Review of Exploration Potential: EL52/2004 – Loyetea

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Summary

The Dial Range area has moderate prospectivity for VHMS deposits, based on the recent confirmation of favourable lithostratigraphic correlations with prospective parts of the Cambrian Mount Read Volcanics, and the relative deficiency of modern on-ground exploration for that type of deposit. Its moderate VHMS prospectivity is offset by a low findability factor related to extensive post-Cambrian cover, poor exposure, difficult terrain, and possible land use conflicts.
Dial Range also has moderate prospectivity and moderate findability factors for hypothetical Cambrian intrusion-related deposits of unknown economic potential, and economically unattractive Devonian intrusion-related deposits.

Introduction

Because of some previous reconnaissance mapping and prospect evaluation that I had carried out for Pasminco (Fitzgerald, 1993), Bass Metals' exploration manager Kim Denwer invited me to participate in a review of the mineral potential of their EL52/2004 in the Dial Range – Loyetea area of northwest Tasmania.
A preliminary discussion on 1st November resulted in an agreement that I would spend a few days to:

- review any post 1993 exploration results available in open-file reports from Mineral Resources Tasmania (MRT),
- re-familiarize myself with district geology and historic mineral prospects in preparation for a possible field visit,
- consider current exploration potential of the various deposit styles in known historic prospects, especially any with significant drill intercepts of untested anomalies,
- elucidate the controls on mineralization of the several hematite-limonite ironstone deposits in the district and their relationships to Ordovician siliciclastic conglomerates and some known copper prospects, in particular to evaluate the potential for North Lyell and Iron Blow style hematite + copper deposits.

This report summarizes that brief review of existing data.

Bass Metals' exploration philosophy and program to date

Bass Metals Ltd claims to have an open-minded and non-specific attitude towards mineral exploration and production in Tasmania, and therefore has no predetermined constraints or models of metal commodities, deposit styles, and deposit sizes, (pers. comm., Travis Murphy).

Bass Metals' original interest in the Loyetea EL52/2005 (Jones, 2006) was based on:

- eistence of over 40 known minor mineral occurrences of diverse metal associations and host rocks,
- 'interpreted extension of the Que-Hellyer corridor structures through the area'
- 'large scale regional structures including the northern extension of the Hellyer Fault and also possibly the Tenth Legion Fault'.

Exploration in the first year of tenure was essentially data compilation and remote sensing, including:

- compilation of 'previous exploration information in the area as well as acquiring datasets that may be of assistance in targeting *VHMS and intrusion-related mineral deposits'*.
- Acquisition and interpretation of ASTER spectral data, which despite the masking effects of vegetation and extensive cloud cover (Agar, 2005), led to identification of three approximately 5-km-wide areas of 'potentially significant alteration' (Jones, 2006). Area 1 'marked by silica zones and phyllic (sericite) and argillic (alunite) alteration', centred 2 km NNW of Loyetea Peak at the southeastern margin of the Housetop Granite, is the only one of Jones' three zones that coincides with the 19 potential targets selected by Agar (2005). Jones' areas 2 & 3 are at Mt Duncan and Mt Montgomery in the Dial Range 'over interpreted Mt Read Volcanics units marked by propylitic (chlorite) zones with silica and carbonate alteration'.
- A Geoinformatics GIS-based interpretation to provide 'high-quality targets' for 'rapid drill testing' of *world class VHMS deposits, intrusive related tin systems (e.g. Renison and Mt Bischoff) and intrusive related nickel skarn systems (e.g. Avebury)*. This apparently 'generated two Rosebery-Hellyer VHMS style targets on the license and two intrusion-related targets'. However, Jones' (2006, Figure 5) location diagram showed only one VHMS target at Loyetea Peak, and

two intrusion related (Sn?) targets at Heka and Riana[1]. All of them lie partly outside EL52/2004.

The company proposed to follow up with:

- geologic mapping and rock chip sampling of identified magnetite skarns, and the Geoinformatics generated VHMS style and intrusion-related targets,
- mapping over the interpreted positions of the Hellyer Fault and Tenth Legion Fault,
- possible soil geochemistry to evaluate potential for VHMS style mineralisation (Jones, 2006).

It seems that little progress was made during 2006-2007 (Turnbull and Bates, 2007), and in the following year the emphasis switched to a (helicopter?) airborne VTEM survey flown over the southern half of the EL area (Bates, 2008). VTEM detected a number of anomalies along the eastern margin of the Housetop Granite but none in the area dominated by Cambrian volcanics in the southern part of the survey (Figure 1). Areas of superficial Tertiary basalt clearly dominate the conductivity responses (Figure 2) and preliminary interpretation indicated some anomalies are attributable to 'cultural features'[2].

Nevertheless, three anomalies (Nos. 2, 7, and 16) were considered to warrant follow-up. Anomalies 2 and 16 are on Tertiary basalt, probably covering Ordovician Gordon Limestone (Baillie et al., 1986), near the Redwater Creek magnetite skarn prospect (Figure 3), which is weakly anomalous in Zn and Sn (Bates, 2008). Previous exploration for F-Sn-W skarn deposits by Comalco culminated in drilling of several holes at this prospect (Jones, 2006), which, reputedly, did not test the VTEM Anomaly 2 zone (Anonymous, 2008). Bass Metals Ltd considers that Anomaly 2 may represent a sulfide-prospective distal part of the skarn system. At last report, July 2008, Bass Metals' geophysical consultant was awaiting final VTEM data, and confident that he could design a drill hole to test the Anomaly 2 conductive target without further geophysical surveys (Anonymous, 2008).

