



**BULGOBAC (Boco Siding) EL 4/2000**

**ANNUAL REPORT  
FOR THE PERIOD ENDING 29<sup>th</sup> MAY 2004**

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## **1. SUMMARY**

This report details exploration work undertaken on EL 4/2000 Bulgobac during the period 29 May 2003 to 1 May 2004, the fourth year of this tenement. Work on the licence has focussed on exploring the north east striking contact between the Central Volcanic Sequence and Southwell sub-group correlates, along a strike length of some 9.6 km, for Rosebery and Hellyer style VHMS deposits. The work completed comprised 2.5 line km of gridding, surveying with DGPS and geologically mapping. These lines and 6.6 line km of uncut, DGPS located lines on Boco Plains were also partial leach (PL) soil sampled (373 samples including duplicates and standards submitted for analysis).

Work during the reporting period largely completed the partial leach soil coverage of the CVC – Southwell Subgroup contact, with the northern extent of sampling abutting the southern end of the Sock Creek grid on EL 30/2000 (currently being sampled). Two anomalies worthy of further work remain on EL 4/2000 – The Base of the Hollway andesite and at Sawmill Creek. It is recommended that these anomalies be followed up by some further PL soil sampling and by diamond drilling.

## 2. INTRODUCTION

This report details exploration work undertaken on the Bulgobac EL 4/2000 during the period 29 May 2003 to 1 May 2004, the fourth year of this tenement.

Access to the tenement is Via the Murchison highway and Emu Bay Railway, in the east, and on the Boco Road, cutting through the centre of the tenement. A network of 4WD tracks, developed for logging and mineral exploration, extend from these main access points and provide excellent access to the majority of the area of interest.

Zinifex's main target on EL 4/2000 is Cambrian Rosebery or Hellyer type Zn-Pb-Cu-Au-rich VHMS mineralisation hosted by the Mount Read Volcanics (MRV). The tenement covers a generally NE striking section of the MRV including the contact between the Central Volcanic Complex (CVC) and the overlying Southwell Subgroup (or lower Tyndall Group), separated in part by the Hollway Andesite (correlates of the Que-Hellyer Volcanics). Recent interpretations suggest that all economically significant VHMS Pb-Zn mineralisation in the Central Mt Read Belt occurs at this stratigraphic level and that as such the area of EL 4/2000 warrants detailed exploration. Despite a long exploration history (see Section 5) much of the prospective contact zone has not been adequately tested by modern deep search geophysical or geochemical techniques, a result of focussing on targets in the CVC (the Boco Alteration Zone) and the presence of thick glacial cover (to >100m in some areas). Zinifex are systematically exploring the EL using a combination of geological mapping, partial leach soil geochemistry and infill ground time-domain EM, where there is no existing coverage, or the work that has been done is considered to have been ineffective.

### 2.1 Attribution

The following personnel were responsible for the work carried out by Zinifex Rosebery Mine on the EL 4/2000 Bulgobac licence area during the reporting period:

Senior Geologist: Andrew McNeill – Zinifex Rosebery Mine

### **3. LAND TENURE**

EL 4/2000 Bulgobac (24 sq km) was granted to Pasminco Australia Limited on 16 June 2000 for a period of 5 years. The location of the Tenement is shown on Figure 1. EL 4/2000 covers ground that fell vacant on the relinquishment of EL's 24/95 (Aberfoyle) in February 1998, EL 47/96 (RGC) in September 1998 and the partial relinquishment of Pasminco's EL 44/88 in November 1998. During 2001 Pasminco applied for two blocks of vacant ground adjoining EL 4/2000; ELA 9/2001 (5 sq km) and ELA 10/2001 (4 sq km). These areas were granted on 9<sup>th</sup> August 2001 and were immediately incorporated into an enlarged EL 4/2000 (33 sq km). On April 5<sup>th</sup> 2004 the name of Pasminco Australia Limited was changed to Zinifex Australia Limited as part of a float of some assets.

Land covered by EL 4/2000 is all crown land designated as State Forest, informal reserves, parts of the Sawmill Creek, Boco Creek, Burns Peak and Mackintosh Forest Reserves and some HEC land all of which are available for exploration under the Mineral Resources Development Act 1995.

### **4. REGIONAL GEOLOGY**

Basement in western Tasmania is Precambrian age, comprising predominantly greenschist facies meta-sediments with minor basalts and dolerites. Higher-grade amphibolite and eclogite facies are also present within the Precambrian. This Precambrian basement is exposed to the east of the Bulgobac licence (Figure 2).

Cambrian volcanism and sedimentation developed on this Precambrian continental crust, and is subdivided into the Eco-Cambrian tholeiitic Crimson Creek Formation (CCF) and, the mid to late Cambrian predominantly calc-alkaline, Mt Read Volcanics (MRV).

The CCF was deposited in shallow but rapidly subsiding basins (Brown, 1986). The CCF consists of basaltic lavas and volcanoclastics, turbidites, carbonates, chert and minor evaporites. This formation is exposed west of the licence.

