

# Exploration Potential of Exploration Licence 64/2004, Waratah

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## Summary

The area of Exploration Licence EL 64/2004 around Waratah has been extensively and intensively explored by nine exploration companies over the past forty-five years. Their principal targets were carbonate-replacement tin deposits analogous to the 10 million tonne deposit at Mount Bischoff, base metal deposits particularly at, or of similar type to, the small Magnet lead-zinc-silver vein deposit, and to a lesser extent gold deposits of no particular type.

Almost the entire west to east span of the EL has been covered by detailed grid based geologic mapping, soil geochemical, electromagnetic, and ground magnetic surveys, particularly along the favourable contact zone between the Oonah and Crimson Creek Formations. The licence area was covered by several stream geochemical surveys and airborne magnetic and electromagnetic geophysical surveys targeting both tin and base metal deposits. Exploratory drilling programs to test EM-conductive or combined conductive-magnetic anomalies and geological conceptual targets at four locations (Deep Gully Creek, BAB, Stone Dam and North Magnet prospects) failed to find any carbonate-replacement tin mineralized zones, only minor alluvial tin in some sub-basaltic and inter-basaltic Tertiary gravels. In 2007 the area of tin-prospective Oonah Formation was surveyed by high-powered helicopter-borne VTEM but it did not detect any prospective anomalies. Consequently, the licence area has low prospectivity for carbonate-replacement tin deposits, except for possible extensions of the Mount Bischoff deposit, which are contained in existing mining leases, excluded from EL64/2004.

Most of the base metal exploration was focussed on the Magnet mine located at the extreme south-western corner of the licence. Between 1895 and 1940 this mine produced about 630,000 tonnes of ore from a steeply plunging galena-sphalerite-bearing manganiferous carbonate lode in serpentinized mafic rocks. A total of twelve exploration holes, drilled by four companies, to test for lode extensions up to 300 metres along strike of the mine workings, have found only minor sub-economic mineralized zones. However, historical reports from the 1920s indicate there is high probability that the main ore shoot extends to depth below the approximate 350-metre-depth of the old mine. Unfortunately, the westerly plunge of the Magnet lode places the deeper parts of the lode, below about 150 metres from surface, outside the western boundary of EL 64/2004. Accordingly, the potential for discovery of economic extensions of the Magnet lode at shallow depths within EL 64/2004 is low. There is moderate potential in the area for existence of other small lead-zinc-silver vein type deposits. Conversely, narrow low-tonnage deposits of this type have low economic potential, and a low findability factor because they respond poorly to geophysical exploration methods.

There are no known untested high-potential geophysical anomalies or conceptual geological targets in EL 64/2004. Its overall prospectivity rating is low.

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## INTRODUCTION

EL 64/2004 covers an area of 48 km<sup>2</sup> around the town of Waratah in northwest Tasmania. It includes the historically mined Magnet Pb-Zn-Ag deposit and encloses two mining leases (12M/2006 & 2M/2008, totalling 4 km<sup>2</sup>) associated with Bluestone's tin mining operation at Mount Bischoff.

TNT Mines P/L, a wholly owned subsidiary of Minemakers Ltd., is exploring the licence area principally for granitoid related Sn-W deposits. This project is part of a (January 2011) joint venture arrangement with Clancy Exploration Ltd. covering two Tasmanian ELs (Oonah 63/2004 and Waratah 64/2004) which are held by Clancy's subsidiary Geoinformatics Exploration Tasmania P/L.

Minemakers' Geology Manager, Russell Fulton, commissioned me to undertake a general prospectivity analysis of the Waratah EL 64/2004, with specific emphasis on:

- tin and tungsten prospectivity
- Bass Metals' exploration of the Ag-Pb-Zn Magnet deposit
- tin prospectivity at Magnet.

This work has been undertaken as a short-term geological consultancy; based entirely on a review of existing geologic and exploration reports, it has not involved any fieldwork nor generated new data.

## GEOLOGICAL SETTING

A largely fault-bounded east-north-east trending block of poly-deformed siltstone shale, quartz sandstone and dolomite assigned to the upper part of the early NeoProterozoic Oonah Formation, occupies the central part of EL 64/2004 (Figure 1). It is surrounded by a succession of basaltic volcanoclastic turbidites, finely bedded siltstones and mudstones comprising the generally deeply weathered and poorly exposed Late NeoProterozoic-Early Cambrian Crimson Creek Formation.

Lying between those Formations, in the western half of the EL along the north side of the Magnet Creek valley, is a narrow strip of lithicwackes, red mudstones, cherts, and mafic volcanics with ocean-floor characteristics and associated mafic-ultramafic intrusives. The mafic rocks in this belt have been traditionally called the 'Magnet Dyke' but are now recognized as part of an Early Cambrian (?) oceanic assemblage known as the Cleveland-Waratah Association, which was probably emplaced during an Early Cambrian collisional orogeny (Seymour et al., 2007).

The north-eastern corner of the Middle Devonian Meredith Granite batholith crops out about three kilometres south of EL 64/2004. Gravimetric modelling indicates that the subsurface margin of the granite shelves gently, with 'some crestal pinnacles', to the north towards Mount Bischoff near Waratah (Leaman, 1991 in: Halley,

1992a). A number of granite-related quartz porphyry dykes crop out between the Meredith Granite and Mount Bischoff.

Tertiary basalts up to a couple of hundred metres thick cover parts of the eastern edge of the EL, and on the small plateau of the Magnet Range in the western part.

A dolomitic unit in the Oonah Formation near Waratah, and rare carbonate rocks in the Cleveland-Waratah Association at Luina, host/ed the important Devonian granitoid-related carbonate-replacement tin deposits of Mount Bischoff and Cleveland, respectively (Table 1). The Magnet PbZnAg carbonate lode is a granitoid-related vein type deposit located at the intersection of faults in

Cleveland Waratah Association host rocks at the very south-western corner of EL 64/2004. Several very small PbZnAg vein-type prospects with no significant production, including, Six-Os, Fawkners, Persic and Silver Cliffs, exist in the Oonah Formation inlier between Magnet and Mount Bischoff.

Table 1 Significant mineral deposits in the Waratah area (Seymour et al., 2007)

Mount Bischoff	10.5 Mt @ 1.1% Sn
Cleveland	12.4 Mt @ 0.6% Sn, 0.25% Cu
Magnet	0.63 Mt @ 7.3% Pb, 7.3% Zn, 427 g/t Ag

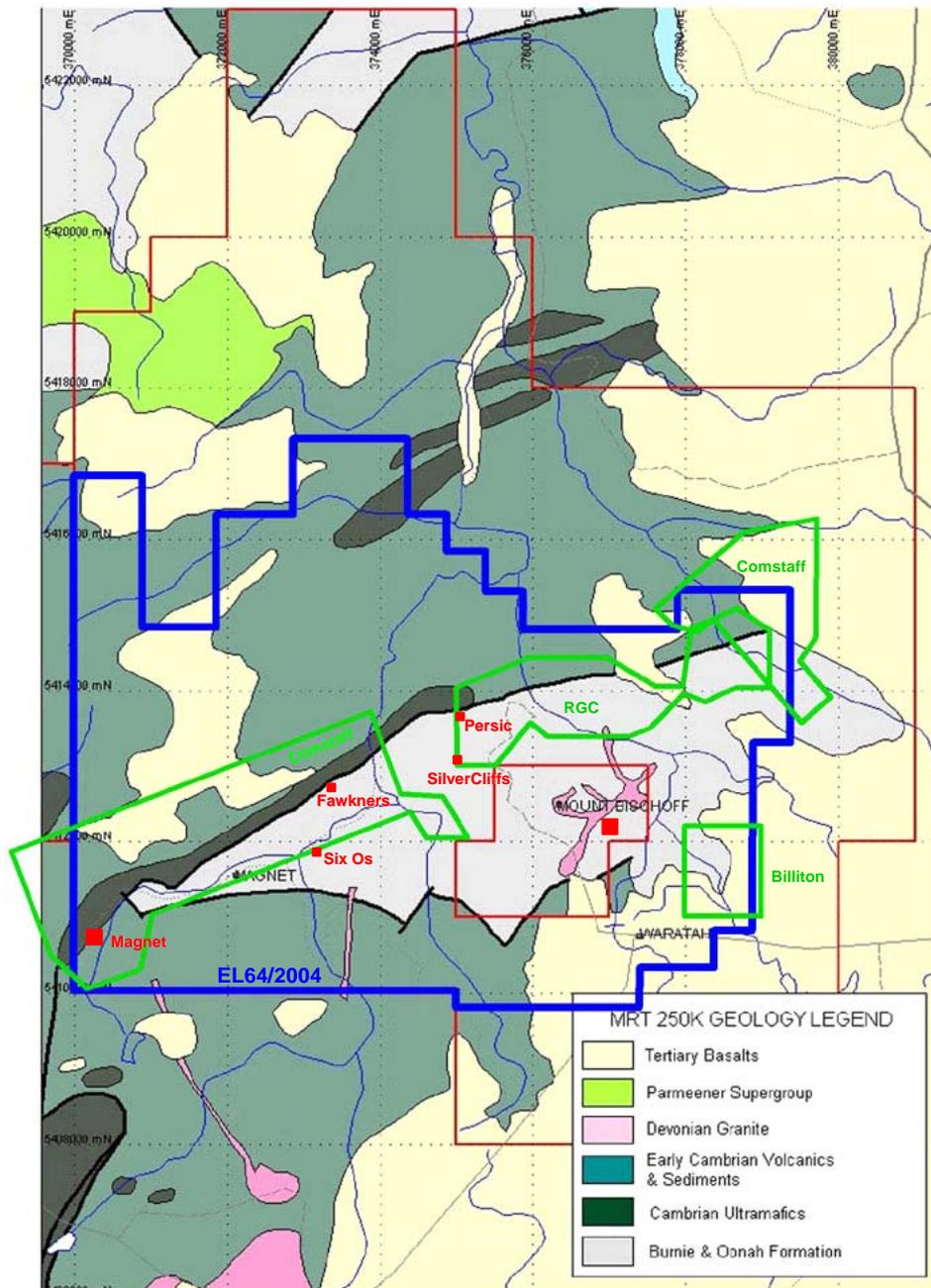


Figure 1 Location diagram showing simplified geology, current EL 64/2004 boundary (blue), Mount Bischoff mining leases (red), and outlines of the areas gridded and surveyed by previous explorers (green). (Adapted from Turnbull, 2006)

# EXPLORATION HISTORY OF THE WARATAH-MAGNET AREA

## EZ Company Ltd 1950s

According to a brief summary by Glasson & Cox (1968), the Electrolytic Zinc Company Ltd. had carried out a literature review, limited surface mapping, and drilling of two holes at the Magnet Mine, in the early 1950s. The two holes, WP83 of 171 m and WP84 of 334 m, were drilled in opposite directions (to north-west and south-east, respectively) on a section about 150 metres south-west of the Magnet orebody. Glasson & Cox considered that the holes were ‘of little value’ because they had not been sited to properly test conceptual zones of intersecting shears, which were considered to be the main structural control on mineralized shoots. Table 2 presents the ‘disappointing’ intercepts and grades as quoted by Glasson & Cox (1968).

Table 2. Assay data from EZ drill holes WP83 and WP84

Hole	Length (m)	From (m)	Pb %	Zn %	Ag g/t
WP83	0.75	~140	0.7	3.9	37
WP84	1.4	277.6	0.9	1.7	34
WP84	4.1	289.8	0.5	1.7	58
WP84	3.1	302.4	1.3	1.8	87
WP84	0.5	312.5	2.4	2.3	106

## ABERFOYLE 1965-1968

In 1965-67 Aberfoyle, apparently ‘in partnership’ with EZ Company Ltd, carried out ‘a large amount of line cutting and detailed field investigations’ including geological mapping and soil geochemical and ground magnetic surveys over a 5-km-long grid between the Cleveland and Magnet Mines (Cox, 1967; Glasson and Cox, 1968). Most of that grid was outside, to the south-west of, current EL 64/2004 but it included a more detailed coverage at 30 m line spacing over a 600 m x 100 m area around the Magnet Mine. At that time the Magnet Mine seems to have been in Aberfoyle’s EL 1/63, which covered the Magnet to Cleveland area (Drawing No. C-176-G in: Glasson and Cox, 1968)

Glasson & Cox’s geological interpretation agreed with Nye’s (1923), that the steep westerly plunge of the Magnet orebody was controlled by the intersection of two shear zones. The distribution of manganese and zinc soil geochemical anomalies supported their concept that there were three similarly favourable structural settings, located between 200 and 600 metres to the southwest of the Magnet open cut. Glasson and Cox (1968) proposed a five hole diamond drilling program (M1-M5, total ~1200 metres) to test these targets at about 120 and 200 metres depth.

Aberfoyle apparently did not trouble to report their drilling results but my search of MRT’s drill hole database indicates that they did drill three diamond core holes at Magnet during 1968-1969: M1, M2 and M3, of 182, 274 and 183 metres depth, respectively.

Rugless (1976, page 8) somehow subsequently extracted some information about those drill holes, and discussed them in relation to his own structural interpretation of three mineralized pipes, suggesting that the Aberfoyle program had also (like the earlier EZ Co. program) ‘failed to compensate for the structural controls on the lode’:

‘Cleveland Tin N.L.<sup>1</sup> drilled three boreholes which tested two sections south of ore Pipe 3, with little success. Borehole M3 tested the southern ultramafic unit where no ore pipes (convergent zones) have been recognised, and failed to intersect mineralisation. Boreholes M1 and M2 tested the section closer to Pipe 3. M1 intersected only a trace of lead-zinc mineralisation and is interpreted to have been well south of Pipe 3. M2 intersected stronger mineralisation and is interpreted to have clipped the southern edge of Pipe 3.’

Neither Rugless nor subsequent reviewers (eg. Blake, 2007; Chaku, 1998; Ellis, 1989) reported any intercept or assay data from the three Aberfoyle drill holes. However, I stumbled by chance upon a file called ‘cleveland drill holes m1-m3.xlsx’, hidden amongst Bass Metals’ digital data<sup>2</sup>. This spreadsheet, presumably compiled by Mike Blake from an undisclosed source, contains collar locations, down-hole survey data, and lithological logs of holes M1, M2 and M3, and assay data from M1 and M2. The intercept and grade data, summarized in Table 3, are consistent with Rugless’ comments that the holes only intersected weakly mineralized zones.