According to Anonymous (2008), Anomaly 7 'is coincident with a mapped fault and is proximal to a Devonian Pb occurrence and a minor Au mine'. The fault referred to is presumably the Duncan Fault (Burns, 1963), the Pb prospect probably Hutton's about a kilometre to the northeast, and the minor gold mine possibly Walloa Creek (Fe,Cu, Au, Ag) about 1.5 kilometres to the southeast. Anonymous' report (2008) overlooks the geologic mapping that indicates the anomaly also coincides with a small patch of Tertiary basalt (Burns, 1963), which is known to be highly conductive elsewhere.

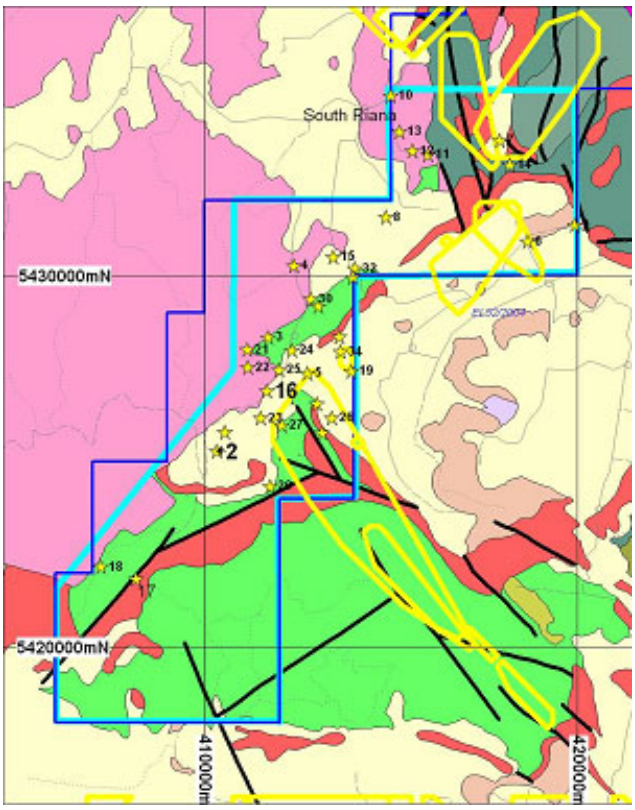

Figure 1 Geologic plan showing the Loyetea EL52/2004 (dark blue), the area covered by airborne VTEM survey (light blue), interpreted conductors (numbered stars), and Stage 1B GXL target polygons (yellow), from Bates (2008).

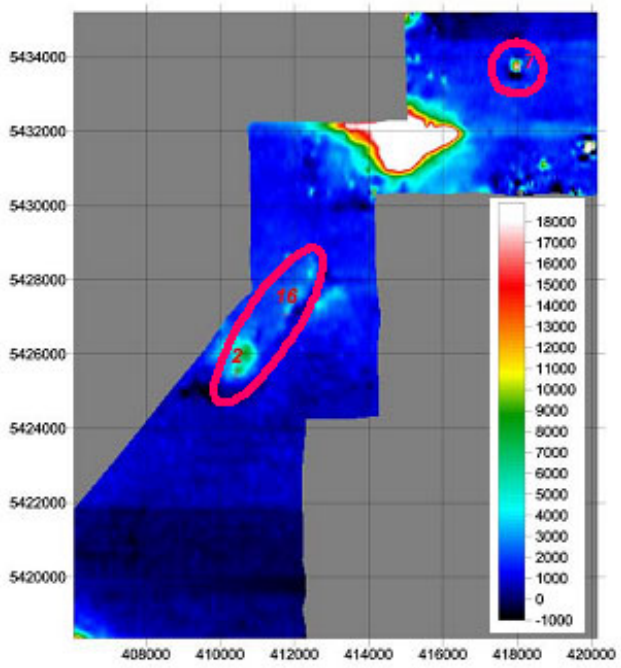

Figure 2 Colour contoured image of VTEM Channel 20 data showing locations of Anomalies, 2, 7 and 16, (conductivity units unspecified; modified from Bates, 2008).

[1] Probably because the legend on that diagram was poorly placed to partly obscure the anomalies it was supposed to depict; c.f. Fig. 3 of Bates (2008).

[2] i.e. man-made conductors: fences, buildings, stockyards etc.