Ultramafic cumulates and volcanic equivalents were thrust onto the CCF in the mid Cambrian (Crawford and Berry 1992). These rocks generate strong magnetic anomalies and outcrop within the Huskisson Syncline, to the west of the licence. The ultramafics are interpreted at depth beneath the licence (Leaman, 1992).

The MRV form a 200km long by 20km wide north-south trending belt along the eastern side of the Dundas Trough, adjacent to and in some areas overlapping and intruding the Precambrian basement. The volcanics include intermediate to felsic lavas, sub-volcanic porphyries and granites, volcanoclastics and basement-derived sedimentary rocks. The MRV host six economically significant volcanic hosted massive sulphide deposits.

Equivalents of the MRV underlie the entire Bulgobac licence, and vary from massive felsic lavas, volcanoclastics and subvolcanic intrusives of the Central Volcanic Complex (CVC) in the east and south. This package is overlain, in part, by a thin micaceous greywacke and shale sequence, correlated with the Animal Creek Greywacke, and the Hollway andesite, a package of feldspar-phyric dacitic to basaltic lavas and hyaloclastic lava breccias with a geochemical signature suggesting a correlation with the Que-Hellyer Volcanics (Coutts, 1990).

Poorly mapped mixed provenance fine to coarse grained sediments (including volcanic quartz-rich volcanoclastics) with minor quartz-feldspar porphyry intrusives and lavas, probable correlates of the Southwell Subgroup (or lower Tyndall Group) overly the Hollway Andesite and define a synclinal structure in the north and west of the tenement (Reid, 1990; McKibben, 1993).

Regional structures that subdivide the MRV are the Rosebery Fault, west of the licence, and the Henty Fault, which is located 5km east of the licence.

Cambrian volcanism and sedimentation was followed by predominantly basement derived late Cambrian to Devonian age sedimentation, which includes siliciclastic conglomerate, sandstone and limestone. None of these sequences occur within the licence.

At least two phases of regional compression were associated with the mid Devonian Tabberabberan Orogeny (Keele, 1991). The development of folding, cleavage and regional thrusts in lower Palaeozoic rocks were associated with this event. Fold trends in the licence are N to NE.

Deformation was followed by the extensive intrusion of Devonian to Carboniferous granitoids. The Meredith Granite and associated hornfels aureole outcrop west of the licence area (Brown, 1986). The Devonian granites are associated with carbonate replacement Sn mineralisation at Renison Bell and Mount Bischoff, and the Pb Zn Ag vein deposits of Zeehan and, possibly, the Tullah Fields.

After substantial erosion of this terrane extensive Tertiary flood basalts and subvolcanic sediments were deposited. Remnants of the basalt flows are preserved to the north of the licence. In the Quaternary extensive unconsolidated glacial and fluvio-glacial deposits up to >100m thick accumulated in the Boco Plain area and the Valley of Boco Creek to the west (Augustinius and Nichol, 1999). These deposits now obscure much of the Palaeozoic geology in the eastern and central part of the tenement.

No economically significant mineralisation is known from the licence area, however a large sericite-pyrite alteration zone has been located as isolated outcrops, and by drilling, on the glacially covered Boco Plain. This zone, the Boco Alteration Zone has been extensively explored, as discussed below.

## 5. PREVIOUS EXPLORATION

The area of EL 4/2000 Boco Siding (Bulgobac) has had a long history of modern exploration, most of which has been completed in two areas; the Boco Alteration Zone and the Hollway Andesite. In this report the term Hollway Andesite Prospect will be used for the Hollway andesite itself and the volcano-sedimentary sequence overlying the andesite and forming the syncline east of the Pinnacles Rhyolite. Outside these areas exploration has largely been restricted to geological mapping, at various scales, and stream sediment sampling. The tenement area has also been mapped at various scales by MRT (Barton et al., 1966; Collins, 1981; Corbett and McNeill, 1986). Tables 1 and 2 summarise the previous exploration over the Hollway Andesite (including the Summit Prospect) and the Boco Alteration Zone, respectively. Work on the Boco Alteration Zone has also been summarised in detail by Herrmann (in Elliston (1998a)) and Taylor (1987). Table 3 summarises work completed on EL 4/2000 by Zinifex/Pasminco.