Table 3 Assay data from Aberfoyle drill holes M1 and M2

Hole	From (m)	To (m)	Length (m)	Pb %	Zn %	Ag g/t
M1	106.4	106.6	0.27	0.1	0.2	3
M1	107.0	107.5	0.55	0.1	0.7	3
M1	125.2	125.4	0.24	0.3	0.9	6
M1	148.9	149.4	0.49	0.0	0.1	3
M1	149.4	150.0	0.61	0.2	0.8	6
M2	192.5	193.1	0.58	1.8	4.0	-
M2	193.1	194.0	0.91	0.4	tr	-
M2	194.0	195.3	1.37	tr	tr	-
M2	196.0	196.3	0.30	tr	0.1	-
M2	204.1	204.2	0.12	tr	0.5	-
M2	204.2	204.5	0.30	tr	tr	-
M2	237.9	238.4	0.46	tr	tr	tr
M2	238.4	239.2	0.82	tr	0.11	tr
M2	239.2	239.9	0.73	tr	0.17	tr
M2	239.9	240.9	0.94	tr	0.24	tr

<sup>1</sup> Aberfoyle were operators of the Cleveland Tin Mine at Luina.

<sup>2</sup> Waratah\BassData\Drilling\cleveland drill holes m1-m3\cleveland drill holes m1-m3.xlsx, date modified: 15/01/2008.

## COMSTAFF 1976-1984

The Waratah-Magnet area was a core part of Comstaff's EL 5/63, which covered a large piece of western Tasmania between Waratah and Rosebery. They held and explored for it 25 years, under various joint ventures, and for a wide range of targets particularly including VHMS deposits in the Mount Read Volcanics, carbonate-replacement tin deposits chiefly at Mount Bischoff, Devonian Pb-Zn-Ag veins, and alluvial tin deposits. MRT's Tasxplor database lists 160 reports pertaining to EL 5/63, submitted between 1964 and 1989. There may be a few exploration gems buried therein but it's obviously a great task to wade through those voluminous data. Accordingly, I have selectively examined only the EL 5/63 reports that came through relevant Tasxplor search filters (eg. location and prospect names including Magnet, Mount Bischoff, and Waratah), or relating to prospects that had been mentioned in previous reviews of exploration history (e.g. by RGC, Pasmenco, MPI and Bass Metals).

Shaw and Everett (1985) summarized Comstaff's early regional exploration efforts in the Waratah-Magnet area (excluding Mount Bischoff) as follows:

- 1970-71 Geologic mapping and stream sediment geochemical surveys in the area between Mount Bischoff, Magnet and Corinna Road. Principal anomalies were attributed to contamination from Magnet and Mount Bischoff mines. A regional Turair EM survey detected eight anomalies. The three best anomalies (A1, A4 and A6) were gridded and followed up by ground Turam EM. Of these, only anomaly A4, (2 km north-east of Magnet Mine) was confirmed and recommended for further investigation.
- 1972 Reconnaissance stream geochemical and geologic mapping in Arthur River tributaries discovered prominent tin anomalies in Deep Gully Creek.
- 1973 Small reconnaissance grids over Turair EM anomalies A2, A4, and A5 in the Magnet area were surveyed by Crone EM and ground magnetics but no anomalies were detected.
- 1975-76 A 5-km-long grid over the 'Magnet-Bischoff line' (Figure 2), which embraced the previous reconnaissance grids, was covered by geologic mapping, soil geochemical, ground magnetic and EM surveys. Only one EM anomaly (BAB) was detected near the south-eastern edge of a Tertiary basalt plateau on the Magnet Range.
- 1976 Craig Rugless (1976) reviewed the prospectivity of the Magnet Mine, considered it had potential for zinc-ore in unmined footwall zones, and proposed two drill holes to test the lode at about 200 m below surface. Holes MAG1 and MAG2 intersected parts of the old mine workings but 'only selvages of the mineralized pipe were recovered'.
- 1978 Drill hole BAB1 (187m) tested the EM anomaly on Magnet Range (Figure 2). It intersected 50 m of Tertiary basalt and gravels underlain by

non-mineralized interbedded red mudstone, shale and greywacke of the Crimson Creek Formation.

- 1983 A regional DIGHEM survey identified 'numerous anomalies'. Five anomalies were reviewed (without field work); those five are associated with Tertiary basalt and lie north of the current boundary of EL 64/2004.

The following sections describe two areas that received more detailed exploration by Comstaff:

### Magnet Mine

In 1975-1976 Comstaff established a grid (3.8 x 1.4 km, 200-m-spaced NNW lines) along the Magnet Creek Valley (Figure 1 & Figure 2) to explore for north-easterly extensions of the 'Magnet ore horizon and/or other favourable ore settings in the area' (Rugless, 1976). They geologically mapped it at 1:5000 scale, sampled its A° horizon soils and analysed them for Cu, Pb, Zn, Ba, Mo, Sn, Ag (or Hg?)<sup>3</sup> and Ni, and did a ground magnetic survey. Rugless also carried out a more detailed review of the Magnet Mine and produced a 1:2000 scale geological map of the mine area.<sup>4</sup>

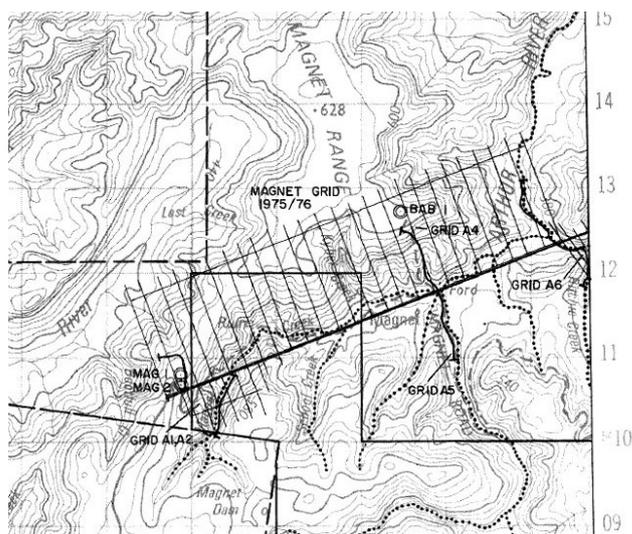


Figure 2 Location of Comstaff's exploration grids on the 'Magnet-Bischoff line' (copied from: Shaw and Everett, 1985).

Rugless (op. cit.) presented a detailed written description and discussion of the geology of the Magnet Mine and the grid area. He had some fairly advanced ideas about the region's tectonic evolution, which are now partly

<sup>3</sup> Rugless (1976) listed silver in the analytical suite and discussed results of mercury analyses!

<sup>4</sup> A hand written note on the cover page of MRT's (pdf) copy of Rugless' (1976) report notes that 16 plans, 2 tables, and 2 appendices are 'all missing & unavailable'. However, Chaku (1998) mysteriously acquired a complete copy of the report from Normandy Poseidon's Adelaide Office, and included it as Appendix 5 in his report. Unfortunately, the latter was copied at low resolution and several of Rugless' most interesting geological plans and sections of the Magnet Mine are highly pixellated, only semi-legible. Rugless' Magnet Mine plans and drill sections were drawn at 1:2000 scale but the pdf copies appended to Chaku's report are at 1:4000 scale. It would be worth an attempt to obtain better copies, if further testing of the Magnet deposit is planned.

superseded. And he refuted Nye's (1923) 'Magnet dyke' model of the ultramafic host rocks, interpreting them instead as a group of ultramafic basalt flows and comagmatic gabbroic intrusives essentially conformable with the enclosing mudstone-greywacke sequence, which is consistent with the current interpretation of the 'Cleveland-Waratah Association' (Seymour et al., 2007). However, some of his description seems fanciful; for example:

'A 1800 m long by 400 m wide arcuate alteration zone encompasses the Magnet Lode and basic rocks to the north-east. Alteration consists of albitization, chloritization, silicification, carbonatization and less commonly epidotization, which is consistent with the propylitic alteration type ... commonly found at the outermost alteration zones of porphyry copper deposits.'

Rugless' 'stereographic analysis of all the mineralized veins along the Magnet Road cutting' and his recognition of 'at least three mineralized convergent zones or pipes' are also unconvincing. Nevertheless, they did at least lead him to concur with Nye's (1923) earlier interpretation that the Magnet Lode formed at the convergence (intersection) of steeply-dipping north-east and north-trending shears (faults), which controlled the steep westerly plunge of the ore pipe/s (shoot/s). But as Rugless himself admitted (referring to Nye's description): 'This is confirmed by the indicated direction of the mine workings'.

In April-May 1976 Comstaff drilled two holes (MAG1, 278 m and MAG2, 284 m) on Rugless' recommendation 'to test the width and grade of the lode', in Pipes 1 and 2, about 150 m apart and 170-180 m below surface.<sup>5</sup> The results apparently did not come to light until part of the EL was relinquished nine years later (Shaw and Everett, 1985).

As briefly mentioned in the preceding summary Shaw and Everett (1985) played down the Magnet drilling results, reporting that 'only selvages of the mineralized pipe were recovered'.

Peter Ellis (1989) took a closer look at the Comstaff drill logs for Placer Exploration, agreed that the 'results were disappointing', and summarized the mineralized intercepts of 9 m @ 4.9% Pb+Zn & 139 g/t Ag in MAG1, and 27 m @ 2.9% Pb+Zn & 42 g/t Ag in MAG2.

Chaku (1998) for MPI was more specific about the same intercepts and noted that core recovery was poor in the mineralized zones, averaging 45% in MAG1 and 80% in MAG2.

He quoted the grades as:

MAG1: 9 m @ 1.5% Pb, 3.5% Zn & 139 g/t Ag including 1 m @ 6.6% Pb, 13.7% Zn & 915 g/t Ag.

MAG2: 27 m @ 0.4% Pb, 2.5% Zn & 42 g/t Ag including 5 m @ 0.6% Pb, 6.3% Zn & 48 g/t Ag<sup>6</sup>.

<sup>5</sup> Targets according to Rugless' proposed holes shown on his 'Level Plan of Pipes 1, 2 & 3', in Appendix 5 of Chaku (1998).

<sup>6</sup> Chaku (1998) quoted 4.8 m @ 4.4 g/t Ag in MAG2; possibly a typographic error or mistake in converting some of the Ag assays originally reported in oz/ton units?

Peter Ellis must have unearthed and re-sampled these drill cores<sup>7</sup> because Appendix VI in his (1989) report lists Cu, Pb, Zn, Ag, Au, As, Bi, Sn, Sb assay data of about 80 'rock chip' samples from Comstaff's drill holes MAG1, MAG2 and BAB1. He mentioned them only in passing, to note that they include values up to 0.065 g/t Au, and therefore the Magnet lode was unlikely to be a source of anomalous Au in the streams. However, the tin results, up to 330 ppm Sn, are interesting and they receive further examination in the DISCUSSION of PROSPECTIVITY, in this report.

### Deep Gully Creek – Belmont Hill

Comstaff's reconnaissance geologic mapping and stream sediment sampling program in the early 1970s detected significant and extensive tin-geochemical anomalies in the lower part of Deep Gully Creek and its tributaries a few kilometres north of Mount Bischoff (Herrmann, 1973).<sup>8</sup> Nearly a decade later Comstaff followed up with heavy concentrate stream sampling and found a 'pronounced' tin anomaly in Deep Gully Creek near the contact between the Early NeoProterozoic Oonah Formation (Bischoff Series) and Late NeoProterozoic Crimson Creek Formation (Levings, 1984).

Comstaff established a grid over the area and did geologic mapping, soil geochemical sampling and ground magnetic surveys (Figure 3). This grid was mainly on the north-eastern side of Deep Gully Creek; about half of it lying outside the current boundary of EL 64/2004 (Figure 1). Magnetics outlined a number of domains, including a narrow linear 'mild positive' anomaly overlying a dolomitic unit and partly coincident with a weak tin soil geochemical anomaly. Although some other tin soil anomalies were found over Tertiary basalt, it was noted that none existed above the 550 m elevation level, and that the tin came from inter-basaltic (or sub-basaltic?) layers of alluvium.

Five vertical holes (DGCs 1 to 5, totalling 902 m, with percussion pre-collars and diamond core tails) were drilled on the eastern side of Deep Gully Creek in early 1984 to 'test the possibility of a hardrock Sn source beneath the Tertiary basalt in the vicinity of Belmont Hill'<sup>9</sup> (Levings, 1984). It is not clear how these holes, spaced out over an area of about 700 m x 500 m on the south-western flank of Belmont Hill, were targeted. They are more or less along strike of the dolomite unit, presumably designed to test its northeast strike extension below the basalt.

<sup>7</sup> According to MRT's website drillhole database MAG1 & MAG2 cores are currently in MRT's Mornington Core Store. There is no explanation in Ellis' report of whether the Placer assays were of continuous or selected samples of core. I surmise they were selected re-samples because of the long lengths of some intervals (up to 40 m), and the assay values for the best mineralized zone in MAG2 (255-259.8 m) correspond only qualitatively with the original data in Comstaff's drill logs presented by Shaw & Everett (1985).

<sup>8</sup> I had almost forgotten my pioneering role in this discovery nearly four decades ago. But I'll never forget the world class (some would say horrific) horizontal scrub we toiled through in the Heazlewood River headwaters.

<sup>9</sup> Only one of these holes, DGC2, is just within (~100 m) the northern boundary of EL 64/2004, the other four DGC holes are outside it.

All of the holes went through a sequence of Tertiary basalt flows and minor interflow sediments, from 73 to 134 m thick. Four of the holes ended in partly silicified 'Bischoff dolomite' (Oonah Formation) with between 27 and 67 m of weathered 'Tertiary chaos breccia' lying between the base of the basalt and the basement dolomite. One hole (DCG4) ended in mudstone (Crimson Creek Formation) with no sub-basalt breccia. Inter-basalt sediment layers intersected in three of the holes (DCGs 1, 3, & 4) contain minor tin: 10 to 65 ppm Sn, in intervals from 2 to 25 m thick. SIROTEM down-hole EM logging surveys in three of the holes detected no conductors.

These holes appear to have confirmed the strike continuity of the dolomite unit for at least 1.5 km north-east of Deep Gully Creek. Although variably silicified the dolomite is 'not Sn-mineralized in any intersections or exposures' (Levings, 1984). Levings concluded that the tin in soils and stream sediments was mainly 'due to the redistribution of cassiterite from Tertiary inter-basaltic silty-sand layers'. However, the textural style of cassiterite suggested a primary source in a nearby carbonate-replacement type Sn deposit.<sup>10</sup> On that basis, Levings 'strongly recommended' continued exploration of the dolomite unit extending to the south west of Deep Gully Creek, to include ground EM survey and semi-stratigraphic drilling. Comstaff did not follow up on that 'strong recommendation', but a few years later RGC explored the south-western strike extension.