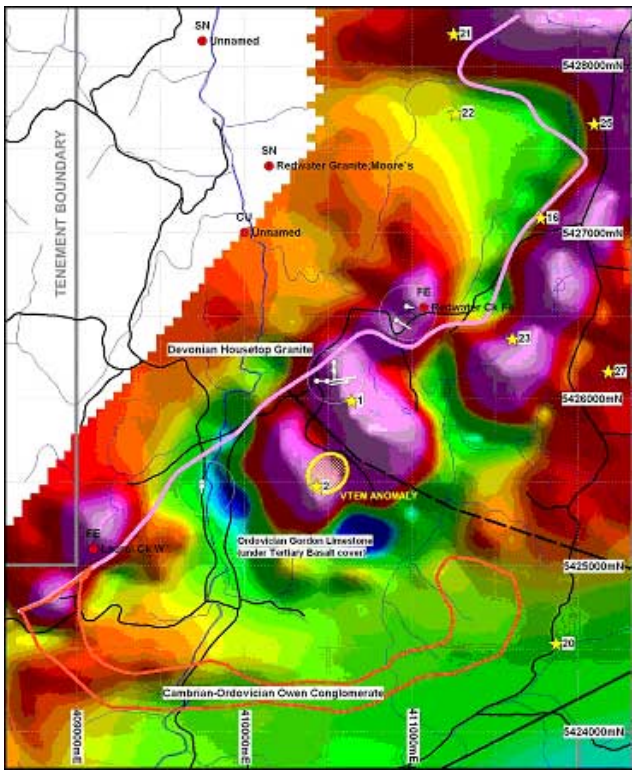

Figure 3 Location of VTEM anomalies No. 2 and No. 16 near Redwater Creek, plotted on a colour-contoured image of total magnetic intensity. The diagram (from Bates, 2008) also shows the southeastern edge of the Housetop Granite (pink line) and locations of existing (Comalco?) drill holes.

Pasminco's 1992-95 prospectivity review & exploration program

Jones (2006) summarized previous mineral exploration of the Loyetea, Housetop Granite, and Dial Range areas from the late 1960s up to the mid 1990s but he unaccountably overlooked Pasminco's 1992-1995 program in the Dial-Natone-Gunns Plain area under EL9/92. That EL overlapped only the northeastern half of Bass Metals' EL52/2004 and extended several kilometres further west to cover the magnetite + pyrrhotite skarn at Natone and hematite deposits at Blythe River and Cuprona (Figure 4).

I played a small contract geological role in that Pasminco program, carrying out reconnaissance litho-stratigraphic mapping, a comprehensive review of previous modern exploration, and field appraisals of most of the known mineral occurrences in the Dial Range area between the coast and Gunn's Plains (Appendix B, Fitzgerald, 1993).

Pasminco's main exploration target in the Dial Range area was 'economically viable polymetallic base metal deposits', i.e. VHMS-type deposits. Copper-gold deposits of unspecified type were 'an important secondary target' (Fitzgerald, 1993). Their initial exploration program involved:

- compilation and assessment of previous exploration and Geological Survey data,
- reconnaissance mapping and sampling (WH) coupled with a petrographic study by Dr Tony Crawford, which elucidated and revised some lithostratigraphic and structural relationships in the Cambrian successions,
- relocation, mapping and sampling of most significant historic mineral prospects
- a high resolution helicopter-borne magnetic and radiometric intensity survey, which Dr David Leaman interpreted in conjunction with existing gravity data, to conclude that most of the area is underlain at shallow depths of 1-3 km by an anomalously dense and highly magnetic phase of the Devonian Housetop Granite.

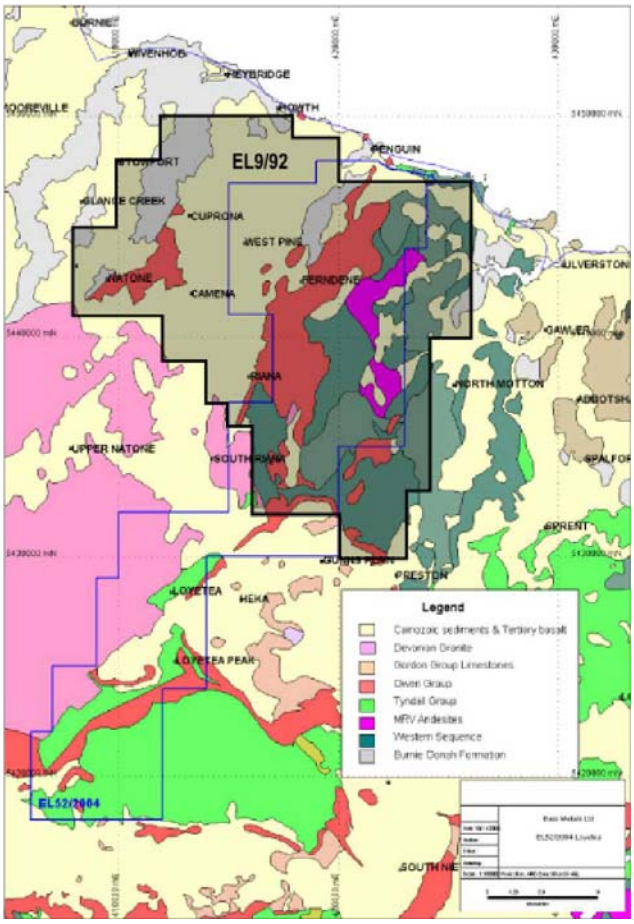

Figure 4 Location of Pasminco's former EL9/92 covering most of the northeastern half of Bass Metals' current EL 52/2004 (modified from Jones, 2006).