**Table 1 Previous exploration over the Hollway Andesite Prospect on EL 4/2000**

Year & Reference	Activities
1975 Butt et al. (1975)	Completion of an Airborne EM survey (INPUT); no significant anomalies.
1977-1978 Hall (1978)	Establishment of the EAB grid (two lines of which extend onto the area of EL 4/2000); geological mapping, A0 soil sampling, SP and ground magnetics.
1978 Beamish (1978)	Orientation -80# stream sediment survey over the EAA grid area.
1978-1979 Hall (1979)	The EAA grid was cut (22.8km) north of the Boco Road. Mapping, rock-chip sampling, A0 horizon total digest soil sampling (1024 samples) and a ground magnetic survey were completed; no significant anomalies were located.
1980 Hall and Pigott (1980)	Extend EAB grid east by three lines; geological mapping, ground magnetics, SP and IP, A0 soil sampling (listed as planned work – can't find report of this work at MRT, but appears to have been completed).
1981-1982 Anderson (1982a)	EAB grid extended further to NW (ECE extension Grid), soil sampling (C Horizon), and geological mapping.
1983 Shaw (1983)	Drilling of DDH EAB4 (178.0m); results not reported in detail.
1983 Dvorak (1983)	Completion of DIGHEM III survey over area. No outstanding EM responses were located (Trussell, 1984)
1985-1986 Anon (1986)	Line cutting preparatory to UTEM survey, stream sediment sampling, minor rock-chip sampling.
1986-1987 Anon (1987)	Review of previous soil geochemical coverage; line cutting, UTEM III survey (no significant anomalies) and interpretation of stream sediment sampling (BCL & -80#).
1987-1988 Anon (1988)	Completion of UTEM III survey – no significant anomalies
1988-1989 Rosenhain and Mathison (1989)	“limited field observations”; re-logging DDH EAB4; description of geophysical and geochemical anomaly tested by EAB4.
1989-1990 Lorrigan (1990)	Regional aeromagnetic and gravity surveys and preliminary interpretation; collection of magnetic susceptibility data from drill core; rock-chip sampling along the Boco Road and other tracks; two lines of wacker sampling (and 65.5m of DDH) over glacials south of the Boco Road

**Table 1 Previous exploration over the Hollway Andesite Prospect on EL 4/2000 cont..**

<b>Year &amp; Reference</b>	<b>Activities</b>
1990 Coutts (1990), Reid (1990)	BSc (Hons) theses completed on the Hollway Andesite (Coutts) and the Burns Peak – Boco Road areas (Reid). Work included geological mapping, petrography and whole-rock geochemistry; results indicate the Hollway andesite has geochemical affinities with the Hellyer Basalt.
1990-1991 Kirsner et al. (1991)	Photogrammetry and production of new base maps; re-processing of the 1990 aeromagnetic survey; digitisation of previous IP data; “brief” reconnaissance mapping.
1991-1992 Kirsner (1992)	Re-logging and sampling of DDH EAB4, geological mapping, compilation of soil data, construction of semi-regional cross sections, reprocessing of UTEM data.
1992-1993 Poltock et al. (1993)	Drilling BPD77 472.3m (collared just outside current EL); intersected volcanoclastic with massive sulphide clasts (to 36% Pb, 16.5% Zn); DHEM completed. Review of previous IP data.
1993-1994 Poltock and Saxon (1994)	Geological mapping, rock-chip sampling whole-rock geochemistry and petrology (largely outside the area of EL 4/2000). Drilling of BPD80 (469.7m) to test down-dip extension of sequence in BPD77; best intersection 6m @ 0.9% Zn, 0.2% Pb; DHEM completed. Review of UTEM and IP data.
1994-1995 Saxon (1995)	Geological mapping, rock-chip sampling and petrology (largely outside the area of EL 4/2000). Interpretation of regional gravity and magnetic data.
1995-1996 Quayle and Dibben (1996)	The EAB grid was refurbished and additional lines (1220E-1600E) cut to the east. Dipole-dipole IP and ground magnetic data collected. Compilation of existing mapping and further 1:5,000 scale mapping. A combined IP/soil target defined at the upper contact of the Hollway Andesite (Summit Prospect).
1996-1997 Weber et al. (1997)	Prospectivity Review; compilation of previous exploration data.
1997-1998 Murphy and Denwer (1998)	Diamond drilling (2xDDH for 410.2m) to test Pb-Zn soil (DDH BPD88; 199.8m) and IP (DDH BPD89; 210.3m) anomalies at the ‘Summit’ Prospect; weak Pb-Zn mineralisation was intersected.

**Table 2 Previous exploration over the Boco Prospect on EL 4/2000**

<b>Year &amp; Reference</b>	<b>Activities</b>
1972-1977 Hanson (1977)	INPUT AEM survey (1975); gridding (57.5 line km), gradient array IP, ground magnetics, grid based mapping and regional mapping, soil sampling (no significant anomalies); diamond drilling (BBP207-209; 475m) to test IP anomalies; alteration and weak base metal mineralisation intersected.
1977-1978 Mill (1978)	New access track and cutting of the Boco Extension grid, regional 1:10,000 scale mapping, gradient array IP (no significant anomalies), ground magnetics.
1978-1979 Mill (1979)	Minor infill gridding and geological mapping, dipole-dipole IP, and soil sampling on the infill lines.
1979-1980	No work.
1980-1981 Mill (1981)	Review of geophysics and geology.
1981-1982 Sainty and McDonald (1982a, 1982b)	Boco extension grid pegged (35.76 line km), geologically mapped, soil sampled and covered with Dipole-Dipole IP and ground magnetics.