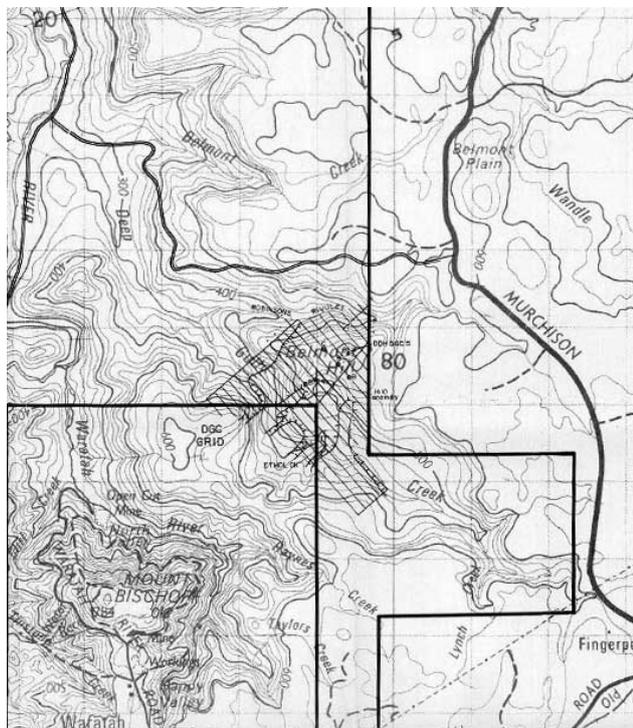


Figure 3 Location of Comstaff's exploration grid at Deep Gully Creek. (Copied from Levings, 1984)

<sup>10</sup> Scott Halley (RGC, 1994) subsequently deduced that the Deep Gully tin was eroded from Mount Bischoff about 2 km to the south-west – but not from a more local source.

## BILLITON 1988-89

Billiton Australia picked up EL 46/88 to explore for 'stratabound replacement and exogranitic skarn tin mineralization' (Randell and Hungerford, 1989). The licence initially covered a 70 km<sup>2</sup> area between Wombat Flat and Deep Gully Creek. Billiton relinquished parts of the EL in the first year, to concentrate their exploration on two areas of principal interest at Stone Dam and Butler's Road. The Stone Dam segment overlapped the south-eastern half of the current EL 64/2004; it enclosed Waratah and the then Mount Bischoff RL 8807, but narrowly excluded the Magnet deposit (Figure 4). The Butler's Road area adjoins EL 64/2004 immediately south of Magnet.

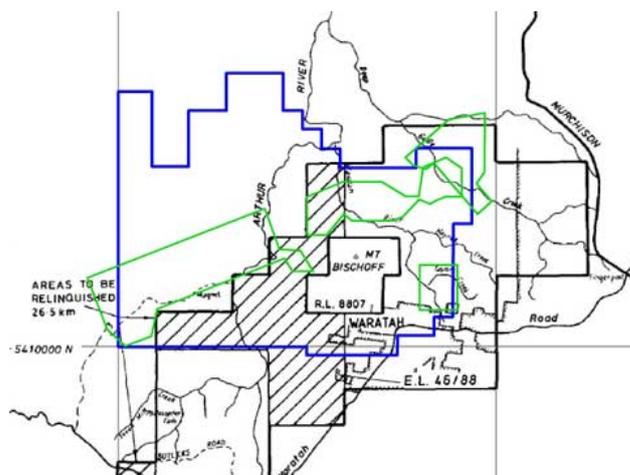


Figure 4 Location of the original and reduced areas of Billiton's EL 46/88, in relation to the blue outlined area of current EL 64/2004 (modified after: Randell and Hungerford, 1989)

The exploration rationale for this area was based on the combined magnetic and electrically conductive properties of cassiterite-bearing massive pyrrhotite zones, which have been the main source of ore in the western Tasmanian carbonate replacement<sup>11</sup> tin deposits exemplified by Renison Bell, Mount Bischoff and Cleveland. Mount Bischoff is unambiguously anomalous in data from helicopter-borne geophysical surveys flown in 1981 and 1983.<sup>12</sup> Randell and Hungerford (1989) noted that the Mount Bischoff magnetic-electromagnetic anomaly of 'several hundred nT and in excess of 100 mhos' may have been exaggerated by the deposit's topographic prominence.

### Stone Dam

Billiton focussed exploration on Stone Dam, at the edge of Tertiary basalt cover about 2 km southeast of Mount Bischoff, in 'recognition of an aeromagnetic anomaly of similar characteristics to that which overlies Mt Bischoff' (Figure 5). They established a grid over the area (13 line km) and carried out geologic mapping, rock chip

<sup>11</sup> Otherwise known as distal sulfide skarn tin deposits.

<sup>12</sup> 1981 Mines Department/Geox, magnetic survey at 200 m line spacing, 150 m terrain clearance. 1983 Comstaff/Digham, electromagnetic and magnetic survey at 200 m line spacing, 35-50 m terrain clearance.

sampling, detailed ground magnetic survey, and three short UTEM traverses across the anomaly<sup>13</sup>.

Geologic mapping showed that most of the area was covered by 50-70-m-thick Tertiary basalt flows overlying Oonah Formation sandstones, siltstones and shales, which are exposed only in gullies eroded through the basalt. A narrow, southwest trending quartz-muscovite porphyry dyke<sup>14</sup> in the western part of the grid was interpreted as being Devonian granitoid-related (similar to those at Mount Bischoff) and possibly connected with a small cassiterite-pyrrhotite deposit at Fook's Lode between Waratah and Mount Bischoff.

Ground magnetic data revealed a chain of positive anomalies (>1000 nT above local background) along the cliffs marking the basalt-edge around the head of Stone Dam Creek. Three UTEM traverses over the largest, ~200-m-wide anomaly, at the head of the gully near the southern end of the grid, indicated two parallel conductors coincident with the magnetic anomaly, and very likely of the same source (Figure 6). Modelling of the geophysical datasets produced ambiguous interpretations (as it typically does) that the anomalies could be due either to the basalt cover, or to a gently north-dipping source close to the surface immediately below the basalt cliff edge. The data were 'not inconsistent with' a massive pyrrhotite source (Randell and Hungerford, 1989).

Previously, in 1981, Metals Exploration Ltd. had tested the same anomaly, which they had defined by ground magnetics and Max-Min/Pulse EM surveys, with a single diamond drill hole (MBD62, 120 m, inclined at -50° to the north). Randell and Hungerford (1989) noted that MBD62 passed 'through 70 m of Tertiary basalt into Cambrian (?) sediments but did not explain the EM anomaly', and that it had gone only 15 m into the basement rocks, possibly down the dip of the strata.

Despite the geophysical ambiguity and previous inconclusive drilling, Billiton proceeded to test the anomaly again, from its north-eastern side, with diamond drill hole WD 89-1 (depth 223 m, collared at AGD66 378535E 5411235N, inclination -55°, azimuth 228° Mag.). This hole must have been collared right on the edge of the basalt, probably for logistic reasons. It passed through basalt to 87 m, (strongly weathered to clay in the lower 30 metres) and below that intersected a 'chaotic assemblage of fine siltstones, sandstones and pebble conglomerate' - but no carbonate units. No 'visible UTEM or magnetic source' was intersected and the basement rocks are not geochemically anomalous. In the absence of down-hole EM data, Randell (1990) concluded that the magnetic and conductive source/s were probably in the Tertiary basalt and underlying clay, and recommended relinquishment of the EL.

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<sup>13</sup> Billiton's Stone Dam anomaly is located on the south-eastern boundary of current EL 64/2004; about one kilometre south of the area covered by Bass Metals' VTEM survey.

<sup>14</sup> Assays of three rock chip samples from this porphyry in Stone Dam Creek indicated low Sn-content of 8-14 ppm Sn.

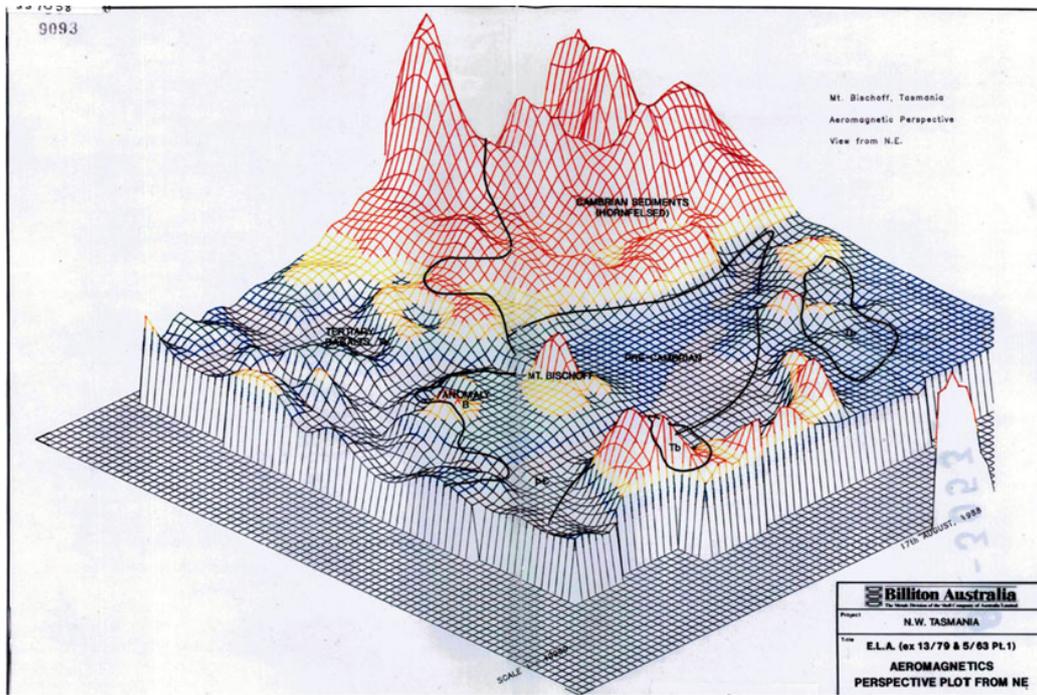


Figure 5 Perspective wire-frame representation (looking south-west) of aeromagnetic data showing Mount Bischoff as the discrete anomaly in the centre, and the weaker Stone Dam anomaly (here labelled Anomaly B) on the edge of the 'noisy' Tertiary basalt responses to the south-east of Mount Bischoff (copied from: Randell and Hungerford, 1989).

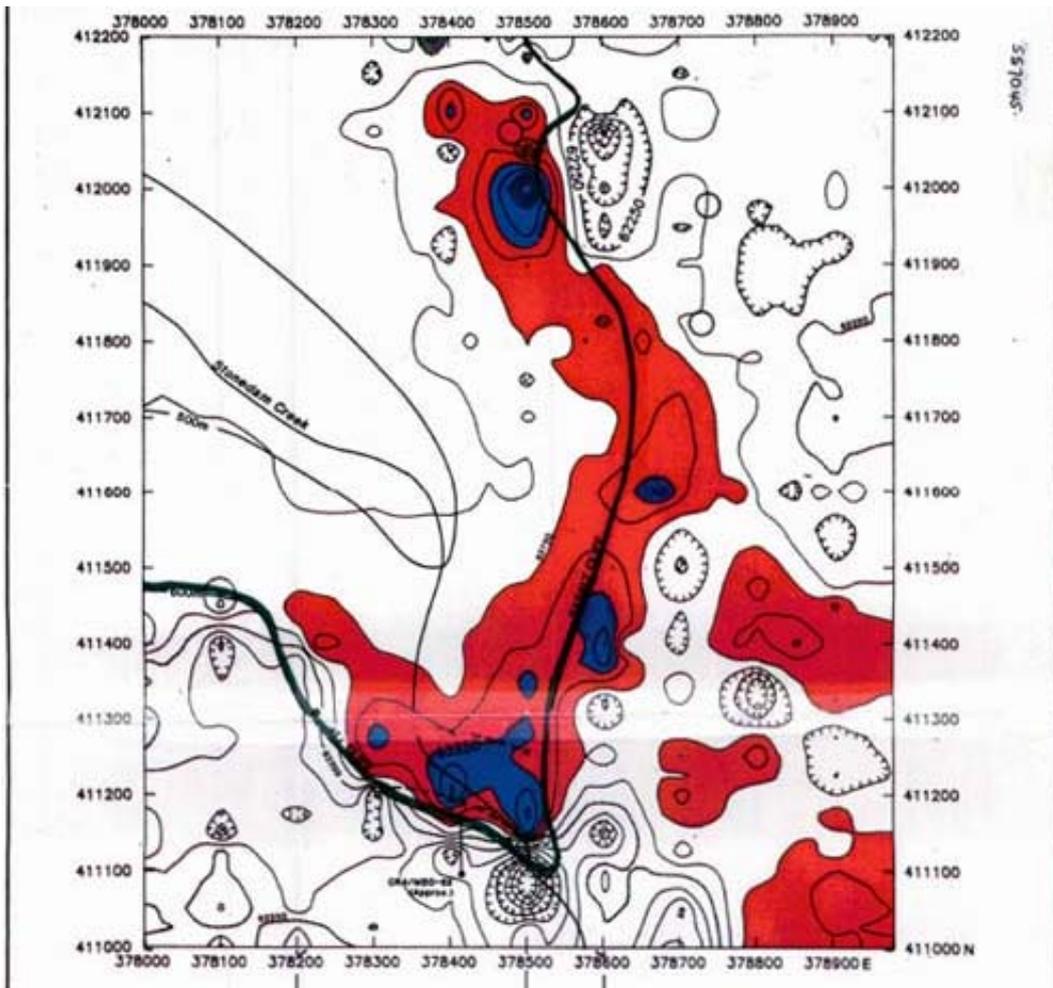


Figure 6 Contoured representation of ground magnetic data and locations of EM conductors (short dashed lines) on Billiton's Stone Dam prospect. (copied from: Randell and Hungerford, 1989)

## PLACER 1989

Placer Exploration Ltd. acquired EL 47/88 by tender in January 1989, following the final relinquishment of Comstaff 's old EL5/63 (Ellis, 1989). Placer's target was 'gold mineralization associated with Cambrian high magnesia and/or low titania volcanics....similar to that observed in some Western Australian, Victorian and South African gold areas' (?)

EL 47/88, of only 19 km<sup>2</sup>, covered the Magnet Creek to Wombat Hills area, including the Magnet Mine in a strip just 1-km-wide (Figure 7). At that time EZ Co. held mining leases over the Magnet tailings pond and access track. Ellis (op cit.) also noted that the Magnet Mine was covered by a 1 km<sup>2</sup> Fossicking Area with public rights to the upper 15 metres.

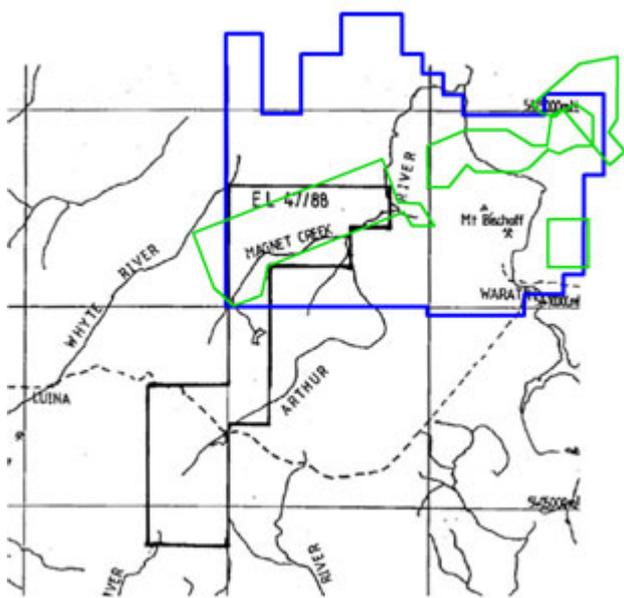


Figure 7 Location of Placer Exploration's EL 47/88.