My field inspections and literature reviews of about nineteen historic prospects suggested they fell into four more or less empirically determined categories, as outlined in Table 1. Fitzgerald (1993) suggested that all four deposit types were possibly formed in a single metallogenic event related to the Devonian emplacement of the Housetop Granite, which is interpreted to extend under the entire Dial Range area at depths less than 1 km below surface.

There is not much doubt about the Devonian metallogenic association of type 4 skarn. The small type 3 fissure lodes are probably also Devonian granite-related, although they comprise a wide spectrum of mineral assemblages including barite and hematite in association with base metals and minor silver and gold. The enigmatic Types 1 and 2 are discussed in a little more detail in the following section of this report.

Table 1 Mineral deposit types in Dial Range area (modified from Fitzgerald, 1993).

Type	Style of Mineralization	Prospect	Commodities
1	Cambrian hydrothermal systems; associated with intrusive felsic Lobster Creek Volcanics	Penguin	Ag Pb Cu (Au)
		Neptune	Ag Pb
		Dial Mine	Cu Ag (Au)
		Keddie's	Cu Ag (Au) (Sn)
		Davie's Adit	Cu
2	Hematite-silica replacement uncertain age, structurally and/or stratigraphically controlled	Penguin Creek	Fe
		Iron Cliffs	Fe (py)-limonite
		Dial	Fe
		Blythe River	Fe
		Cuprona	Fe
3	Devonian vein; small, fault fissure fill	Copper King	Cu
		Rutherford's	Cu
		Kaine's	Ba (Cu)
		Sullock's Hill	Ba, Pb
		Badger's	Pb Zn (Ag) (Cu)
		Hutton's	Pb Zn
		Walloa Creek	Cu Ag
		Devon Consols	Cu Ag (Au)
		Russell's	Cu Ag (Au)
4	Devonian skarn; contact metasomatic related to Housetop Granite	Natone	Fe

The results of Pasminco's initial exploration were 'a little disappointing' (Fitzgerald, 1993) and in the following year (Fitzgerald, 1994) they carried out a low-key program restricted to:

- A brief examination of the enigmatic limonitic Ironcliffs ironstone deposit, which concluded that it was epigenetic, related to the nearby hematitic bodies at Tasmanian Iron Mines - not a gossan – and the associated base metal sulfide and barite veinlets were due to a later, fault related, minor metallogenic event.
- A lithogeochemical study of Cambrian volcanic units, which concluded that the Lobster Creek Volcanics are compositionally similar to the main Suite I of the Mount Read Volcanics (Crawford et al., 1992), that they are intrusives of limited extent and have low potential for VHMS deposits. The Motton Spilite was found to have affinity with Crawford et al.'s Suite V rift tholeiites.
- Recognition of the anomalous density, magnetic intensity, and radioactivity of the Housetop Granite suggested potential for base metal ± gold bearing skarn and manto deposits analogous to granitoid related systems in the Cloncurry and Central Colorado districts.

Pasminco's enthusiasm fizzled out in 1995 after a final half-hearted exploration effort limited to:

- Rock chip sampling and mapping at Ironcliffs and Penguin Creek (Tasmanian Iron Mines), which led to an (unsubstantiated and largely incomprehensible) arm-waving interpretation that 'the hematite alteration is a district wide feature of the Owen Conglomerate and marks deposition from oxidized Fe-rich fluids…..related to intrusion of Cambrian[3] granite' (McGunnigle, 1995). McGunnigle went on to suggest 'that there may have been ample fluid with which to form ore….. however, there appears to be little scope for the development of suitable traps and reducing environments which would be capable of converting the fluids to sulfide ores'!
- An honours research project by Rebecca Sproule involving mapping, petrographic and geochemical studies (Sproule, 1994) 'failed to produce significant results apart from recognition of a basaltic intrusion in the Dial Mine area, which is analogous to Suite III of the MRV' (McGunnigle, 1995)[4].

[3] I can only hope that this was a typographic error; the Owen Conglomerate is generally understood to be Late Cambrian – Early Ordovician in age whereas emplacement and un-roofing of the Cambrian granitoids preceded the Tyndall Group, therefore at least Middle Cambrian age (Corbett, 1992).

[4] McGunnigle (1995) did not explain why this was 'significant' apart from commenting it was the first high-K shoshonitic volcanic rock found 'north and east of the Henty Fault'.

Lithostratigraphic updates

MikeVicary's recent reconnaissance-verification mapping, along accessible roads and tracks in the Kindred-Castra areas (Vicary, 2006) has contributed to revision of the lithostratigraphy of the Dial Range Cambrian sequences and elucidated correlations with the Western Volcano-Sedimentary Sequence (WVSS) and the Tyndall Group (TG) of the Mount Read Volcanics (MRV).
In brief:

- The Motton Spilite (Metabasalt) and Barrington Chert are assigned to allochthonous sequences, possibly correlates of the Early Cambrian Cleveland-Waratah Association, or Late Neoproterozoic Togari Group.
- The Cateena Group and its included Kerrison Volcanic and Wilsonia Volcanic units are mostly/probably correlates of the WVSS. Cateena Group rocks in the Allison Road-Foggs Flat area on the east flank of Dial Range are of uncertain correlation: either WVSS or TG[5].
- The Sprent Formation, (comprised of chert-basalt-quartzite-schist clast-bearing lithicwacke-conglomerate, greywacke and ashy siltstone) in the Preston-Isandula area (south east of Dial Range) represents the basal unit of the Tyndall Formation (or possibly the upper part of the WVSS).
- Feldspar-pyroxene crystal-rich volcaniclastic sandstones and ashy siltstones previously assigned to Kerrison Volcanics in the Isandula-Motton area (east of the Dial Range) are correlates of the Lynchford Tuff in the Lower Tyndall Group.
- Felsic volcaniclastic sandstone-siltstone, intermediate dykes, and siliceous conglomerate in the Radford's Creek Group at Gunn's Plains Road are correlates of the Tyndall Group – but the conglomerates could be thrust slices of Owen Group?
- The 'Lobster Creek Volcanics' now referred to as 'Lobster Creek Intrusives', are widespread as intrusive bodies varying from a few metres up to a couple of kilometres in size. They are dated at 500±3.5 Ma, and were possibly comagmatic with the andesitic crystal-rich volcaniclastic Lynchford Tuff correlates of the Tyndall Group.

Vicary (2006) concluded that in the Castra-Kindred area 'most of the known mineralization occurs at or near the contact between the Tyndall Group and underlying Western Volcano-Sedimentary Sequence' and advised that 'future exploration should target exhalative or sub-seafloor replacement VHMS-style mineralization at the base of the Tyndall Group or potential Cu-rich feeder zones at a deeper stratigraphic level'. In an oblique reference to the mineral deposits of the Dial Range area, he noted that 'Cambrian Cu, Pb, Zn and Ba mineralization…. has been overprinted by Devonian Sn-As assemblages along the eastern margin of this [Housetop Granite] intrusion'.

[5] Vicary (2006) cited the exposure of crystal rich volcaniclastic sandstone (Kerrison Volcanics) at Preston Road near Kerrison's Creek as being correlates of the Tyndall Group.

I do not have access to the updated MRT digital geologic mapping data, but I think it would be a useful exercise to make a GIS-based spatial analysis of the relationships between the revised stratigraphic correlations, known mineral deposits, and metal associations.

Comments on deposit styles

Despite the long standing recognition of probable correlations between the Mount Read Volcanics of western Tasmania and the Cambrian partly volcanic succession in the Dial Range area, and sporadic exploration for volcanic hosted polymetallic massive sulfide deposits at Dial, there have been no convincing discoveries of VHMS-type deposits or associated altered facies. This had been the primary exploration target for the Pennzoil-Geopeko JV in the late 1970s, and for Pasminco in the early 1990s. Both of these exploration groups failed to find encouragement for VHMS deposits, and subsequently switched their priorities to exploration for Devonian granite-related replacement deposits.

Type 1- Intrusion-related pyritic deposits & altered zones
Geopeko modified an earlier Cambrian syn-volcanic genetic model and ultimately concluded that the Cu-Ag-As-Sn sulfide deposits at the Dial Mine and Keddies prospects were Devonian granite-related (Large, 1981). This accords with subsequent gravity and magnetic field interpretation by David Leaman. Although a good deal of Leaman's interpretation was equivocal, he concluded that 'much mineralisation [in the Dial Range district] is associated with unambiguous granite roof forms. Virtually every known site can be correlated with magnetic trend changes which can be mapped regionally' (Leaman, 1993). Elsewhere in his report, Leaman noted that 'most, if not all, trends are relatively recent in structural and chemical terms – probably Devonian in age'; implying that 'the mineralization observed in the area is either Devonian in age or was remobilized during the Devonian'.

However, in 1993 I formed the opinion that the Dial Mine-Keddies system may be related to emplacement of the felsic-intermediate diorite intrusive/s, misleadingly named 'Lobster Creek Volcanics' (LCV), which are geochemically similar to Suite 1 Mount Read Volcanics (Fitzgerald, 1994) and of Late Cambrian-Early Ordovician age (490 ± 18 Ma, Fitzgerald, 1993). This idea was based on the existence at the Keddies-Dial Mine area of pyritic replacement deposits in sedimentary rocks adjacent to a tourmaline-pyrite-altered marginal zone in the LCV, and the porphyry copper-like sericite-pyrite altered zone in and adjacent to a similar LCV-type intrusive stock on the shore platform near the Penguin Mine (Herrmann, 1993). Whilst it is possible that fluids from Devonian granite were focused along and altered the LCV contact zones, the LCV do not seem particularly susceptible to alteration. Moreover, in view of tourmaline and sericite-pyrite altered-volcanic facies associated with Cambrian granitoids elsewhere in Tasmania (e.g. Mt Darwin and Mt Selina), I considered it an unnecessary complication to invoke the Devonian granite.

After describing my LCV samples from the Dial area and considering the petrogenetic-tectonic implications, Tony Crawford imagined 'that the possibility of porphyry Cu-Au mineralization might be more tantalizing than previously considered for the Mount Read Volcanics' (Appendix C, p. 108, in Fitzgerald, 1993). Fifteen years of (admittedly rather sporadic) exploration in the MRV does not seem to have vindicated that allure and, as far as I'm aware, porphyry Cu-Au models do not rate highly in current Tasmanian exploration programs[6].