**Table 2 Previous exploration over the Boco Prospect on EL 4/2000 cont..**

<b>Year &amp; Reference</b>	<b>Activities</b>
1982 Sainty (1982)	Geological mapping, trial percussion drilling program (7 holes for 226.0m).
1982-1983 Sainty (1983a)	Completion of three percussion holes (305.8m); petrology on samples from percussion drilling.
1983 Sainty (1983b)	Completion of four DDH (BBP242 and 246-248; 1899.7m) and two percussion holes (180.2m); core and chip geochemistry and some petrology; commencement of UTEM III survey.
1984 Sainty (1984a, 1984b)	Downhole SIROTEM completed – no anomalies; UTEM survey completed – 3 subtle anomalies; diamond drilling of four holes (BBP250-251, 253-254; 1689.5m) – two holes testing UTEM features – no significant mineralisation intersected.
1985 Williams (1985)	CSR farmed in to EL. Diamond Drilling (BBP278-280; 1601m) – no significant mineralisation intersected; petrology, drill core geochemistry and some sulphur Isotopes done; magnetic susceptibility data collected from drill core.
1986-1987 Taylor (1987)	CSR withdraw from JV; Pancontinental farm-in; review previous exploration and geology; petrological and geochemical study; UTEM survey over the extended Boco grid – no significant anomalies; Pancontinental withdraw from JV and tenement is relinquished.
1988-1989 Howland-Rose (1989)	Re-establish grid, RMIP and follow-up of 5 RMIP anomalies with gravity; no results warranting further follow-up. Tenement relinquished.
1990 Randell (1991)	Review of previous exploration, including stable isotopes and litho-geochemistry.
1990-1992 Kirsner (1992b)	Pasminco farm-in; Photogrammetry to produce base maps, high resolution helimagnetic survey, infill gravity survey and interpretation, regional scale geological mapping.
1997-1998 Elliston (1998a)	Review of previous exploration, re-interpretation of helimagnetic data, minor 1:5,000 scale geological mapping, rock-chip sampling and a detailed evaluation of the volcanic facies and hydrothermal alteration at the Boco Prospect. No significant targets worthy of follow-up and the tenement was relinquished (Elliston, 1998b).

**Table 3 Previous exploration on EL 4/2000**

<b>Year &amp; Reference</b>	<b>Activities</b>
2000-2001 Simpson and McNeill (2001)	Previous exploration reviewed and digital data compiled. 20.8 line km of grid cut and(or) rehabilitated and surveyed with DGPS; 12 line km of this grid geologically mapped, 751 'B' and 'C' horizon soil samples collected and submitted for analysis (including duplicates and standards) and 7 rock chip samples analysed. This work has defined two partial leach soil anomalies, one on the glacially covered Boco Plains and the second at the base of the Hollway andesite, adjacent to a total digest soil anomaly located by previous explorers.
2001-2002 McNeill (2002)	The work completed comprised a review of previous UTEM data, 4.2 line km of grid cut and(or) rehabilitated and surveyed with DGPS; geological mapping of the grid, vehicular tracks and selected creeks and collection and analysis of 567 (including duplicates and standards) 'B' horizon soil samples. Work to date has identified three partial leach soil anomalies and a UTEM anomaly that are worthy of further follow-up.

**Table 3 Previous exploration on EL 4/2000 cont..**

<b>Year &amp; Reference</b>	<b>Activities</b>
2002-2003 McNeill (2003)	The work completed comprised a review of previous UTEM data and completion of a single loop ground EM survey. 4.1 line km of grid was cut, surveyed with DGPS and geologically mapped. These lines and 3.4 line km of uncut, DGPS located lines on Boco Plains were also partial leach (PL) soil sampled (322 samples including duplicates and standards submitted for analysis). 82 samples over the Sawmill Creek anomaly, previously analysed by PL methods, were re-submitted for total digest analysis to follow-up the PL soil anomaly.

## **6. WORK COMPLETED 2003-2004 REPORTING PERIOD**

Work carried out by Zinifex/Pasminco during this reporting period has focused on partial leach soil sampling and geological mapping.

### **6.1 Partial Leach soil sampling**

The Boco partial leach soil sampling program was designed to cover the north east striking contact between the Central Volcanic Sequence and Southwell subgroup correlates, interpreted to be the time equivalent of the Rosebery host sequence, between Burns Peak, to the south west, and Animal Creek, to the north east, a strike length of some 9.6 km. Previous exploration over this area is summarised in detail in Section 5.

The soil samples were collected at 25m intervals at or near a grid peg and involved digging a hole with a pick, removing the organic rich A-horizon and collecting approximately 500g of sample from the nominal B horizon. The samples were placed in ziplock plastic bags and once returned to the field office the bags were stored open to prevent anaerobic reactions. When a batch of 200 samples was collected, the sample bags were sealed and the samples despatched to Amdel in South Australia for analysis by partial leach technique DL42. Elements determined were Ag, As, Au, Ba, Bi, Cd, Cu, Co, Mo, Ni, Pb, Ni, Y, Zn, Zr and the rare earth elements Ce, Eu, Gd, La and Sm. The pH of the leachate, after digestion, was also determined.

Three duplicate and two standard samples were collected per 100 samples. The field duplicates were also analysed in duplicate to allow assessment of both the sample and laboratory variance. Additionally at each sample site a small amount of soil was collected and stored in a chip tray for reference and to allow soil colour to be recorded. Soil colour was assigned from a Munsell Colour chart with 19 colours.

The 373 samples (including duplicates and standards) from this program were analysed as part of two batches (SDS 4538 and 4539).