After reviewing previous exploration data, Placer conducted a geological mapping and stream sediment geochemical survey taking:

- 5 kg samples of -6 mesh active sediments for bulk leach extractable Au, Ag and Cu (BLEG) analyses.
- Conventional -80 mesh samples for Cu, Pb, Zn, Bi, As, Sb, Sn and Ag analyses.

The survey detected a 'strong' anomaly in Magnet Creek with BLEG analyses of 32 ppb Au, 4580 ppb Cu and 456 ppb Ag, apparently supported by anomalous Cu, Pb, Zn, As and Sn in the -80 mesh data. Unfortunately, Ellis' partly illegible maps of sample locations and analytical results combined with his largely un-intelligible discussion of the anomalies and follow-up sampling, thwarted my efforts to pinpoint this anomaly and evaluate the data. Moreover, he noted that there 'appears to be a problem' in repeatability of analyses of samples from the Magnet area (Ellis, 1989, p.13), and elsewhere (p.14) he mentioned that an anomaly in the headwaters of Arthur River was not reproduced in follow up sampling. This

casts doubt on the validity of all Placer's BLEG analyses, and indeed the method's applicability<sup>15</sup>.

Nevertheless, Ellis concluded that follow up sampling 'showed the gold was only in the lowermost parts of a few of the streams in the Magnet Mine – Lunch Creek area', i.e. for about 1 km downstream of the mine, which naturally enough suggested contamination from the mine. However, 'low to negligible gold values' in samples of the Magnet mineralized zones (mullock?) and gossan did not particularly support the contamination theory. Ellis (grasping straws) speculated on several other potential gold sources including boninitic mafic volcanics, leakage from a 'possible fault between the Magnet dyke and PreCambrian', and 'small base metal shows' along the base of the Magnet Range, and half heartedly proposed further detailed rock chip sampling to track it down. He seems to have overlooked a historic reference to a more likely source of gold in Tertiary gravels north of Magnet Creek, which P.B. Nye (1923, p. 185-186) had clearly explained:

'Small quantities of gold and cassiterite have been obtained at a few localities along the flanks of the Magnet Range. The gold has been obtained in several of the small creeks, which flow into the Magnet Creek. In all of these streams water-worn pebbles and boulders occur. These could not have been formed by the action of the small creeks, and, moreover, the rock-types composing them are all strangers. The source of these pebbles and boulders has, therefore, to be explained, and it is undoubtedly the conglomerates and gravels forming the basal members of the Tertiary beds underlying the basalt capping of the Magnet Range. The gold is derived from these basal beds, and is present in the creeks as a result of the disintegration of these beds. The quantity of gold obtained has been very small, and amounts to only a few ounces obtained in Matthew's Creek by cradling.'

Notwithstanding their non-definitive results and interpretations, Placer Exploration Ltd. relinquished the licence, perhaps on the strength of Ellis' last (and only unequivocal) words: 'No further work should be undertaken' (Ellis, 1989, p. 21). That was the right decision.

## RGC 1990-1993

RGC Exploration-Renison Ltd. acquired ELs 12/90 and 15/90 by tender in 1990, specifically to explore for carbonate replacement tin deposits similar to Mount Bischoff and Luina (Halley, 1992a, b). The two adjoining ELs originally covered a combined area of 332 km<sup>2</sup>, around the northern and eastern margins of the Meredith Granite, extending from Waratah to south of Mt Ramsey

<sup>15</sup> BLEG stream geochemistry was designed for exploration in ephemeral streams in arid environments. I believe it is inappropriate in the high rainfall, high gradient perennial streams of western Tasmania. Several exploration companies used it in Tasmania in the late 1980s and early 1990s without much success; some found that it produced erratic and non-reproducible results.

and west to Mt Stewart. This area was reduced to 140 km<sup>2</sup> in June 1992, following reconnaissance mapping and rock chip sampling and a comprehensive and detailed regional appraisal of the pre-existing stream sediment geochemical data, Tasmania Department of Mines' 1981 aeromagnetic survey data, and new infill gravity data obtained to supplement the existing regional gravity data (Halley, 1992a). The overlap with EL 64/2004 was essentially similar to that of the original area of the previous EL 46/88 that had been held by Billiton Australia (Figure 4).

David Leaman's (1991) interpretation of the gravity data indicated that the Meredith Granite has very steep contacts along its eastern margin, but shelves gently northwards with 'some crestal pinnacles' associated with mineral deposits between Luina and Waratah.

RGC's subsequent detailed exploration was restricted to three prospect areas at Wombat Flat, Whyte River Skarn, and Deep Gully Creek. The first two are both well outside the current EL 64/2004 and are not described here. RGC's Deep Gully Creek prospect covered 4 km of the generally east-trending contact between the Oonah and Crimson Creek Formations, immediately northeast of Mount Bischoff, within EL64/2004 (Figure 1).

### Deep Gully Creek

Scott Halley's (1993) report eloquently stated RGC's Deep Gully Creek exploration rationale:

'This area was selected for detailed follow-up because it has lithological, structural and geochemical features in common with the major carbonate replacement type tin deposits. These features are: location above a buried granite ridge; a major fault runs through the area; a thick dolomite unit occurs adjacent to the fault; the area is intruded by quartz feldspar porphyry dykes; base metal vein deposits occur in the area; Sn-anomalous stream sediment geochemistry has been recorded.'

RGC established a grid with 200-m-spaced N-S oriented lines to cover the Oonah-Crimson Creek contact zone and carried out:

- 1:5000 scale geologic mapping and rock chip sampling.
- Soil geochemical sampling at 25 m spacings along grid lines.
- Ground magnetic survey at 5 m station spacing.

Geologic mapping showed the Crimson Creek Formation (CCF) on the northern part of the grid consists of a suite of 'dark grey to red chert, greenish brown siltstone and mudstone, deeply weathered basalts, brown labile micaceous greywacke and dark grey micaceous quartzite'. They are in faulted contact to the south with massive pale grey quartzite and interbedded shales of the Oonah Formation (OF), which includes a thick dolomite unit adjacent to the fault in Deep Gully Creek at the eastern end of the grid (Plan 3 in: Halley, 1993). Outcrops of ultramafic pyroxenite and serpentinite between the CCF and OF on the west bank of the Waratah River appear to be in a fault bounded slice representing the eastern end of the (misnamed) 'Magnet Dyke', now understood to be

part of the Cleveland-Waratah Association. From there, the faulted CCF-OF contact trends east-southeast along the Waratah River in the central part of the grid, but strikes northeast in Deep Gully Creek; Halley (op. cit.) hypothesised that the contact was displaced by a younger (north-trending?) fault.

On the north bank of the Waratah River, within both the CCF and the OF, Halley (op. cit.) mapped several outcrops of strongly sericitized quartz porphyry, which he described as being identical to the dykes at Mount Bischoff. Their alteration style is reputedly similar to the sericitic facies in the peripheral zones of the Mount Bischoff system, but different to the pyrrhotite+topaz greisenized porphyries proximally associated with tin mineralized zones.

A thick capping of Tertiary basalt flows occupies the ridge between Waratah River and Deep Gully Creek, and also on Belmont Hill to the east. Halley surmised that the spatial associations between the highest tin stream geochemical anomalies, waterworn boulders of stanniferous topaz-altered quartz porphyry, and the base of the basalt, indicate that the anomalous tin and boulders were probably Tertiary alluvial deposits derived from erosion of Mount Bischoff and subsequently covered by valley-fill basalt flows.

Commenting on assays of 31 reconnaissance rock chip samples, Halley noted that 'high Pb-Zn samples from the old mine dumps contain very low Sn'. However, according to the tabulated data (Appendix 3, Halley, 1993) there were only two mine dump samples from Persic and Silver Cliffs mines and they assayed 75 and 220 ppm Sn, 29 and 21.5% Pb, 0.2 and 1.6% Zn, and 1200 and 525 g/t Ag, respectively. Apart from one sample of a quartz porphyry dyke with 580 ppm Sn, all other 28 rock chip samples assayed between 3 and 30 ppm Sn. Thus the Persic and Silver Cliffs PbZnAg mineralized veins are slightly anomalous in Sn relative to background, and comparable to the values of ~250 ppm Sn reported in Bass Metals' drill intercepts of the Magnet lode.

680 soil samples of the B, BC, and C horizons of residual soil were taken at depths between 0.6 and 1.2 m, presumably by hand auger. The samples were analysed for Pb & Zn by AAS, Sn by XRF, and Sb, As, Ba, Br, Ce, Cs, Cr, Co, Eu, Au, Hf, Ir, Fe, La, Lu, Mo, K, Rb, Sm, Sc, Se, Ag, Na, Ta, Th, Sn, W, U, Yb, & Zn by Neutron Activation Analysis (NAA).

Some of the NAA element data (eg. Sc, K, Rb, Cs, Cr, Co and REE) were useful in discriminating lithochemical groups and refining the geological map interpretation.

A few sporadic Sn soil geochemical anomalies (up to 0.6% Sn) detected along the Waratah River immediately north of Mount Bischoff (between AGD 376000 and 376800 E) were provisionally attributed to mine and alluvial contamination. Nevertheless, Halley earmarked the Sn anomalies for 'closer inspection' in recognition of some support from elevated levels of As, W, Sb and Au. The ground magnetic survey recorded low-amplitude responses over the basement rocks, with no distinctions

between the Oonah, Crimson Creek and ultramafic formations, and typically 'noisy' high-amplitude features over the areas of Tertiary basalt cover. There are no discrete magnetic anomalies that might indicate carbonate replacement pyrrhotite or magnetite deposits in the basement rocks on the gridded area.

Halley (1993) recommended that future exploration should include:

- Grid extensions and mapping to better define the CCF-OF contact between the Waratah River and Deep Gully Creek. Particularly to determine if there was a fault offset, which he appears to have considered might be an important control on granitoid-related mineralization.
- Re-examination of the possibly alluvial source of tin anomalies in the south-central parts of the grid.
- Consideration of two potential 'stratigraphic' exploratory drill holes. One to test the dolomite unit in contact with Crimson Creek Formation in Deep Gully Creek, and one to test the CCF-OF contact in the vicinity of quartz porphyry dykes near 376900E (GDA).

However, no further work was carried out on the ELs. In his final report in April 1994, Halley tersely concluded that 'it is evident that old drainage systems transporting material from Mount Bischoff cut through the Deep Gully area prior to the basalt flows. The porphyry boulders and tin in Deep Gully are apparently not from a local source' (Halley, 1994). RGC had explored an analogous situation 10 km south of Mt Bischoff at Wombat Flat, where a stream sediment tin anomaly exists downstream of outcrops of Tertiary siltstone lying beneath Tertiary basalt flows, and concluded that 'the tin was probably derived from the greisens [in the Meredith Granite] during a period of erosion during the Tertiary' (Halley, 1992b).

## PASMINCO & MPI 1993-97

During the period 1993 to 1997 Pasminco held titles (partly by joint venture agreement) to a group of five contiguous exploration licences totalling 431 km<sup>2</sup>, which they called the Luina area, extending from Waratah to Mt Stewart (Weber, 1997a, b, c; Weber and Murphy, 1997a, b). MPI Gold Pty Ltd were the original holders of EL 17/93, which covered 70 km<sup>2</sup> in the Luina to Magnet area, but they joint ventured it to Pasminco Exploration shortly after granting (Chaku, 1998).

Parts of three of those licences (ELs 17/93, 48/94 & 23/96) covered the area of the current Waratah EL 64/2004.

Pasminco's Luina area exploration program was restricted to a 'prospectivity analysis' based largely on a GIS compilation of existing stream sediment, soil and rock Cu-Pb-Zn geochemical data, but no new field work. Within the area currently covered by EL 64/2004, Pasminco's stream sediment geochemical compilation showed:

- A 'significant' Zn-Pb-Cu anomalous zone along Magnet Creek and Tinstone Creek, which were (quite reasonably) attributed to contamination from the Magnet and Mount Bischoff mine workings, respectively (Figure 8). Weber (1997c) observed that stream sediments in Magnet Creek were also highly anomalous upstream (west) of the Magnet Mine. I suspect that this anomaly also would have originated by contamination along the route of the horse-drawn tramway, which was used for ore transport between 1899 and 1902, and subsequently for road haulage of Zn-rich tailings by EZ Co. in the mid 1970s (Webster, 2007).
- Another 'distinctive' Zn-Pb-Cu anomaly 3 km southwest of Mount Bischoff. Apart from noting it was 'quite large occurring in two catchments' and not in an area of historical workings, Weber (1997b) did not offer an interpretation of this anomaly. However, its proximity to the original old Magnet Road (west of Ritchie Creek) suggests that it too may be due to contamination. Webster (2007) noted that the ore initially produced from Magnet, in 1895-1899, was brought out by packhorse along this track: spillage of a few packs of ore, or metalling of sections of the track with mineralized mullock, might account for the stream geochemical anomaly.
- Poltock (1995) noted a 41 ppb Au stream sediment anomaly (-16# BLEG) 1 km NE of the Magnet Mine, in the same stream where Placer had previously recorded a 13 ppb Au anomaly. However, it remained 'unexplained' after stream traversing failed 'to locate anything of interest'. Apart from the inherent irreproducibility of BLEG analyses, a possible explanation is that gold is being recycled out of Tertiary gravels exposed along the flank of Magnet Range, beneath Tertiary basalt flows. This was recognised in 1923 by P.B. Nye, who recorded that: 'small colours can be obtained at most places in these creeks by washing methods, but is not sufficient to render the operation profitable. It is also very probable that the amount of gold contained in the gravels (Tertiary) would not be sufficient to make the treatment of these beds an economic success', (Nye, 1923, p. 185-86).

Pasminco's final report (Weber, 1997b) mentions 'metallogenic modelling' showed a dense network of intersecting northwest and northeast structural 'trends' (unsubstantiated, probably interpreted from aeromagnetic data) but which are not coincident with the 'Magnet Mine-Mount Bischoff Oonah Trend' (?). This metallogenic modelling exercise was apparently part of a larger review of Pasminco's Tasmanian interests, which ultimately concluded that their Luina ELs should be relinquished because they were peripheral to Pasminco's key exploration areas in the Mount Read Volcanics Belt.

Apart from the regional GIS compilation summarised above, most of Pasminco's field work in EL 17/93, including some drilling, was subsequently focussed on a 4 km<sup>2</sup> Au-Sb stream sediment anomaly on mafic volcanics in the contact metamorphic aureole of the Meredith Granite south of Arthur Dam (eg. Basford and

McGunnigle, 1997; McGunnigle, 1996; Poltock, 1995). The Arthur Dam prospect is about 5 km south of the southwest corner of the current EL 64/2004. Therefore, it warrants no further description here.