Nevertheless, Cambrian or Devonian intrusion-related, base metal- or tin-bearing sulfide replacement deposits (e.g. Renison Bell type) might be targets worth reconsideration, especially in view of the fact that there has been negligible prospect-based geophysical exploration for these deposits since the early 1980s. The EM surveys applied by Geopeko at the Dial Mine prospect were low-powered systems: VLF-EM and TURAM. The depth-capability and interpretation of TEM systems has considerably advanced since then, and it is slightly regrettable that Bass Metals' recent VTEM did not include a few short flight lines over the old Dial Mine prospect. One of Geopeko's last recommendations was for a deep-penetrating EM system to be applied at Dial Mine grid, to search for conductive pyrrhotite-cassiterite deposits at depths beyond detection by magnetics and soil geochemistry (Sumpton and Turley, 1984).

Type 2 - Hematite-ironstone deposits

My previous observations and interpretations (Herrmann, 1993) of the several hematite-dominated deposits at Blythe River-Cuprona, Mt Riana (Dial Fe), and Ironcliffs may be condensed into the following points:

a) Most of the known hematite deposits lie near contacts between the PreCambrian Burnie Formation and the Ordovician Dial Group[7], particularly near the western margin of the latter.
b) They are sub-vertical, parallel to generally north-trending contact zones, and typically have faulted western margins; i.e. there were strong structural controls on mineralization, probably fault-related, discordant, not stratiform.
c) The deposits are composed essentially of hematite and quartz, with textures suggesting replacement of sedimentary rocks of uncertain (perhaps non-specific) lithostratigraphic affiliation.
d) In some instances, e.g. Cuprona, there is confusion or uncertainty about whether the host rocks are part of the PreCambrian Burnie Formation, overlying EoCambrian-Cambrian sequences, or basal sections of the Ordovician Dial Group. This probably means they span the entire range; the 'Dial Iron' hematite deposits at Mt Riana are certainly in Owen-like, presumably Ordovician, conglomerates.
e) Consequently, the age of mineralization is uncertain. Some geologists have interpreted the existence of hematite pebbles in Dial Group conglomerates as indications of a pre-Ordovician metallogenesis, but similar hematite replacement of the matrix of the same lithofacies indicates a post-Cambrian event, or at least a continuation into the Ordovician.
f) Limited geochemical data indicate that the ironstones do not contain significant base or precious metals.

The limonite-dominated Ironcliffs deposit at Ferndene State Reserve is a minor exception to the last point, insofar as it is reportedly contains traces of Pb, Ag, Ba, Cu and Zn. That contributed to a long-standing controversy about whether it was a gossanous cap to a sulfide deposit, or a variant of the hematite deposits a few hundred metres along strike to the north at the Tasmanian Iron Mines. Most recent geologists have concurred with the latter; that the Ironcliffs ironstone is an epigenetic, post Cambrian, structurally controlled, replacement deposit in PreCambrian Burnie Formation, and its minor associated vein-style base metals and barite represent a separate later event related to brittle faults (Burns, 1964; Herrmann, 1993; Fitzgerald, 1994).

The hematite-quartz assemblage, apparent association with major (probably reverse) faults, and proximity to the western edge of the Dial Group conglomerates are partly empirically similar to the setting of hematite-barite bodies proximally associated with Cu-Ag-rich deposits along the Great Lyell Fault at Mt Lyell. Those are likewise of controversial genesis, but have recently (again) been interpreted as 'the results of intense oxidation on a sulfide-rich schist mass exposed at surface in the Late Cambrian, during deposition of the adjacent Owen sediments, rather than as a separate mineralizing event' (Corbett, 2001), i.e. not strictly structurally controlled or epigenetic, and therefore dissimilar to the Dial-Blythe hematite deposits.

On the other hand, the nearby Cu-Ag occurrences at Copper King near Cuprona and Rutherford's near Natone[8] tantalizingly support the Lyell-Blythe-Cuprona hematite connection, particularly the minor bornite and covellite reported at Rutherford's (Gee, 1977). According to my 1993 summary, both prospects have pyrite and chalcopyrite in sporadic steeply dipping quartz ± siderite veins in Burnie Formation slate, in a northeast trending shear/fault zone, which is up to 100 m wide, parallel to, and about 100 m west of a line of hematite ironstones localized at the eastern contact of the Burnie Formation. However, the slaty host rocks, and shear-hosted quartz-siderite veins do not resemble the setting at Mt Lyell, and the reported bornite-covellite could be products of supergene oxidation. The apparent absence of altered felsic volcanics and significant disseminated or massive pyrite-chalcopyrite zones are obviously major negative empirical factors.

[6] There are dubious reports of an intersection of porphyry-style mineralized zones at the Cethana prospect by Pluton Resources (www.businessspectator.com.au/bs.nsf/Article/Pluton-Resources-confirms-porphyry-copper-at-Cetha-BT8MK?OpenDocument) and a proposed 2,500 m drilling program by Macquarie Harbour Management at the Thomas Creek porphyry Cu-Au prospect (www.ecplaza.net/news/12/16592/macquarie_harbour_mining.html)

[7] correlate of the Denison Group and Owen Conglomerate

[8] Both of these prospects are outside, west of, Bass Metals' EL52/2004

The Dial Range and Blythe-Cuprona hematitic ironstones have not had significant modern exploration, particularly electrical geophysical surveys[9], or geological research, and their metallogenesis remains obscure. However, there's no evidence of base or precious metal-rich facies in any of them, and their empirical affiliation with other potentially economic deposit styles (e.g. North Lyell Cu-Ag) is very flimsy. I consider that they have low prospectivity. They may be good candidates for mineralogical-geochemical-structural-metallogenic academic research, but they are not favourable mineral exploration targets.