Prior to plotting the entire dataset over the Boco Plains was reviewed and those samples most likely contaminated by windblown material from the Emu Bay

Railway (used to haul concentrates) were identified. Fifteen 'contaminated' samples, with Pb contents of up to 388 ppm, were deleted from the dataset. Additionally, 17 samples, 4.5% of the data set, have a low (pH<8.0) post-digest pH. At these 'low' pHs the speciation of reagents in DL42 may change and the resulting assays may be unreliable. Many of the low-pH samples had high Pb and Zn results that could be important in the interpretation of the dataset. However, Test work at Amdel indicated that decreasing the sample:liquid from 10:1 (method DL42) to 5:1 (method DL43) could buffer the solution to a higher, acceptable, final pH (for samples with a post-digest pH of >7.2) and not significantly affect the precision of the analysis. Accordingly, the 17 samples with low post-digest pH were re-assayed with the new protocol. Of the low pH samples all had DL43 post-digest pH's of >8.0. In the preliminary interpretation discussed below the low (pH <8.0) samples from the original dataset have had their assay results replaced by the re-assayed data.

Assay results are presented in Appendices 1 and 2 and sample locations are shown on Plan 1. The entire Boco dataset (some 1907 samples, including duplicates) has been plotted as a series of images (Figures 3 to 10). The raw data has been used to prepare these figures, however, images were also prepared using response ratios (value/median for each element) levelling by colour-group and also by SDS (both using the median value for each element). These images did not show anything additional to the raw data and have not been included.

Interpretation of the data is largely as per McNeill (2003) with the distribution of anomalous metals, particularly the highly mobile Zn, on the Boco Plains area suggestive of dispersion from an anthropogenic source (the Boco Siding area) along the locally north flowing drainage (note that samples the slight 'hill' between the two creek systems are generally non-anomalous for Pb, Bi, Ba, As and Zn, whereas the lower lying areas are anomalous in these elements).

## **6.2 Soil pH measurements**

Recently published studies (e.g., Smee, 1999 and 2003) have shown that direct determinations of soil pH may be a useful indicator of buried sulphide mineralisation. Previous sampling had located a subtle anomaly over the Rosebery orebody and it was therefore decided to commence routine soil pH determination to further assess the usefulness of this method. To this end a teaspoon sized sub-sample of each soil sample collected during the current year was mixed with 50ml of distilled water for 2 minutes and the pH of this mixture determined using a pHscan WP2 meter calibrated at pH 4, 7 and 10 and with a resolution of 0.1 pH. Results are included in Appendix 2 and are shown on Figure 12. No significant pH lows are recorded.

Of ten check sample pairs measured, six had results within the 0.1 pH resolution of the meter, with a maximum difference between check samples of 0.5 pH units. Similarly pH measurements on the two standards used (PXTAS1A and PXTAS2) yielded a range of values, from 4.9 to 5.4 for PXTAS2, larger than the precision of

the probe. Tests (on samples from EL 30/2000 – to be reported in full in the annual report for that tenement) have indicated improved precision can be obtained using more rigorous quality control than used for the measurements reported here.

Additionally to increase the size of the sample set without having to re-sample the grid the potential for using stored chip-tray sub-sample is being investigated. Results from the Rosebery Mine Lease (to be reported in detail elsewhere) indicate that the stored samples in general have lower pH's, possibly a result of bacterial action and(or) oxidation. These effects are being assessed in more detail prior to a decision on re-sampling.

### **6.3 Geological Mapping**

Geological mapping was completed over the infill lines west of Boco Plains and north of Sawmill Creek. An outcrop map is presented as Plan 2 and an updated interpretation is included as Plan 3. No significant alteration or mineralisation was located during the reporting period. No significant changes to structural or stratigraphic interpretations were required.

## **7. CONCLUSIONS & RECOMMENDATIONS**

A program of partial leach soil geochemistry and geological mapping to explore the 9.6 km long, north east striking, contact between the Central Volcanic Complex and Southwell sub-group correlates, was completed during the fourth year of tenure of EL 4/2000. During the reporting period 2.5 line km of grid was cut, geologically mapped and surveyed with DGPS. This grid and 6.6 line km of uncut lines (located by DGPS) on the Boco Plains were soil sampled (373 samples including duplicates and standards submitted for analysis) analysed by partial leach methods and had their pH determined. This work did not locate any significant new anomalies that were not potentially the result of anthropogenic contamination.

Two significant partial leach soil anomalies remain untested:

#### *1. Hollway.*

This prospect was originally defined by a linear A0 and C Horizon total digest soil geochemical anomaly (to 1800 ppm Pb, 3600 ppm Zn and 115 ppm Cu) coincident with an IP resistivity low at the base of the Hollway Andesite (Anderson, 1982b). The anomaly was tested by a 178m drill hole (EAB4) that intersected minor sphalerite and galena (<1% Pb+Zn) in veins. No downhole geophysics were done in EAB4 and the UTEM survey completed in 1988 (Anon, 1988) did not locate any significant conductors (Silic in McNeill, 2001).