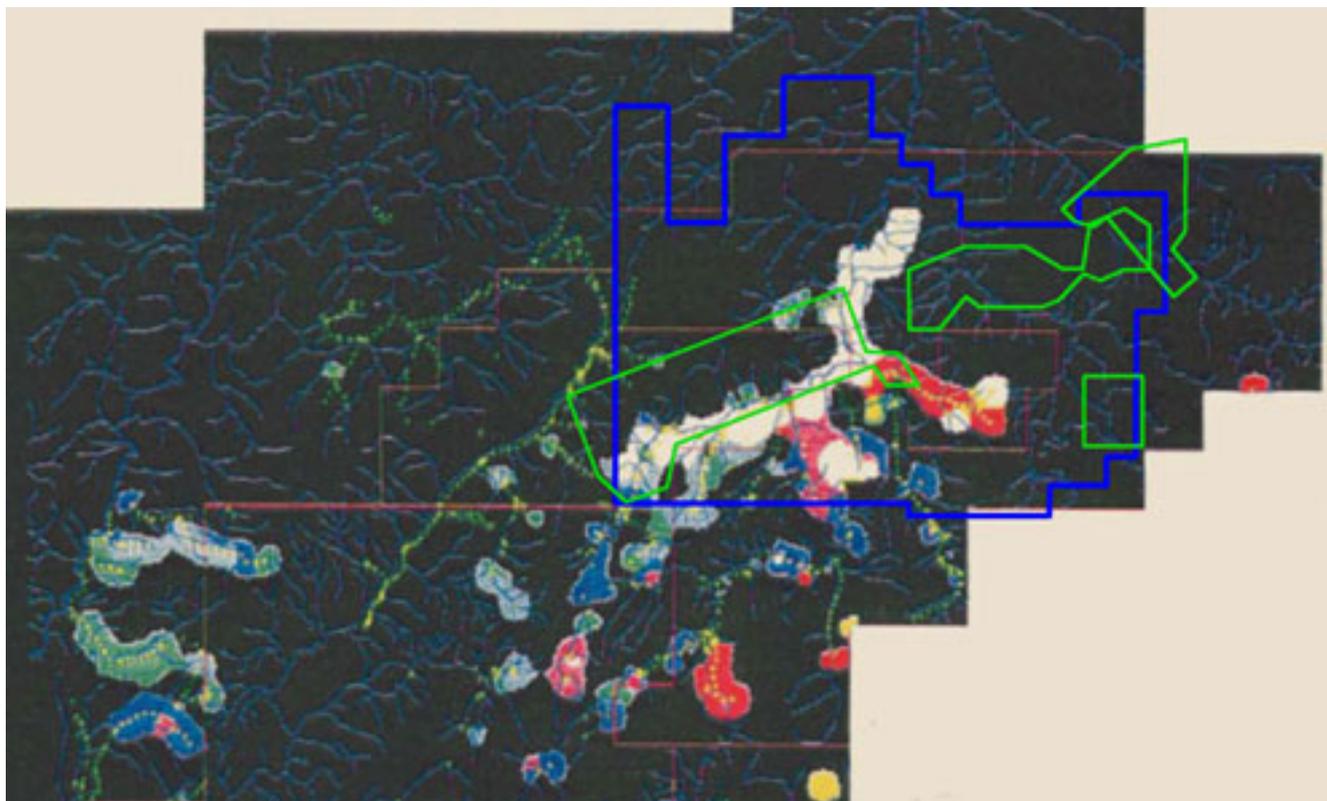


Figure 8 Pasmenco's GIS colour-graduated image representing combined Cu+Pb+Zn stream sediment geochemical data (modified from: Weber, 1997c). The highest values are in white; the area of EL64/2004 is outlined in blue. There are extensive high anomalies in streams draining the Magnet and Mount Bischoff mines.

## MINING PROJECT INVESTORS P/L 1998

Following Pasmenco's rationalization of exploration projects and withdrawal from the EL 17/93 joint venture, Mining Project Investors P/L (MPI) became interested in a discrete but untested aeromagnetic anomaly located at ~371400E 5411500N (GDA) near the Magnet Mine, which they considered had potential for Mount Bischoff type tin mineralization. The anomaly had variously been referred to as the West Magnet Anomaly (Weber, 1997c) or the North Magnet Mine Magnetic Anomaly (Chaku, 1998).

MPI conducted a ground magnetic survey on two short lines (bearing magnetic north) across the anomaly, which indicated a strong response of ~1000 nT over an approximately 100-m-wide zone centred on Magnet Creek. Soil geochemical sampling on one line indicated highly anomalous Pb+Zn+Ag over the magnetic zone, obviously from Magnet tailings contamination in the creek. However, a moderately anomalous sample (1100 Zn, 219 Pb, 34 Sn; in ppm) on its southern flank was thought to be above flood level and 'gave encouragement to the anomaly containing mineralization'.

Modelling of the magnetic data initially indicated a source with a southerly dip, but a re-interpretation, in consideration of the steep terrain and limited drill rig accessibility, suggested a steep northerly dip<sup>16</sup>. Accordingly, the anomaly was tested in late March 1998 by a single diamond drill hole: NMM1, of 199.5 m collared at 371020E 5411315N (AGD66), inclined at -55° on a 173° magnetic azimuth. The hole obliquely intersected a steeply south dipping sequence of interbedded cherty-hematitic mudstone and fine-grained siliceous-lithic sandstone. The sandstone units locally contain interstitial magnetite with magnetic susceptibilities up to two to three times background, which were interpreted to account for the magnetic anomaly. Several 'structurally disrupted' zones of quartz + carbonate + chlorite veins contain traces of pyrite and chalcopyrite but assaying of selected intervals did not show significant mineralization. Assays of the non-oxidized intervals indicate background levels of about 50-100 Cu, 5-15 Pb, 100-150 Zn (ppm) and 8-10% Fe. The cores were not assayed for tin.

<sup>16</sup> The terrain dictated the geophysical interpretation!

Chaku (1998) did not comment on the litho-stratigraphic setting of the sequence intersected in NMM1.

He concluded that:

- The vicinity of the magnetic anomaly did not warrant further exploration.
- A literature review and rock chip sampling of the Magnet Mine suggested that it was under explored and could still contain economic zinc-mineralized zones.

However, there is no record of further MPI exploration on this licence until its final relinquishment in May 2004.

## EXPLORATION HISTORY of Exploration Licence 64/2004

### BASS METALS 2005-2009

EL 64/2004, originally of 104 km<sup>2</sup>, is one of several Tasmanian exploration licences acquired by Geoinformatics Exploration Tasmania P/L and subsequently joint ventured out to Bass Metals in August 2005 (Turnbull, 2006).

Bass Metals were principally interested in its potential for two types of Devonian granitoid intrusion-related deposits, which are exemplified in the EL area by:

- Mount Bischoff<sup>17</sup> type carbonate-hosted cassiterite-sulfide replacement deposits.
- Pb+Zn+Ag rich vein type deposits similar to the Magnet Mine<sup>18</sup>.

### 2005-2006

The initial 2005-2006 exploration program involved:

- Familiarization and data compilation.
- Experimentation with HyMap and ASTER infrared spectral remote sensing data to map altered facies.
- Geoinformatics' proprietary 3-D GIS metallogenic modelling to generate targets.

Bass Metals recognized that the vegetation cover in northwest Tasmania seriously limited the applicability of infrared spectral remote sensing. Nevertheless, they went ahead with an interpretation of available ASTER data for 'targeting *active zones* rather than providing the bullseye targets that had originally been hoped for from the HyMap data' (Turnbull, 2006). The interpretation produced a liberal sprinkling of quartz, carbonate and sericite altered zones across the EL, which, it was conceded, superficially mapped broad lithologies but did not highlight structural features or known mineral occurrences (Figure 9).

In particular, the ASTER alteration mapping did not distinguish the Mount Bischoff and Magnet deposits. Bass Metals, quite reasonably, did not expend any further effort on spectrally based exploration.

The Geoinformatics modelling generated ten granitoid related carbonate replacement targets, one nickel-skarn target, and seven VHMS targets<sup>19</sup> (Figure 10).

Apart from Mount Bischoff, most of the other carbonate replacement targets were coincident with VHMS targets<sup>20</sup>. And, at the Magnet locality, the modelling identified coincident Ni-skarn, carbonate replacement and VHMS targets! There is no indication in Bass Metals' reports that the Geoinformatics modelling significantly influenced their subsequent exploration program in the Waratah EL or that any of the targets (other than Magnet) were systematically followed up.

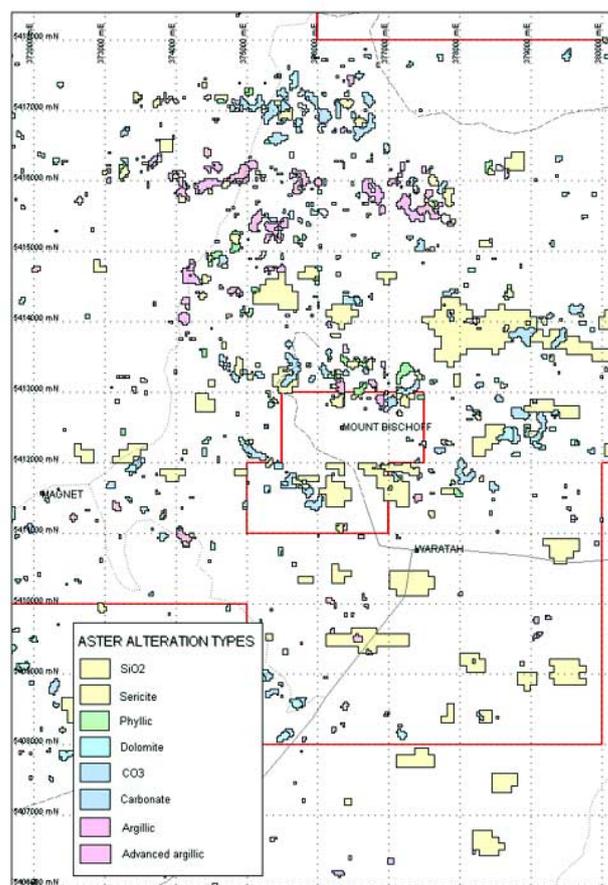


Figure 9 'Alteration zones' in the Waratah area interpreted from ASTER spectral mapping data (copied from: Turnbull, 2006).

<sup>17</sup> Mt Bischoff: 10.5 Mt @ 1.1% Sn; under separate mining leases enclosed by but excluded from EL 64/2004.

<sup>18</sup> Magnet Mine recorded production estimated at 0.63 Mt @ 7% Zn, 7.3% Pb, 427 g/t Ag; it is partly included in, at the south-western corner of, EL 64/2004.

<sup>19</sup> Two of the Geoinformatics targets are in the northern portion of EL 64/2004 that was relinquished in 2009.

<sup>20</sup> These target coincidences, for deposit styles that have quite different host lithofacies and metallogenic associations, in my opinion, cast serious doubt on the validity of 'Geoinformatics' method.

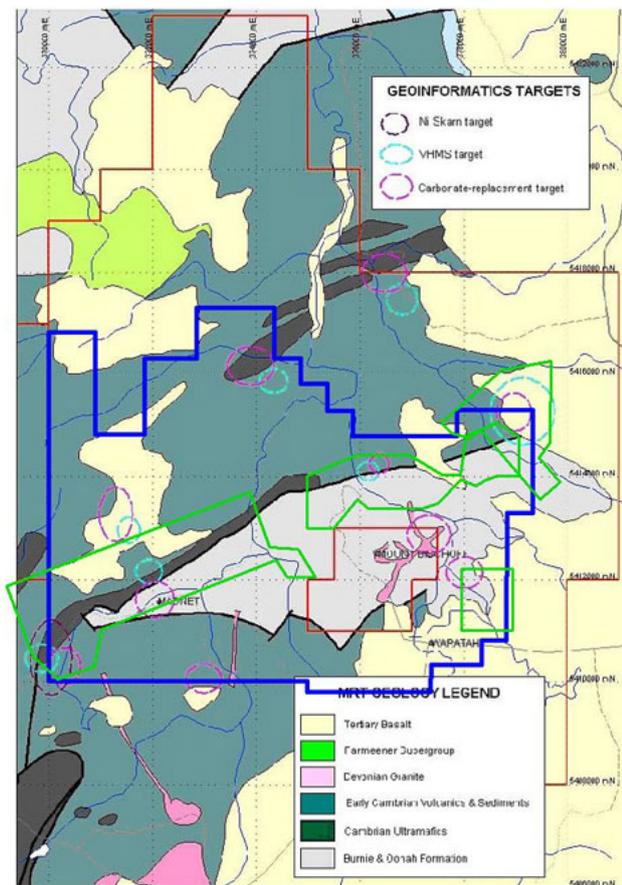


Figure 10 Target areas generated by Geoinformatics' proprietary GIS metallogenic modelling method.

- Potential for up to 20,000 t of similar grades in the upper 100 m of a narrow 'hanging wall lode', which had previously not been exploited above Level 9.
- North and south extensions of the Magnet lode prospected at surface but apparently inadequately tested at depth.

Blake (op. cit.) also implied that the North Magnet Magnetic Anomaly had not been effectively tested by MPI's drill hole NMM1, and that it and another anomaly 500 m further north may have potential for a carbonate-replacement-Sn or Magnet-type PbZnAg deposit.

Late in 2007, Bass Metals commenced a proposed seven-hole drilling program designed to test shallow strike-extensions of the Magnet lode from its footwall side. The first diamond core hole, MGD001 was drilled horizontally for 97 m on a WNW azimuth from a bend on the Magnet Road<sup>22</sup> to test the lode about 100 m north of the workings. Core recovery was low but the hole 'was considered to have successfully tested the target (interpreted to be around 70m), with sub-economic vein related sphalerite present at the target position' (Bates, 2008). The drill log records 3% sphalerite in carbonate veins over one metre at around 76 m down hole but this is not evident in the assay data, which indicate the grade nowhere exceeds 0.04% Pb+Zn. The drilling program was postponed after the first hole 'pending a review of the planned program (?) and acquiring a more appropriate drill rig'.

### 2006-2007

In 2006-2007 Bass Metals' focus was on the historic Magnet Mine. Mike Blake (2007) reviewed published accounts of the mine's production history and created a 3D (DataMine) model of the workings based on descriptions, plans and sections in Geological Survey Bulletin No. 33 (Nye, 1923). He concluded that there was significant potential at Magnet for remnants or extensions of the mineralized zones:

- Sphalerite-(zinc)-rich parts of the lode probably remain in situ in the lower levels of the mine, because historic mining had been focussed on lead and silver production.
- There is potential for 40,000 t of lode material<sup>21</sup> grading ~6% Pb, 7% Zn and 394 g/t Ag in the (assumed) 100 m depth extension below the (16 level) historic mine workings. However, Blake noted that those potential down dip depth extensions of the lode lie west of the EL 64/2004 boundary and exploration would require co-operation with the adjoining licence holders (Rubicon Min Tech Ventures Proprietary Limited & Stellar Resources).