Discussion of Prospectivity

The long-standing recognition that the Dial Range Trough contains Cambrian volcano-sedimentary rocks that may correlate with the western Tasmanian Mount Read Volcanics, and therefore may have similar prospectivity for VHMS deposits, has attracted the interest of a series of exploration companies over the past three decades. However, there has been no significant, 'on-ground' VHMS prospect exploration since the Pennzoil-Geopeko joint venture effort in the late 1970s and early 1980s; i.e. more than 25 years ago. Eighty percent of that Pennzoil-Geopeko work was concentrated around the Dial Mine, and the explorers ultimately concluded it was a Devonian granite related system – not Cambrian VHMS.

Pasminco had a sincere look at the VHMS and granitoid related deposit potential in 1992-1995 but their program was eventually limited to reconnaissance geology, airborne magnetic survey, and improved regional geophysical interpretation – no intensive on ground exploration. Again, they concluded that most of the many minor historical prospects in the area are Devonian granite-related, and that the VHMS potential was consequently low. It is worth noting that that assessment was largely based on a *regional geophysical interpretation* – not on exhaustive prospect based exploration, research, or drilling results.

Since then, the suspected correlations with the Mount Read Volcanics have been confirmed, but only slightly elucidated, by lithostratigraphic mapping by MRT's geologists, mainly Mike Vicary (2006). I say 'slightly elucidated' because that mapping also has only been of a reconnaissance nature – as Vicary stated: 'along existing roads and tracks or areas of relatively easy access'. The actual distribution of complex lithofacies associations remains unclear. The geological interpretation still largely relies on Kerry Burns' admirably detailed (but stratigraphically incorrect and structurally rather fanciful) 1 mile to 1 inch map published in 1963. The Dial Range has (as far as I'm aware) missed the detailed 1:25,000 'MRV project' type mapping carried out over much of western Tasmania.

Nor has the Dial Range Trough experienced the systematic electrical geophysical surveys, particularly TEM and IP, which have extensively covered most of the MRV and suspected correlates in western Tasmania and the Fossey Mountain Trough. For a quarter of a century, it has been an exploration backwater (rather analogous to the Rocky Cape Block of northwestern Tasmania, which Keith Corbett once memorably described as 'a geological retirement village', where nothing much had happened since the Late Proterozoic).

Mike Vicary noted that most of the historical prospects in the Castra-Kindred area (mostly southeast of the Dial Range Trough) lie stratigraphically near the base of the Tyndall Group correlates, which is therefore (and partly because of western Tasmanian MRV implications) prospective for VHMS deposits. That is a concept that is worth examining in a GIS-based spatial analysis and, if verified, could be extrapolated to the Dial Range, where some Tyndall Group correlates are interpreted to exist.

Given the amount of 'blue sky' permitted by lithostratigraphic uncertainties and the deficiency of modern intensive on-ground exploration, but tempered by the possible-probable Devonian granite-related mineralization 'overprint', I subjectively-viscerally consider that the Dial Range area has moderate VHMS prospectivity. However, that is offset by a low findability factor, due to the large extent of cover rocks (Ordovician siliciclastic rocks and Tertiary basalt), poor geologic exposure elsewhere (due to deep weathering and persistent colluvium on steep slopes), structural complexity probably involving thrust faulted stratigraphic repetitions, difficult terrain, and potential access limitations on private land and State reserves.

Therefore, it will take commitment and persistence to properly explore and evaluate the VHMS potential. This may be difficult to justify under the present economic uncertainties.[10] Nevertheless, the Dial Range merits a sustained and detailed exploration program; the next time the exploration wheel comes around. That program should include:

- Detailed mapping, backed up by lithogeochemistry and petrography, to firmly establish the lithostratigraphic correlations and structural framework.
- Systematic (e.g. 200 m line spaced) TEM and IP geophysical surveys over the prospective parts of the MRV correlates (i.e. the WVSS-TG contact zone and stratigraphically below it) to explore for conductive sulfide bodies and significant pyritic footwall altered zones.
- Re-examinations of historic prospects that go beyond reconnaissance visits, perhaps coupled with sponsored academic research (i.e. including evaluation of historic data, mapping, sampling, lithogeochemistry, petrography, SWIR spectral analysis, isotopic studies, particularly Pb-isotopes) to determine the metallogenic styles, end speculation, and inform prospectivity assessment.

[9] excepting the large calc-magnesian silicate magnetite-pyrrhotite skarn at Natone

[10] The phenomenally hyped 'global financial crisis'.