The linear, 700m long, Cu, Pb, Bi As +/- Zn Partial leach soil anomaly described by Simpson and McNeill (2001) appears to occur to the north of the total digest soil anomaly and EAB4 appears to have been collared in the middle of this feature. The lack of an EM response may be seen to downgrade this target, however, if any mineralisation

is poorly electrically connected, or of Que River size and at depth of >150m then it may not have been detectable. It is therefore recommended that the apex of the anomaly be tested at a depth of 200-250m below surface (i.e., below the collar of EAB4).

During this review it was recognised that the potential SW extension of the anomaly, along the andesite-CVC contact, has not been tested by Partial Leach soil geochemistry. It is therefore recommended that 4.85 line km of gridding, partial leach soil sampling and geological mapping be completed to test the potential strike extension.

## 2. *Sawmill Creek Track.*

The Sawmill Creek Track soil anomaly, a 900-1200m long linear feature sub parallel to an un-named creek, is defined by elevated (generally >5 x background [bg] and up to 20 x bg) As, Ag, Bi, Cu, Pb and Zn in partial leach soil samples. Total digest analysis of samples from two lines over the anomaly indicated low level anomalism of Pb, Zn and As, and a ground EM survey failed to locate any significant conductors (McNeill, 2003). However, as discussed above it is possible that certain targets may not have been detectable with EM. The presence of a soil anomaly at the interpreted host position (top of the CVC) make the anomaly attractive enough to warrant drill testing and it is therefore recommended that the apex of the anomaly be tested at a depth of 200-250m below surface.

Therefore, the major recommendations resulting from this years work are to:

- Complete 4.85 line km of gridding, partial leach soil sampling and geological mapping to test the potential strike extension of the Hollway PL soil anomaly.
- Drill test the Sawmill Creek and Hollway Partial Leach soil anomalies with approximately 1000m of diamond drilling.

A decision on further work will be based on the results of this program.

## 8. EXPENDITURE

Total expenditure for all work undertaken by Zinifex Rosebery Mine within Bulgobac EL 4/2000, for the period ending 1<sup>st</sup> May 2004 was **\$35,779**. A detailed expenditure statement is given below.

Personnel	\$11,269
Travel & Accommodation	\$0
Geoscience Consultants	\$0
Geophysics	\$0
Geochemical/Assays	\$11,269
Diamond Drilling	\$0
Other Contractors	\$12,231
Stores & Supplies	\$245
Vehicles, Plant & Maintenance	\$579
Land & Environment	\$1,114
Computing	\$1,749
Depreciation, Office, Sundry	\$329
Administration Fee 10%	\$3,250
<b>Total</b>	<b>\$35,779</b>

## 9. KEYWORDS & LOCALITY

### Keywords

Hollway Andesite, Boco Alteration Zone, geology, Partial Leach soil geochemistry, line cutting, geological mapping.

### Locality

1:250,000      BURNIE SK55-3  
1:100,000      SOPHIA 8014  
1:25,000      PARSONS 3638; BLOCK 3838

## 10. REFERENCES

- Anderson, B.E., 1982a. Progress report on Chester-Pinnacles EL 5/63 Part 4. Unpub. Comstaff Pty. Ltd. Report (**TCR83-1903**).
- Anderson, B.E., 1982b. East Chester drill hole proposals. Unpub. Comstaff Pty. Ltd. Memo.
- Anon, 1986. EL 5/63, Comstaff JV, NW Tasmania. Report for the Year ended 30 June 1987. Unpub. BHP Pty Ltd. Report (**TCR86-2571**).
- Anon, 1987. EL 5/63, Comstaff JV, NW Tasmania. Report for the Year ended 30 June 1987. Unpub. BHP Pty Ltd. Report (**TCR87-2690**).
- Anon, 1988. EL 5/63, Comstaff JV, NW Tasmania. Final report on the relinquished area: results of exploration for 1987-1988 and a summary of activities for the period 1963-1988. Unpub. BHP Pty Ltd. Report (**TCR88-2815**).
- Augustinius, P.C., and Nichol, S., 1999. Ground-penetrating radar imaging of Pleistocene sediments, Boco Plain, Western Tasmania. *Aust. J. Earth Sci.* 46:275-282.
- Barton, C.M., Burns, K.L., Gee, R.D., et al., 1966. Mackintosh. Geological Atlas 1 mile series sheet no. 44. Geological Survey of Tasmania, Hobart.
- Beamish, B.B., 1978. Geochemical dispersion patterns in the Pinnacles-Boco area, Western Tasmania. Unpub. BSc (Hons) thesis, University of Tasmania, Hobart.
- Brown, A.V., 1986. Geology of the Dundas-Mt Lindsay Mt Youngbuck Region. *Geology Survey Tasmania Bull.* 6.
- Butt, G., Hansen, J., and Finney, W., 1975. Interpretation report Airborne Electromagnetic (INPUT) survey of the Comstaff South leases, Australia. Unpub. Geotrex report to Comstaff Pty Ltd. (**TCR 85-2397**).
- Collins, P.L.F., 1981. The Mount Read Volcanics and Associated rocks in the Pinnacles – Que River area. *In* Collins, P.L.F., Guilline, A.B., and Williams, E. Geological Survey Explanatory Report, Geological Atlas 1 Mile Series, Zone 7 Sheet 44, Mackintosh. Tasmania Department of Mines, Hobart.
- Corbett, K.D., and McNeill, A.W., 1986. Geology of the Rosebery – Mt Block area. MRVP Map 2. Mineral Resources Tasmania.
- Coutts, B.P., 1990. The geology, geochemistry and hydrothermal alteration of the Hollway Andesite, Western Tasmania. Unpub. BSc (Hons) thesis, University of Tasmania, Hobart.
- Crawford, A.J., and Berry, R.F., 1992. Tectonic Implications of the Late Proterozoic - Early Palaeozoic Igneous Rock Associations in Western Tasmania. *Tectonophysics*, 214:37-56.