<sup>21</sup> Tonnage estimate roughly based on Nye's (1923) report of the 60 m long, 1.8 m wide lode not diminishing with depth. 100 x 60 x 1.8 m @ SG ~4 equates to ~43,200 t.

### 2008-2009

During 2008-2009 Bass Metals Ltd. acquired VTEM data from a helicopter-airborne survey covering a 4-km-wide swathe through the central part of (pre-reduction) EL 64/2004. This program 'was aimed at detecting Pb-Zn-Ag Magnet-deposit analogues which are blind from surface as well as tin mineralization in the immediate vicinity of the recommissioned Mt Bischoff Tin Mine' and also designed to cover several of the Geoinformatics VHMS targets in the area (Bates, 2009) (Figure 11).

The preliminary interpretation indicated one 'possible conductor' adjacent to Mount Bischoff, and a large area of high conductivity over the Tertiary basalt cover at the eastern EL boundary (Figure 12). The south-western part of the licence appears to have uniformly low conductivity and (not surprisingly) there is no anomalous response from the Magnet deposit.

The VTEM data contributed to the decision (in late 2008?) to relinquish northern and eastern parts of the EL, to reduce its area to 48 km<sup>2</sup>.

<sup>22</sup> Location A7, AGD66 370237E, 5410875N

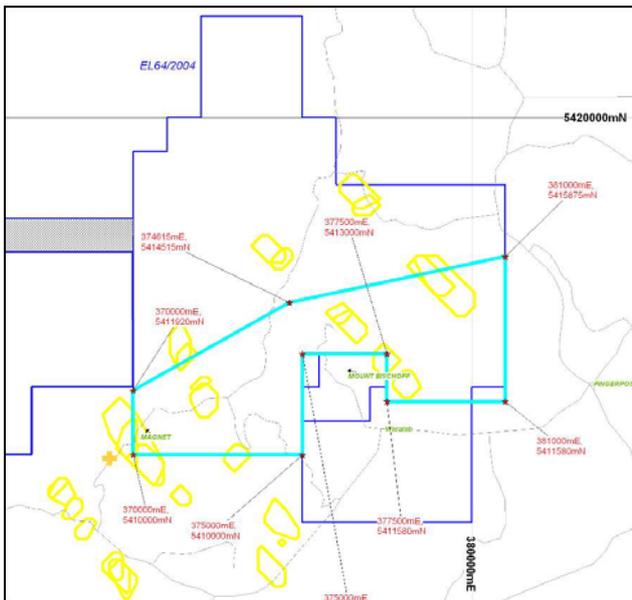


Figure 11 Plan of the original boundary of EL 64/2004 illustrating the VTEM survey area (light blue) and Geoinformatics' target polygons (copied from: Bates, 2009).

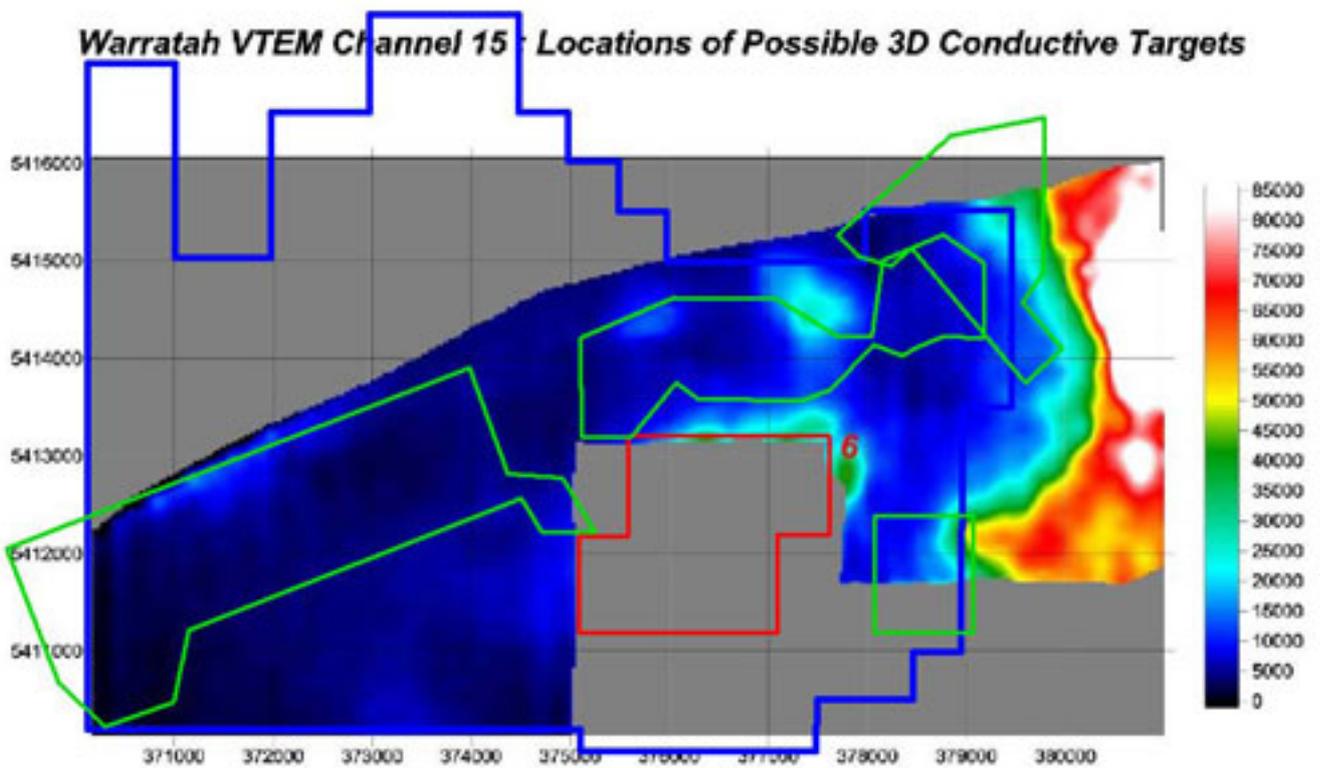


Figure 12 Coloured image of airborne VTEM channel 15 conductivity data over EL 64/2004. The edge of the Mount Bischoff anomaly (labelled 6) is discernible outside the area of the mining leases. The highly conductive area at the eastern end outlines Tertiary basalt; likewise the small anomaly 1 km north of Mount Bischoff is on basalt. The light blue fringe along the north-western edge of the survey is undoubtedly also due to conductive basalt on the Magnet Range. Billiton's Stone Dam anomaly is just outside the VTEM data east of Mount Bischoff. (Modified from: Bates, 2009)

The revised Magnet drilling program resumed in October 2008 with eight holes proposed to test for remnant mineralization in the lode, at about 30-50 m below surface over a 200 m strike length centred on the mine. However, only four diamond core holes, MGDs 002 to 005 totalling 515 m, were drilled from the hanging wall (west) side, (eg. Figure 13) (Bates, 2009).

The results were generally disappointing. They downgraded the potential for near surface ore amenable to open-cut mining, and led to early termination of the program with only half of the planned holes drilled.

- MGD002 intersected 7 m of gossanous lode (about 30 m below surface) in the hanging wall of a 1- m-wide rubble-filled stope with minor galena and sphalerite in quartz carbonate veins on the footwall. The best interval is 0.9 m @ 1% Pb, 6.9% Zn, 96 g/t Ag and 350 ppm Sn.
- MGD003 intersected a similar hangingwall gossanous zone about 25 m down dip of MGD002 and was terminated in the stope-fill. The best interval in this hole is 1.3 m @ 5.8% Pb, 4.5% Zn, 570 g/t Ag and 730 ppm Sn.
- MGD004 intersected non oxidized lode in the southern part of the mine, about 40 m below surface and below the old stopes above Level 2. The lode here consists of a few metres of manganiferous carbonate (rhodochrosite?) veining and breccia-fill, including a 1-metre interval containing sphalerite and galena grading 1.8% Pb, 9.3% Zn, & 373 g/t Ag and 270 ppm Sn.
- MGD005 intersected the lode about 55 m below surface near the northern end of the mine workings, where it was found to contain only minor sulfides, the best assayed interval being 1 m @ 0.8% Pb, 1.8% Zn, & 35 g/t Ag and 250 ppm Sn.

The weighted-average grades of the 27 significantly-mineralized sample intervals (which contain greater than 0.5% Pb+Zn, totalling 37.5 metres in MGDs 2,3,4, and 5) are 0.8% Pb, 2.4% Zn, 105 g/t Ag, 0.014 g/t Au, and 240 ppm Sn.

That marked the end of the exploration trail for Bass Metals Ltd. They did no further work on the Waratah EL during early 2009, while they refocussed their exploration programs to VHMS targets in the Mount Read Volcanics, particularly around their base at Hellyer, and ultimately withdrew from the joint venture with Geoinformatics-Clancy in June 2009.

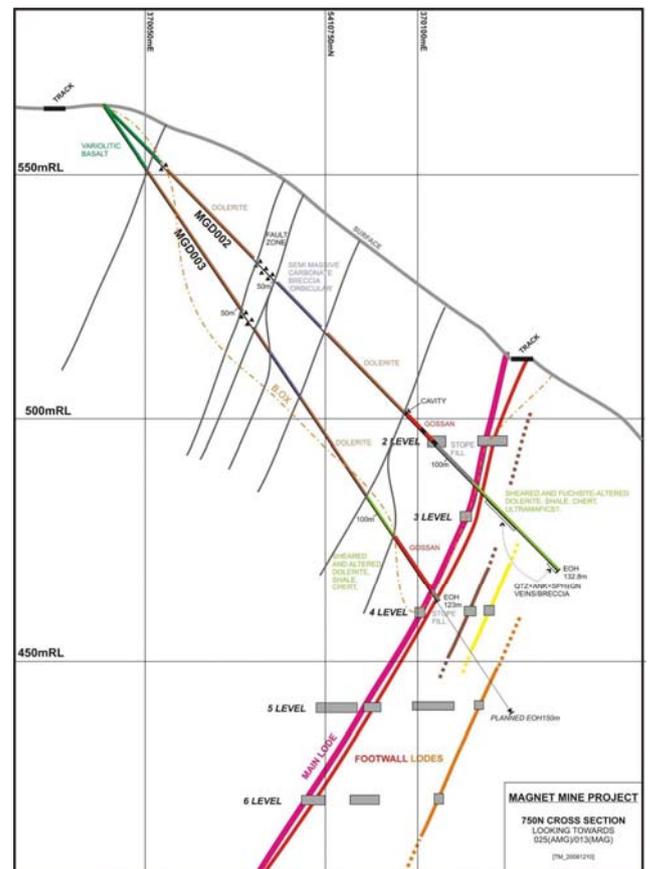


Figure 13 Cross section showing MGDs 002 and 003, which intersected the upper part of the known Magnet lode (copied from: Bates, 2009)

## DISCUSSION of PROSPECTIVITY

As was recognized by its many previous explorers, the mineral prospectivity of the EL 64/2004 area is in two general categories:

- Carbonate-replacement tin (and/or tungsten) deposits exemplified by Mt Bischoff and Cleveland.
- Structurally controlled vein-style PbZnAg deposits like the Magnet lode, and particularly centred on the Magnet Mine at the very southwest corner of the licence.

### Carbonate-replacement tin prospectivity

The tin potential of the EL 64/2004 area and surrounding districts has been well recognized and explored by five companies during the past four decades. Two of those companies, Comstaff and RGC, had direct links to two of the exemplary deposits, Mount Bischoff and Renison Bell, respectively<sup>23</sup>, and therefore they would have had good in-house knowledge of the deposit models, particularly their combined magnetic and conductive properties, and their exploration programs were well founded. Comstaff boldly tested their geologic model with what appear to have been essentially 'stratigraphic' drill holes and down-hole EM surveys, exploring under Tertiary basalt at Belmont Hill. Scott Halley subsequently also considered 'stratigraphic' drilling of a couple of conceptual geologic targets in the same dolomitic unit of the Oonah Formation, but apparently couldn't justify them in the absence of geophysical anomalies. Billiton carried out a nice piece of exploration work at Stone Dam: identifying a coincident magnetic and conductive anomaly in publicly available airborne geophysical survey data, confirming it with ground surveys, and drilling a hole under Tertiary basalt to test it.

Bass Metal's VTEM helicopter survey over the prospective Oonah Formation seems to have effectively detected the conductivity anomaly at Mount Bischoff<sup>24</sup>, thereby vindicating the airborne geophysical approach. Although the 1980's era Dighem airborne system flown for Comstaff did not have great depth penetration, the modern VTEM system is reputedly effective for up to a few hundred metres depth (Witherley and Irvine, 2006). The absence of any other conductive and coincident magnetic anomalies - other than obviously Tertiary basalt related anomalies - suggests there are no pyrrhotite-cassiterite replacement deposits within a few hundred metres of surface in the most prospective zone already covered by the VTEM survey. The surrounding Crimson Creek Formation rocks not yet covered by VTEM do not include significant carbonate units and are generally regarded as having only about third-rate potential as host rocks for carbonate-replacement tin deposits.

Accordingly, EL 64/2004 has low exploration potential for new carbonate-replacement tin deposits. The best tin potential obviously lies in extensions to Mount Bischoff, which are in current mining leases.

<sup>23</sup> RGC was affiliated with Renison Limited, and their geologist Scott Halley had studied Mount Bischoff for his PhD research project.

<sup>24</sup> Or is that anomaly due to mining 'cultural' conductors?

### Magnet Mine Area

The assay data from Comstaff's drill holes MAG1 and MAG2 (sampled by Ellis, 1989) and from Bass Metals' holes MGD 001 to 005, suggest that the Magnet lode is significantly anomalous in tin. Tin assays in both sets of data were by XRF methods<sup>25</sup>, therefore unlikely to be underestimates due to incomplete dissolution.

Figure 14 and Figure 15 illustrate the ranges of tin values plotted against the other elements assayed in the two data sets.

Placer's forty-seven samples of MAG1 and MAG2 drill cores have Sn proportions ranging between 4 and 330 ppm (Ellis, 1989). Ten of those samples that contain greater than 0.5% Pb+Zn have the same range of 4 to 330 ppm Sn but higher average values: mean = 71, SD = 106 ppm Sn. The Sn data are highly correlated with Pb, Au and Ag ( $r = 0.8$  to  $0.9$ ) and particularly highly correlated with Zn and As ( $r = 0.99$  and  $0.96$ , respectively), but not significantly correlated with Cu and Bi ( $r = 0.2$ ) (Table 4).