There is also potential for non-specific 'intrusion-related' deposits, possibly Cambrian, Devonian, or both. Most of the mineralization 'smoke', represented by many small historic prospects, probably falls into this category. However, these have dubious economic potential. There are (to date) no empirical analogues for *economically significant* Cambrian intrusion-related or porphyry-type deposits in Tasmania, and the production from Tasmanian Devonian granite-related deposits has been unimportant over the last two decades. Accordingly, I rate them as having moderate prospectivity, moderate findability, but low economic potential.

References

Agar, B., 2005, ASTER Alteration Mineral Mapping, Northwest Tasmania; Australia: Australian Geological and Remote Sensing Services, 19 p.

Anonymous, 2008, Exploration Activity: Bass Metals Ltd, 6 p.

Baillie, P. W., Williams, P. R., Seymour, D. B., Lennox, P. G., and Green, G. R., 1986, St VALENTINES Geological Atlas, 1:50,000 series, 1st edition, Tasmania Department of Mines.

Bates, S., 2008, Loyetea Project, Black Bluff Range Group, Tasmania EL52/2004, Annual Progress Report 8th August 2007 to 7th August 2008: Bass Metals Ltd, 19 p.

Burns, K. L., 1963, DEVONPORT Geological Atlas 1 mile series, 1:63360, 1st edition, Geological Survey of Tasmania, Department of Mines - Hobart.

Burns, K. L., 1964, Geological Survey Explanatory Report, One Mile Geological Map Series, K55-6-29, DEVONPORT: Tasmania Department of Mines, 266 p., ER8115N0, www.mrt.tas.gov.au/portal/page?_pageid=35,832417&_dad=portal&_schema=PORTAL.

Corbett, K. D., 1992, Stratigraphic-volcanic setting of massive sulfide deposits in the Cambrian Mount Read Volcanics, Western Tasmania: Economic Geology, v. 87, p. 564-586.

Corbett, K. D., 2001, New mapping and interpretations of the Mount Lyell mining district, Tasmania: a large hybrid Cu-Au system with an exhalative top: Economic Geology, v. 96, p. 1089-1122.

Crawford, A. J., Corbett, K. D., and Everard, J. L., 1992, Geochemistry of the Cambrian volcanic-hosted massive sulfide rich Mount Read Volcanics, Tasmania, and some tectonic implications: Economic Geology, v. 87, p. 597-619.

Fitzgerald, F. G., 1993, EL 9/92 Dial Range Annual Report July 1992 - June 1993: Pasminco Exploration, 214 p., TCR 93-3447, www.mrt.tas.gov.au/webdoc/servlets/com.geometryit.manager.ActivityManager?f_actName=docDetails&f_actEvent=homeTasx&f_reportId=44324.

Fitzgerald, F. G., 1994, EL 9/92 Dial Range Annual Report for the year ending June 1994: Pasminco Exploration, 53 p., TCR 94-3592, www.mrt.tas.gov.au/webdoc/servlets/com.geometryit.manager.ActivityManager?f_actName=docDetails&f_actEvent=homeTasx&f_reportId=44477.

Gee, R. D., 1977, Geological Survey Explanatory Report: Geological Atlas 1 mile series, BURNIE: Tasmania Department of Mines, 74 p., ER8015N0, www.mrt.tas.gov.au/portal/page?_pageid=35,832417&_dad=portal&_schema=PORTAL.

Herrmann, W., 1993, Notes on a geological reconnaissance of the Dial Range - EL 9/92, *in* Fitzgerald, F. G., ed., EL 9/92 Dial Range Annual Report July 1992 - June 1993, Appendix B, p. 46-106. Pasminco Exploration, TCR 93-3447.

Jones, A., 2006, Loyetea Project Tasmania EL52/2004, Annual Progress Report 8th August 2005 to 7th August 2006: Bass Metals Ltd, 21 p.

Large, R. R., 1981, Progress Report EL 24/73 Dial Range - 1980 field season: GEOPEKO, ? p., TCR 81-1591.

Leaman, D. E., 1993, Preliminary Interpretation Aeromagnetic Survey Dial Range EL 9/92 for Pasminco, *in* Fitzgerald, F. G., ed., EL 9/92 Dial Range Annual Report July 1992 - June 1993, Appendix E, p. 164-206. Pasminco Exploration, TCR 93-3447.

McGunnigle, N. K., 1995, EL 9/92 Dial Range Final Report July 1992 - June 1995: Pasminco Exploration, 45 p., TCR 95-3793, www.mrt.tas.gov.au/webdoc/servlets/com.geometryit.manager.ActivityManager?f_actName=docDetails&f_actEvent=homeTasx&f_reportId=44644.

Sproule, R. A., 1994, Stratigraphy and geochemistry of the Dial Range Trough, NW Tasmania: Unpub. BSc Hons. thesis, University of Tasmania, ? p.

Sumpton, J. D., and Turley, S. D., 1984, Follow up of aeromagnetic survey of the Dial Range Trough: GEOPEKO, ? p., TCR 84-2149.

Turnbull, C., and Bates, S., 2007, Loyetea Project Tasmania EL52/2004, Annual Progress Report 8th August 2006 to 7th August 2007: Bass Metals Ltd, 21 p.

Vicary, M. J., 2006, Re-interpretation of geological relationships in the Castra-Kindred area: Mineral Resources Tasmania, 40 p., UR2006_01.