- Dvorak, Z., 1983. DIGHEM III survey of the East Chester, North Pieman and Arthur River Areas, Tasmania. Unpubl. DIGHEM Ltd report for Comstaff Pty (**TCR84-2129**).
- Elliston, A., 1998a. Annual Report, Tasmanian Base Metals Project, EL 47/96, Boco Siding/North Pinnacles. Unpub. RGC Exploration report (**TCR98-4133**).
- Elliston, A., 1998b. Relinquishment Report, Tasmanian Base Metals Project, EL 47/96, Boco Siding/North Pinnacles. Unpub. RGC Exploration report (**TCR98-4196**).
- Hall, D.B., 1978. Report on Exploration in EL 5/63, Part 4, in Tasmania, Australia. Unpub. Comstaff Pty Ltd. Report (**TCR85-2439**).
- Hall, D.B., 1979. Report on work completed on EAA grid Extensions (EL 5/63 Part 4). Unpub. Comstaff Pty. Ltd. Report (**TCR79-1359**).
- Hall, D.B., and Pigott, G.F., 1980. East Chester EAB Grid exploration report for 1980, EL 5/63, Section 4. Unpub. Comstaff Pty Ltd. Report (**TCR80-1413**).
- Hanson, N.H., 1977. Report on exploration undertaken in the Bulgobac Exploration Licence 12/72. Unpub. EZ Co. Report No. 128 (**TCR77-1237**).
- Howland-Rose, A.W., 1989. Final Report on EL 17/88, Que River, West Coast Tasmania on relinquishment by Samisen Pty Ltd. Unpub. Report (**TCR89-3017**).
- Keele, R.A., 1991. The Zeehan - Red Hills - Lake Selina Traverse - A Domain Approach to the Analysis of Structural Data. CODES: AMIRA Project P291 - Structure and Mineralisation in Western Tasmania. November 1991.
- Kirsner, L.W., 1992a. EL44/88 Burns Peak Annual report for the period November 1991 - October 1992. Unpub. Pasminco Exploration Report T92-15 (**TCR92-3406**).
- Kirsner, L.W., 1992b. EL2/90 Boco and EL 8/90 North Pinnacles Exploration report for the period 11<sup>th</sup> October 1990 – 29<sup>th</sup> February 1992. Unpub. Pasminco Exploration Report T92-3 (**TCR92-3343**).
- Kirsner, L.W., Lorrigan, A.N., and Rae, H.C., 1991. EL44/88 Burns Peak Annual report for period November 1990 - October 1991. Unpub. Pasminco Exploration Report T91-13 (**TCR91-3310**).
- Leaman, D.E., 1992. North Pinnacles area, Western Tasmania, 1991-1992 Gravity surveys acquisition report for Pasminco Exploration. Unpub. Leaman Geophysics report (**TCR 92-3343C**).
- Lorrigan, A.N., 1990. EL44/88 Burns Peak Annual Report for the period November 1989 - October 1990. Unpub. Pasminco Exploration Report T90-1 (**TCR90-3203**).
- McKibben, J.A.J., 1993. The geology and geochemistry of the North Pinnacles Ridge, western Tasmania. Unpub. BSc (Hons) thesis, University of Tasmania, Hobart.

