment samples were taken and analysed for Au, Ag, Hg and base metals. Nothing significant was obtained.

### ***1984 - 1987; CRA Exploration Pty Limited***

Undertook exploration for gold, base metals and diamonds over a vast area between Chillagoe and Mount Surprise, including parts of EPM 18850. Approximately 17 stream sediment samples were taken from the southern portion of EPM 18850 with no kimberlitic indicator minerals found.

### ***1988; Carpentaria Exploration Company Pty Ltd***

Undertook exploration covering the western portion of EPM 18850 in the Warby Creek 2 Prospect area, looking for gold and base metals. Conducted surface sampling (rock chips and stream sediments) with no significant results obtained. Relinquished the ground.

### ***1990's; Numerous companies***

A number of companies held tenure covering EPM 18850 but undertook so meaningful exploration.

### ***2005 - 2008; Auzex Resources Ltd***

Auzex held much of the southern portion of EPM 18850 and conducted various phases of surface exploration, including gridded soils sampling, rock chip sampling and some stream sediment sampling. Results were generally poor but they still hold tenure in the Mt Surprise area to this day.

### ***Current***

A couple of minor alluvial tin mining operations continue to operate intermittently within granted long term mining leases.

## **6. ORION METALS WORK CONDUCTED**

During Year 1 across Mt Surprise Project area, an extensive reconnaissance exploration program was initiated, comprising primarily of stream sediment and rock chip sampling. In all, 230 samples were collected and reported publically in an Orion Metals Limited ASX release dated 20<sup>th</sup> October 2014.

A total of 43 samples were collected across the relinquished sub-blocks. No other work was conducted across the relinquished portions.

Details on how those samples were collected are provided below. Coordinate locations and results are included in Appendix 1.

### **6.1. Rock Chip Sampling**

A total of 12 rock chip samples were taken, with sample points presented in Figure 6. Appendix 1 contains the digital data for all surface geochemical samples taken.

Samples size ranged from 0.7 kg to 1.5 kg and were chipped off using a geo-pick or gympie and stored in an accurately labelled calico bag. Details of each sample were recorded on paper 'rock chip log' sheets and later digitally entered into an Excel spreadsheet. Detail captured included sample ID, 3-D location and detailed geological descriptions. A final excel spreadsheet was sent to Geobase P/L for incorporating into the Mt Surprise database. Samples were stored securely at the field camp at the end of each day.

At the end of the field trip, samples were transported to Intertek-Genalysis in Townsville, QLD for sample preparation and analysis. Rock chip samples were dry crushed and pulverised so at least 85% of material was 75 µm or finer. Samples underwent three separate analytical phases given the broad range of elements targeted.

Au analysis was achieved using lead collection fire assay, a 50 gram charge in new pots with an Inductively Coupled Plasma Optical Emission Spectroscopy (ICP/OES) finish. This achieved a 1ppb detection limit.

Analysis for Ag (0.05ppm lower detection limit), As (0.5ppm), Bi (0.01ppm), Cu (1ppm), Mo (0.1ppm), Pb (5ppm) and Zn (1ppm) was using a four acid digestion, with an ICP/MS (Mass Spectroscopy) or ICP/OES finish.

A thorough suite of Rare Earth Elements along with digest resistant metals tin and tungsten were analysed using a Na Peroxide Fusion followed by a combination of ICP-OES and ICP-MS. The following elements were analysed for, with lower detection limits in brackets; La (0.2ppm), Ce (0.5ppm), Pr (0.05ppm), Nd (0.1ppm), Sm (0.1ppm), Eu (0.1ppm), Gd (0.1ppm), Tb (0.05ppm), Dy (0.1ppm), Ho (0.1ppm), Er (0.1ppm), Tm (0.05ppm), Yb (0.1ppm), Lu (0.05ppm), Y (0.5ppm), Th (0.1ppm), U (0.1ppm), Nb (10ppm), Ta (0.1ppm), Hf (0.1ppm), Zr (5ppm), Sn (2ppm), W (1ppm), Li (1ppm), Be (1ppm), Ga (1ppm).

Sampling was conducted on the basis of satellite imagery, geological interpretation, historic sample information, and on-ground geological assessment.

## **6.2. Stream Sediment Sampling**

Stream sediment sampling was going to be the most cost-effective and meaningful surface geochemical sampling method of covering the broad expanse of EPM 18850 in an effort to identify areas of REE and Sn-W anomalism. Due to the largely drainage dissected, hilly terrain, access into the vast majority of EPM 18850 by 4WD vehicle is severely limited. Apart from a few tracks that could be accessed in the tenement, in order to effectively explore the tenement, helicopter supported sampling was required for the most part.

A total of 31 stream sediment samples were taken, with sample points presented in Figure 6. Appendix 1 contains all digital data for the surface geochemical samples taken.

The stream sediment sampling program was planned using a combination of aerial photographic and terrain imagery in Esri® ArcMap™ version 10.2.1. This proved successful as it was necessary to select sample sites based not only on adequate sample spacing, but helicopter access as well (flat or gently sloping ground, clear of vegetation). The main sampling program was designed at a spacing of approximately 1 sample every 1-1.5 km<sup>2</sup>. A total of 31 stream sediment samples were taken across the relinquished sub-blocks, mostly with helicopter support.