Bass Metals' MGD 001 to 005 data are probably more representative, because they are from continuous half core samples, whereas Placer's MAG1 and MAG2 samples appear to have been chip samples. The MGD 001 to 005 data summarized in Table 5 show tin contents that range up to 730 ppm. In twenty-seven 'significantly mineralized' intervals containing greater than 0.5% Pb+Zn, the weighted average tin content is 241 ppm, which is about three times greater than the copper content. Tin is significantly correlated with copper, lead and silver ( $r > 0.7$ ) in the 27 mineralized intercepts, but the correlation factors diminish in the complete dataset of 123 samples (Table 6).

The data summarized in Table 5 also show an average Zn Ratio<sup>26</sup> of 74 in the mineralized (>0.5% Pb+Zn) intercepts in Bass Metal's drill holes. This contrasts with the Zn Ratios of 50 in the frequently quoted estimated average grade of ore mined at Magnet (eg. Seymour et al., 2007: 7.3% Pb, 7.3% Zn, 427 g/t Ag), and Zinc Ratios ~30 in assays from the Level 11 and Level 13 stopes (Nye, 1923, p.163).

It also contrasts with the much lower ratios in drill hole intercepts of some PbZnAg lodes at the Oonah Mine, where Zn Ratios range from 0 to 57, and average 17 (Table 6 in: Herrmann, 2009). In the intra-Magnet data it probably reflects selective mining for Pb and Ag, which were more valuable than Zn in historical times. In comparing Magnet with Oonah data, the contrast in Zn Ratios may reflect different hydrothermal conditions and proximity to granite?

<sup>25</sup> MAG1 & MAG2 Sn assays at Classic Comlabs by method XRF1, presumably on pressed powders; MGD 001-005 Sn assays at Burnie Research Laboratory by unspecified XRF method.

<sup>26</sup> Zn Ratio =  $100\text{Zn}/(\text{Zn}+\text{Pb})$  (Huston and Large, 1987)

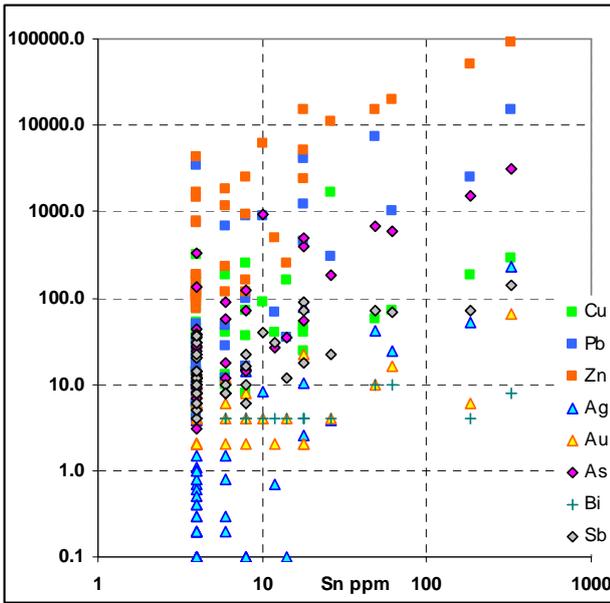


Figure 14 Logarithmic scatter-plot showing relationships between Sn and other elements assayed in Placer's samples of MAG1 and MAG2 drill cores. All units in ppm, except Au in ppb.

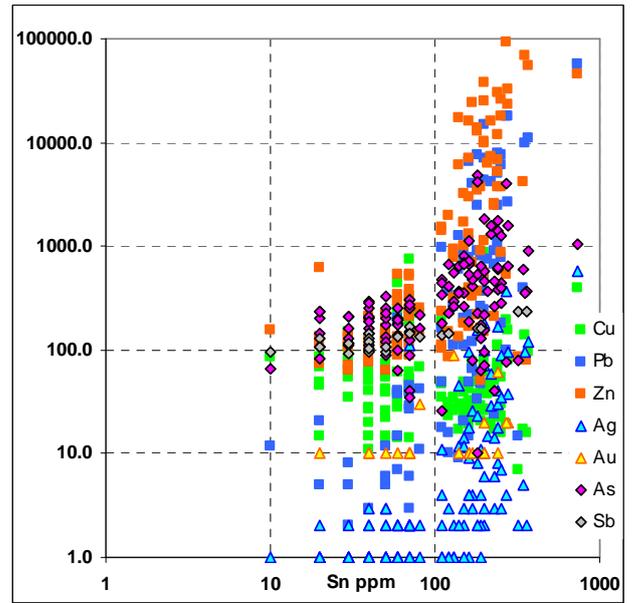


Figure 15 Logarithmic scatter-plot showing relationships between Sn and other elements in Bass Metals' assays of drill holes MGD 001 to 005. All units in ppm, except Au in ppb.

Table 4 Correlation charts of Placer's analytical data from Comstaff's MAG1 and MAG2 cores.

MAG 1 & 2, >0.5% Pb+Zn, n=10									
	Cu	Pb	Zn	Ag	Au	As	Bi	Sn	Sb
Cu	1.00								
Pb	-0.14	1.00							
Zn	0.02	0.79	1.00						
Ag	-0.08	0.92	0.91	1.00					
Au	-0.09	0.89	0.82	0.95	1.00				
As	-0.10	0.79	0.96	0.89	0.79	1.00			
Bi	-0.18	0.49	0.33	0.35	0.39	0.32	1.00		
Sn	0.01	0.78	0.99	0.88	0.79	0.96	0.34	1.00	
Sb	-0.31	0.82	0.81	0.90	0.81	0.81	0.45	0.79	1.00

MAG 1 & 2, All samples, n=47									
	Cu	Pb	Zn	Ag	Au	As	Bi	Sn	Sb
Cu	1.00								
Pb	0.08	1.00							
Zn	0.19	0.86	1.00						
Ag	0.10	0.94	0.94	1.00					
Au	0.09	0.88	0.83	0.93	1.00				
As	0.13	0.87	0.97	0.92	0.81	1.00			
Bi	-0.06	0.31	0.25	0.25	0.27	0.23	1.00		
Sn	0.16	0.84	0.99	0.91	0.81	0.96	0.23	1.00	
Sb	0.09	0.85	0.84	0.86	0.75	0.86	0.25	0.79	1.00

Table 5 Summarized analytical data from Bass Metals' Magnet drill holes, MGDs 001 to 005.

		Cu	Pb	Zn	Ag	As	Fe	Sn	Au
		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
<b>MGD 001-005, all data</b>									
Mean	n = 123	78	2448	5576	23	466	9	136	0.019
SD		117	6957	13629	69	719	8	103	0.020
Max		861	57600	92700	570	4774	49	730	0.090
Min		7	2	51	1	0	3	0	0.010
<b>MGD 001-005, &gt;0.15% Pb+Zn</b>									
Weighted Mean	n = 41	85	6047	17650	76	1007	17	227	0.010
<b>MGD 001-005, &gt;0.5% Pb+Zn</b>									
Weighted Mean	n = 27	83	8397	24127	105	1213	22	241	0.014

Table 6 Correlation charts of analytical data from Bass Metals' Magnet drill holes, MGDs 001 to 005.

MGD 002-005 >0.5% Pb+Zn, n=27								
	Cu	Pb	Zn	Ag	As	Fe	Sn	Au
Cu	1.00							
Pb	0.93	1.00						
Zn	0.62	0.50	1.00					
Ag	0.90	0.92	0.65	1.00				
As	0.11	0.09	0.18	0.27	1.00			
Fe	0.27	0.35	0.06	0.26	-0.19	1.00		
Sn	0.88	0.88	0.47	0.76	-0.06	0.14	1.00	
Au	0.46	0.33	0.12	0.40	0.25	-0.38	0.42	1.00

MGD 001-005 All samples n=123								
	Cu	Pb	Zn	Ag	As	Fe	Sn	Au
Cu	1.00							
Pb	0.22	1.00						
Zn	0.12	0.66	1.00					
Ag	0.24	0.93	0.76	1.00				
As	-0.02	0.34	0.51	0.49	1.00			
Fe	0.04	0.54	0.48	0.51	0.27	1.00		
Sn	0.07	0.72	0.57	0.62	0.34	0.41	1.00	
Au	0.21	0.19	0.18	0.27	0.28	0.06	0.31	1.00

Both Placer's and Bass Metals' datasets, but particularly Bass' MGD 001-005 data, include many samples in which anomalous Sn >100 ppm corresponds to background levels of (say) Pb<50 ppm and Zn<150 ppm (Figure 14 and Figure 15). Notwithstanding the correlations mentioned above, this suggests either: an unusually high background value of Sn in the host rocks, a type of Sn mineralization not exclusively related to Pb-Zn mineralization, or some spurious Sn assay data. The MGD 001-005 data includes six samples in which Sn exceeds the combined Pb+Zn proportions, and also (with one minor exception) greatly exceeds Cu proportions; these particular data imply that the tin is not likely to be present as stannite<sup>27</sup>.

A.B. Edwards (1955) made a detailed mineragraphic study of the Magnet ores and found their sulfide assemblages to be relatively simple, composed 'essentially of sphalerite and galena with lesser amounts of arsenopyrite, pyrite, boulangerite, pyrargyrite, tetrahedrite and traces of chalcopyrite'. None of those minerals are known to have tin-bearing isomorphs, and Edwards did not report any other tin minerals.

Placer's stream sediment geochemical data indicate anomalous levels of a few hundred ppm tin in Magnet Creek and many of its tributaries downstream of the Magnet Mine (Ellis, 1989). The source of these stream anomalies could be either (or both of) the Magnet lode and mine contamination, or Tertiary sub-basaltic gravels along the flanks of the Magnet Range to the northeast, which are known to have shed small amounts of gold and tin into the creeks (Nye, 1923, p. 185-186).

Nevertheless, the existence of two independent sets of XRF Sn drill core assay data almost incontrovertibly supports the notion that the Magnet PbZnAg lode, and

indeed its enclosing country rock, does contain widespread anomalous levels of a few hundred ppm tin. Likewise at the small Persic and Silver Cliffs silver-lead prospects near Mount Bischoff, where RGC reported a couple of mullock samples containing 75 and 220 ppm Sn (Halley, 1993). It is possible that tin exists in a previously unrecognized vein-style cassiterite+pyrite association somehow overprinted by, or onto, the PbZnAg system/s. Perhaps akin to the complex association at the Oonah deposit near Zeehan, with its array of stannite type SnCuAg, cassiterite+pyrite type Sn, and galena type PbZnAg veins (Blissett, 1962; Herrmann, 2009).

The whiff of tin at surface suggests the Magnet lode may possibly, even probably, be vertically zoned, passing downwards from the known PbZnAg zone to a deeper CuSn or Sn zone, and ultimately to a W±Mo zone closest to the granitoid source, perhaps generally analogous to the complex paragenesis and metal zonation at the Cleveland deposit (Collins, 1981). At Cleveland, the stanniferous pyrrhotite+pyrite replacement lodes grade laterally to sphalerite+galena+arsenopyrite veins over distances of a few hundred metres (Figure 16). A similar transition, possibly over a longer interval of maybe a thousand metres, could be expected in an upward direction.

The Cleveland deposit does not give a clear indication of the scale of its vertical zonation because the tin ore bodies cropped out. Nor is Cleveland a perfect analogy for Magnet. Cleveland is a carbonate-replacement metasomatic tin deposit laterally surrounded by quartz+sphalerite+arsenopyrite+chalcopyrite+galena veins located above a quartz+fluorite+W+Mo stockwork, whereas Magnet is essentially a structurally controlled carbonate+galena+sphalerite vein. Therefore, Magnet's tonnage potential at depth is small; probably a couple of orders of magnitude smaller than Cleveland<sup>28</sup>.

<sup>27</sup> Stannite: Cu<sub>2</sub>SeS.SnS<sub>2</sub>; 29.5% Cu and 27.5% Sn by weight (Dana, 1957).

<sup>28</sup> Cleveland: 12.4 Mt @ 0.6% Sn, 0.25% Cu

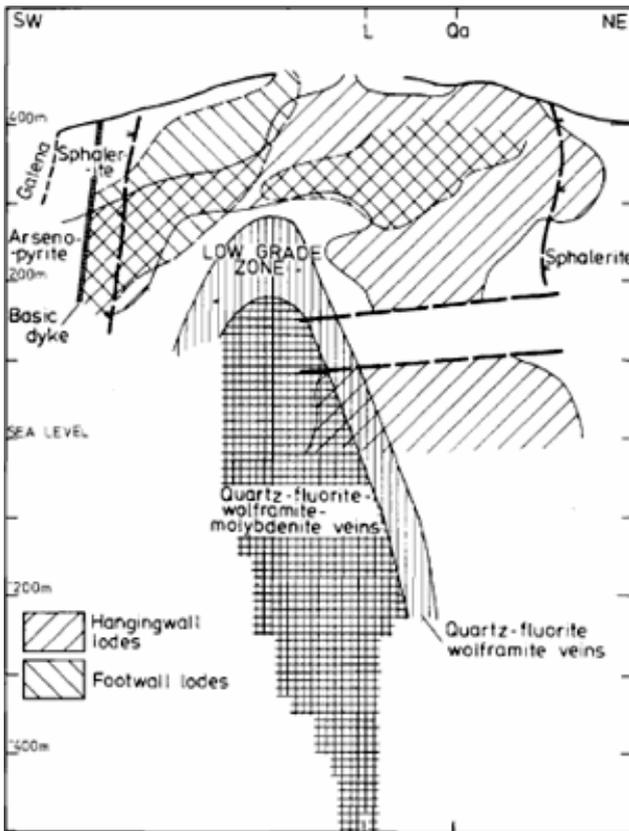


Figure 16 Schematic longitudinal section of the Cleveland deposit showing sulfide zonation. The oblique-hatched hangingwall and footwall lodes are cassiterite-bearing pyrrhotite-pyrite carbonate replacement bodies. (Copied from: Collins, 1981)

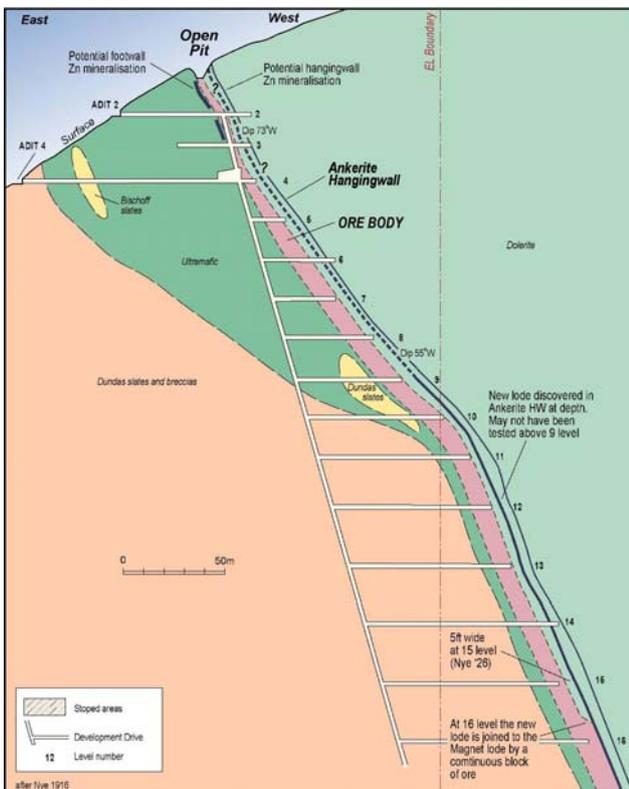


Figure 17 Cross section of Magnet lode and mine (looking south) showing that the deeper half of the mine and potential lode extensions are west of the EL 64/2004 boundary. (Copied from: Blake, 2007)

Nevertheless, and regardless of the potential vertical metal zonation, mining and exploration have not yet proved the bottom of the known PbZnAg Magnet lode. In 1923, P.B. Nye concluded that 'The same general characteristics of the lode have been maintained from the No. 9 to the No. 14 level, and there is no reason why the lode should not continue a similar distance at least below No. 14 level. Certainly, half this depth may be relied upon, and so another 200 feet of backs may reasonably be expected below No. 14 level, and further developmental work at depth is recommended.'