- McNeill, A.W., 2002. Bulgobac (Boco Siding) EL 4/2000, Annual Report for the period to 16<sup>th</sup> May 2002. Unpub. Pasminco Exploration Report BH77.
- McNeill, A.W., 2003. Bulgobac (Boco Siding) EL 4/2000, Annual Report for the period to 16<sup>th</sup> May 2003. Unpub. Pasminco Exploration Report BH80.
- Mill, J.H.A., 1978. Bulgobac River Exploration licence EL 12/72, progress report on activity October 1977 – October 1978. Unpub. EZ Co. Report No. 129 (**TCR78-1310**).
- Mill, J.H.A., 1979. Bulgobac River Exploration licence EL 12/72, progress report on activity October 1978 – October 1979. Unpub. EZ Co. Report No. 130 (**TCR79-1401**).
- Mill, J.H.A., 1981. Bulgobac River Exploration licence EL 12/72, progress report on activity July 1980 – June 1981. Unpub. EZ Co. Report No. 137 (**TCR82-1737**).
- Murphy, F.C., and Denwer, K.P., 1998. Burns Peak EL 44/88, Partial Relinquishment Report, November 1998. Unpub. Pasminco Exploration Report VC217 (**TCR98-4246**).
- Poltock, R.A., Kirsner, L.W., and Saxon, M.S., 1993. Burns Peak Annual Report for the Period November 1992 - October 1993. Unpub. Pasminco Exploration Report T93-16 (**TCR93-3523**).
- Poltock, R.A., and Saxon, M.S., 1994. Burns Peak Annual Report for the Period November 1993 - October 1994. Unpub. Pasminco Exploration Report T94-13 (**TCR94-3654**).
- Quayle, P.M. and Dibben, .S.M., 1996. Burns Peak EL 44/88 Joint Venture Annual Report, Period Ending October 1996. Unpub. Pasminco Exploration Report TA-30 (**TCR96-3945**).
- Randell, J.P., 1991. EL 2/90 Boco, exploration report for the period 20/4/90 to 10/10/90. Unpub. Billiton Australia report (**TCR91-3245**).
- Reid, R.O., 1990. The geology of the Burns Peak – Boco Road Area. Unpub. BSc (Hons) thesis, University of Tasmania, Hobart.
- Rosenhain, A.N. and Mathison, I.J., November 1989. EL44/88 Burns Peak. Annual Report on Exploration Activity. January 1989 - October 1989 (**TCR89-3059**).
- Sainty, R.A., 1982. Exploration Licence No. 12/72 Bulgobac, progress report on exploration activity 16<sup>th</sup> December, 1981 to 4<sup>th</sup> May, 1982. Unpub. EZ Co. Report No. 149 (**TCR82-1842**).
- Sainty, R.A., 1983a. Exploration Licence No. 12/72 Bulgobac, progress report on exploration activity 21<sup>st</sup> November 1982 to 3<sup>rd</sup> May 1983. Unpub. EZ Co. Report No. 165MD (**TCR83-2005**).
- Sainty, R.A., 1983b. Exploration Licence No. 12/72 Bulgobac, progress report on exploration activity 4<sup>th</sup> May, 1983 to 15<sup>th</sup> November, 1983. Unpub. EZ Co.

- Report No. T174MD (**TCR83-2069**).
- Sainty, R.A., 1984a. EL 12/72 progress report on exploration activity 30<sup>th</sup> May to 13<sup>th</sup> November, 1984. Unpub. EZ Co. Report No. 179 (**TCR84-2296a**).
- Sainty, R.A., 1984b. EL 12/72 progress report on exploration activity 16<sup>th</sup> November 1983 to 29<sup>th</sup> May, 1984. Unpub. EZ Co. Report No. 194 (**TCR84-2296c**).
- Sainty R.A., and McDonald, I.R., 1982a. EL 12/72 progress report on exploration activity 16<sup>th</sup> December, 1981 to 4<sup>th</sup> May, 1982. Unpub. EZ Co. Report No. 149 (**TCR82-1842**).
- Sainty R.A., and McDonald, I.R., 1982b. EL 12/72 progress report on exploration activity 5<sup>th</sup> May to 24<sup>th</sup> August, 1982. Unpub. EZ Co. Report No. 153 (**TCR82-1843**).
- Saxon, M.S., 1995. Burns Peak Annual Report for the period November 1994 - October 1995. Unpub. Pasminco Exploration Report T95-19 (**TCR95-3803**).
- Shaw, R.W.L., 1983. Report to the Mines Department of Tasmania for the period 1 January to 30 June 1983. Summary of work completed, in progress and proposed for EL 5/63. Unpub. Comstaff Pty. Ltd. Report (**TCR83-1983**).
- Simpson, K.L., and McNeill, A.W., 2001. Bulgobac (Boco Siding) EL 4/2000, Annual Report for the period to 16<sup>th</sup> May 2001. Unpub. Pasminco Exploration Report ML975.
- Smee, B.W., 1999. The effect of soil; composition on weak leach solution pH: a potential exploration tool in arid environments. *Explore* 102:4-7.
- Smee, B.W., 2003. Theory behind the use of soil pH measurements as an inexpensive guide to buried mineralisation, with examples. *Explore* 118:1-19.
- Taylor, S., 1987. Exploration Licence 12/72 Bulgobac. Final report on the relinquished area, covering Pancontinental's exploration from October 1986 to December 1987 and a summary of exploration in the 1976-1987 period. Unpub. EZ Co. report (**TCR87-2740**).
- Trussell, D.B., 1984. Interpretation of the Chester Area DIGHEM survey. Unpub. Comstaff report (**TCR84-2131**).
- Weber, G.B., Dibben, S.M and Murphy, F.C., 1997. Burns Peak EL 44/88, Joint Venture Annual Report for the Period Ending October 1997. Unpub. Pasminco exploration Report VC 188 (**TCR97-4085**).
- Williams, R.E., 1985. Diamond drilling of the Boco Prospect, EL 12/72 (Bulgobac), Tasmania. Unpub CSR Ltd Mineral development and exploration Group Report No. EMR 112/85 (**TCR85-2508**).