Samples of alluvium were collected by selecting a suitable trap site in the target alluvial channel. A hole was dug to the necessary depth (up to 25cm deep) using a small shovel and the alluvium sieved through a -1mm mesh stainless steel sieve. Approximately 500 grams of the -1mm alluvial material was collected in the pan and transferred to a neatly labelled 150mm x 50mm geochem bag. Sample details including sample ID, 3D co-ordinates, sample colour, channel direction and geological details were collected on a field log sheet and eventually data entered into an excel spreadsheet. The final excel spreadsheet was sent to Geobase P/L for incorporating into the Mt Surprise database. Samples were stored securely at the field camp at the end of each day.

At the end of each field trip, samples were transported to Intertek-Genalysis in Townsville, QLD for sample preparation and analysis. Stream sediment samples were pulverised so at least 85% of material was 75µm or finer. Samples underwent three separate analytical phases given the broad range of elements targeted.

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Analysis for Ag (0.05ppm lower detection limit), As (0.5ppm), Bi (0.01ppm), Cu (1ppm), Mo (0.1ppm), Pb (5ppm) and Zn (1ppm) was using a four acid digestion, with an ICP/MS (Mass Spectroscopy) or ICP/OES finish.

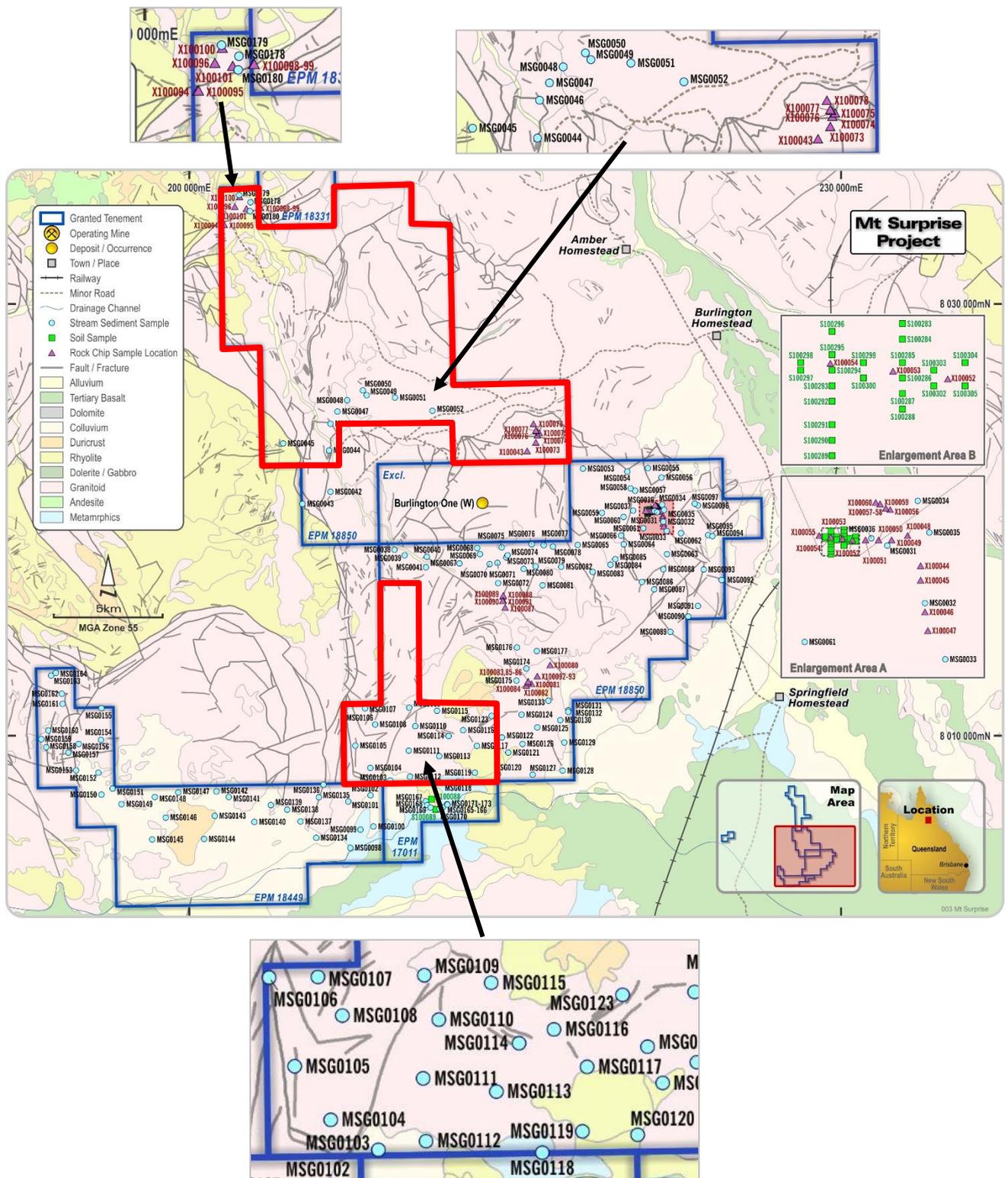
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## **7. CONCLUSIONS**

The 50 sub-blocks relinquished from EPM 18850 were selected on the basis of diminished REE prospectivity due to surface sample results. Results were generally of low order, though the final decision to relinquish was essentially to satisfy cost cutting measures.

Stream sediment sampling as a method for a broad regional geochemical coverage is a good technique and widely used in exploration. In this instance, it assisted in the selection process of sub-block relinquishment, though from some of the blocks relinquished, there may be areas still worthy of follow up exploration.

Figure 6. Mt Surprise Project Geology, and Surface Sample Locations.



Note: Sample prefix X indicates rock chip sample, MSG stream sediment sample, and S indicates soil sample location. Note relinquished portion of EPM 18850 outlined in bold red. Three enlargements of relinquished portions are included for sample ID clarity.

## **8. REFERENCES**

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