Mike Blake (2007) conservatively envisaged potential for another 40,000 tonnes of lode grading around 6% Pb, 7% Zn and 394 g/t Ag, in the 100 m panel below the deepest (16 level) mine workings. At current metal prices<sup>29</sup> that modest inferred resource is worth about A\$30,000,000 in situ. It has, on the strength of Nye's (1923) confident outlook, a high geologic prospectivity, and a high findability factor. All it needs it is half a dozen well-placed diamond drill holes to bring it up to an indicated resource. A budget of half a million dollars should be sufficient to test it. However, its economic potential is low because of the small tonnage, narrow (~1.8m) width, and 300 m depth at the bottom of a long abandoned mine with an internal 73° inclined shaft. Furthermore, and most compellingly, the Magnet lode beyond a depth of about 150 m is outside, to the west of, the boundary of EL 64/2004 (Figure 17). As Blake (2007) pointed out, exploration of the Magnet depth extensions would require the co-operation of Rubicon Min Tech Ventures P/L & Stellar Resources, who still hold the adjoining EL 1/2004.

During the last 40 years, four companies – EZ, Aberfoyle, Comstaff and Bass Metals - undertook drilling programs at the Magnet Mine aimed at finding along strike extensions, or repetitions of favourable structural zones, at relatively shallow depths <220 m. They drilled twelve diamond core holes totalling 2318 metres, their targets seemed to evolve to shallower depths over the decades, and none of the mineralized intercepts provided encouragement sufficient to persist with exploration, or even to complete two of the planned programs (by Aberfoyle and Bass Metals). Probably because of the poor results (nonetheless inexcusably) the documentation and interpretation of some of those drilling programs is fragmentary and hard to find. Mike Blake (2007) compiled most of the historical Magnet mining and exploration data, but again, he did not endure to the completion of the Bass Metals program. Hence, no fully comprehensive and accurate long projection showing the locations of mineralized intercepts in relation to the mine workings yet exists. Figure 18 is my own rough attempt to illustrate the setup, based on the projections and cross sections presented in reports of the previous explorers (Bates, 2009; Chaku, 1998; Glasson and Cox, 1968).

<sup>29</sup> London Metal Exchange values at 22/3/2011: Pb 2650 US\$/t, Zn 2300 US\$/t, Ag 33.60 US\$/oz.; A\$ = US\$.

There is some uncertainty about the positions of Comstaff's MAG1 and MAG2 because according to the typewritten core logs (in Shaw and Everett, 1985) they were drilled on an oblique section  $\sim 70^\circ$  magnetic, and the collar location given for MAG2 is nonsensical<sup>30</sup>. I have plotted them on the assumption that they were drilled according to Rugless' designs (diagrams in Shaw and Everett, 1985) to intersect the main ore body (Pipe 1) at about the No. 10 and No. 15 levels of the mine

Table 7 lists selected mineralized intercepts and assays of the Magnet drill holes; it excludes a few of the holes that did not find mineralized zones, but definitely includes all of the remotely economically interesting intercepts. The data reveal several pertinent realities:

- The estimated grades of historical production indicate the Magnet ore would have been worth about \$800/t in situ, at current metal prices. According to P.B. Nye (1923) depth extensions below Level 16 would likely have a similar in situ value.
- A little over half of that value is in the silver.
- Only a couple of the holes, Bass Metals' intercepts in MGD003 and MGD004, have grades and in situ values similar to historical production.
- If we (arbitrarily) set an in situ value of \$200/t as an absolute minimum economic cut off, a few of the other exploratory holes 'scrape in'. However, most of them are of narrow intercepts; application of dilution factors<sup>31</sup> to allow for a modern day three metre mining width would eliminate some mineralized zones, and reduce the others to marginal values of between \$200 and \$400/t.
- Under those conditions, the only potentially economic zones in sight are around the intercepts in MAG1, MAG2 and MGD003. All three of them appear to be in the envelope of the known, partly mined, Magnet lode.
- Six other holes intersected mineralized zones at distances between about 30 and 150 metres along strike from the known workings, but none of them meet the \$200/t at 3-m-width criterion. The remotest hole, M3, about 300 m south of the main lode, did not intersect any mineralized zone.
- The zone between about 50 and 150 metres below surface on the north side of the main lode has not been tested. However, the implications from the shallower holes on that side, and the several holes and an exploration drive on the south side, are that the lode does not have great strike persistence; that it is rather 'pipe-like', as deduced by several previous explorers.

There is moderate potential for existence other small PbZnAg lodes in the area between Magnet and Mount Bischoff, where the top of the Meredith Granite is understood to shelve gently. However, their findability factor is very low because of the intensity of historic surface prospecting that failed to find other than a few non-economic shows, and their small tonnage and non-magnetic non-conductive mineralogy that renders them generally indiscernible by geophysical methods, and the typically poor outcrop that makes conceptual prediction of favourable structural sites near impossible. A 1-2 km-wide strip extending practically right across the EL, from Magnet to Mount Bischoff and east to Belmont Hill, has already been covered by detailed grid based geological, geochemical and geophysical surveys (Figure 1) without significant discoveries of new PbZnAg vein deposits.

There has been no significant production of ore from Tasmanian Devonian granitoid-related PbZnAg vein deposits in the last 40 years. Magnet was one of the largest of this type, surpassed only by Mount Farrell.

Tony Webster's (2007) summary of the economic performance of the Magnet Mine is a cautionary tale:

'The financial history of the mine shows five increases of capital from £1,024 to £24,000 between 1898 and 1930 and five grants of assistance by the Tasmanian Department of Mines from 1930 to 1940. The mine had only three short dividend paying periods: November 1903 to January 1908; June 1916 to September 1917, and some after November 1922. All dividends were 1/- per share.'

<sup>30</sup> 311.5 m on a bearing of 378.45° M (!) from the entrance to the main adit on No. 4 level'

<sup>31</sup> This is conservative; I have not adjusted the intercepts to true widths.

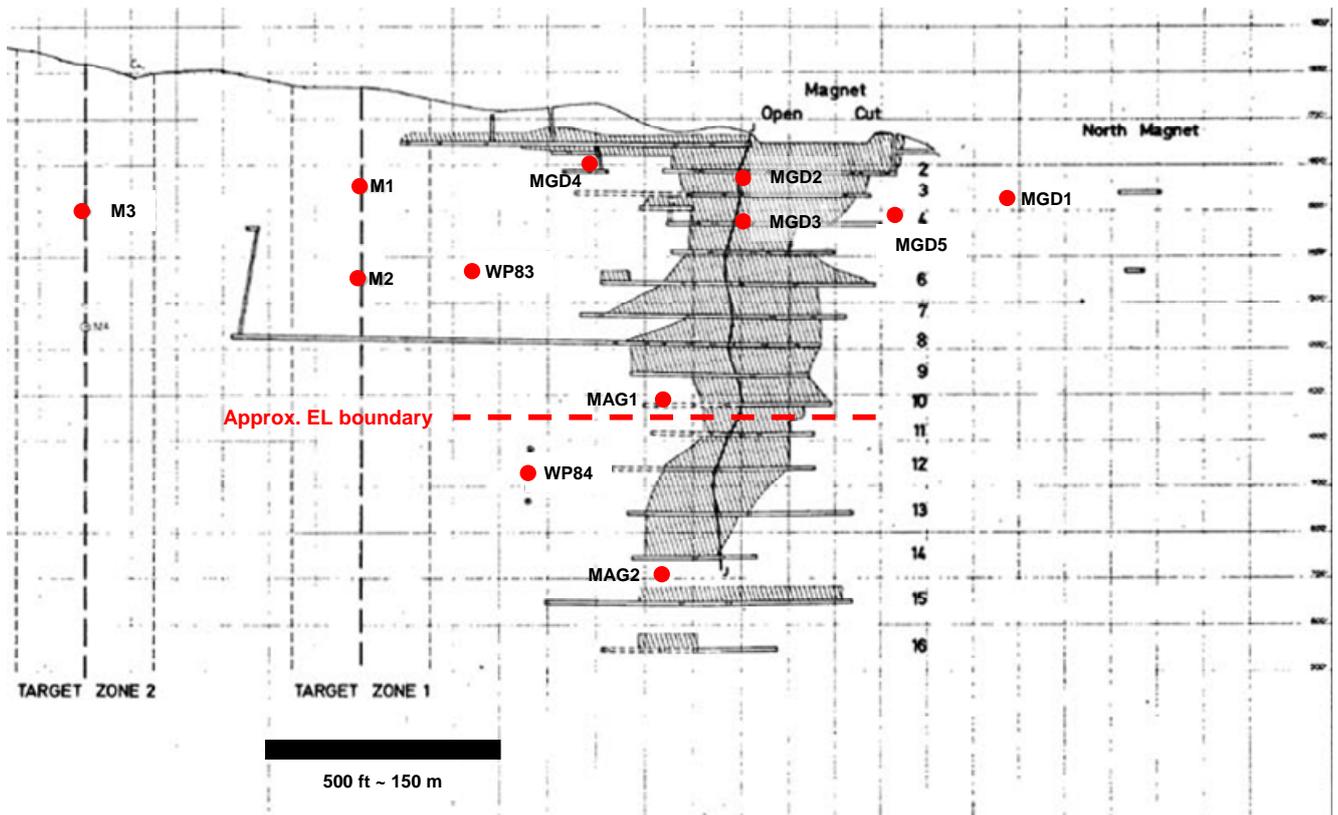


Figure 18 Longitudinal projection of the Magnet lode and mine workings illustrating approximate locations of mineralized intercepts in exploration drill holes. (Modified after: Glasson and Cox, 1968)

Table 7 Mineralized intercepts, grades, and in situ metal values of the Magnet exploratory drill holes.

Hole or Zone	From m	To m	Length m	Tonnage t	Pb %	Zn %	Ag g/t	Value \$/t	3m width \$/t	\$ in Ag %
Magnet production				630,000	7.3	7.3	427	827		56
Magnet Level 16+				40,000	6.0	7.0	394	750		57
WP83	140.0		0.8		0.7	3.9	37	148	37	27
WP84	277.6		1.4		0.9	1.7	34	100	47	37
WP84	289.8		4.1		0.5	1.7	58	116	116	55
WP84	302.4		3.1		1.3	1.8	87	171	171	56
WP84	312.5		0.5		2.4	2.3	106	232	39	50
M1	106.4	106.6	0.3		0.1	0.2	3	10	1	31
M1	107.0	107.5	0.6		0.1	0.7	3	22	4	15
M1	125.2	125.4	0.2		0.3	0.9	6	35	3	19
M1	148.9	149.4	0.5		0.0	0.1	3	6	1	59
M1	149.4	150.0	0.6		0.2	0.8	6	30	6	22
M2	192.5	193.1	0.6		1.8	4.0		139	27	0
M2	193.1	194.0	0.9		0.4			11	3	0
M2	194.0	195.3	1.4					0	0	
M2	196.0	196.3	0.3			0.1		2	0	0
M2	204.1	204.2	0.1			0.5		11	0	0
MAG1	259.0	268.0	9.0		1.5	3.5	139	270	270	56
MAG2	243.7	249.6	5.9		1.1	4.3	120	256	256	51
MAG2	257.0	259.8	2.8		0.8	9.4	69	312	291	24
MGD002	88.3	89.5	1.2		0.1	1.7	46	91	37	55
MGD002	89.5	91.1	1.6		0.5	1.2	41	86	46	52
MGD002	91.1	92.5	1.4		0.7	1.6	94	157	73	65
MGD002	92.5	94.8	2.3		1.8	2.3	94	203	156	50
MGD002	109	109.8	0.8		0.1	0.3	8	19	5	46
MGD002	109.8	111.3	1.5		0.3	3.2	37	122	61	33
MGD002	111.3	112.75	1.45		0.6	2.6	88	171	83	56
MGD002	112.75	113.3	0.55		1.1	5.5	120	287	53	46
MGD002	113.3	114.3	1		0.1	0.6	15	33	11	50
MGD002	114.3	115.3	1		0.0	0.1	4	6	2	69
MGD002	115.3	116.2	0.9		1.0	6.9	96	288	86	36
MGD002	119.2	120	0.8		0.4	2.4	26	95	25	30
MGD003	105	107.4	2.4		0.0	0.0	3	4	3	77
MGD003	107.4	108.7	1.3		5.8	4.5	570	878	381	71
MGD003	108.7	110.4	1.7		1.5	3.8	178	323	183	60
MGD003	110.4	114.9	4.5		0.8	3.0	170	277	277	67
MGD003	114.9	119.2	4.3		0.7	2.6	99	185	185	58
MGD004	89	90	1		0.1	0.5	8	24	8	37
MGD004	90	91	1		0.4	0.7	29	59	20	53
MGD004	91	92	1		0.3	0.7	30	55	18	60
MGD004	92	93	1		0.4	1.0	70	112	37	68
MGD004	93	94	1		0.4	1.6	58	112	37	57
MGD004	94	95	1		0.8	1.4	155	222	74	76
MGD004	95	96	1		0.1	0.3	14	25	8	61
MGD004	96	97	1		0.1	0.3	9	19	6	52
MGD004	97	98.3	1.3		0.1	0.7	18	39	17	51
MGD004	98.3	99.35	1.05		1.8	9.3	373	668	234	61
MGD004	99.35	100	0.65		0.1	0.2	12	19	4	68
MGD005	113	115	2		0.1	0.4	11	23	15	53
MGD005	115	117	2		0.0	0.1	3	6	4	57
MGD005	117	119	2		0.0	0.4	5	16	11	34
MGD005	119	120	1		0.8	1.8	35	100	33	38
MGD005	120	121.5	1.5		0.1	0.3	6	14	7	46
MGD005	121.5	122.8	1.3		0.1	0.4	7	18	8	41

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