

**EL 14/2001 - HEAZLEWOOD AREA**

**ANNUAL REPORT**

**Year Ending August 2004**

**Prepared for:**

***Allegiance Mining NL  
Level 11, Shaw House  
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**15 August 2004**



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## **1. EXPLORATION PHILOSOPHY and STRATEGY**

Exploration Licence 14/2001 is considered prospective for nickel skarn deposits formed when the Meredith Granite intruded and altered the Mt Stewart-Heazlewood ultramafic complex.

Only those altered ultramafics underlain by the Meredith Granite at depths of less than four kilometres are considered prospective from a commercial point of view.

In addition to nickel skarn deposits, the Jasper Mine area is interpreted as having potential for copper-gold deposits in Cambrian basaltic rocks.

A three-stage strategy has been developed to explore for nickel skarn deposits:

- high resolution airmag surveys
- ground mapping and lithogeochemical sampling
- drilling

## **2. WORK COMPLETED 2003-04**

During the 2003-04 summer a high resolution airmag survey was completed over the whole licence area. Results of this survey are appended.

Important features to emerge from this survey were:

- strong magnetic features in the Duffs Hill-Jasper area associated with magnetic lows which may suggest the granite is shallower in this area than previously interpreted from sparse gravity data.
- strong magnetic anomalies south of New Jasper, associated with the Mt Stewart linear and other north-west trending structures

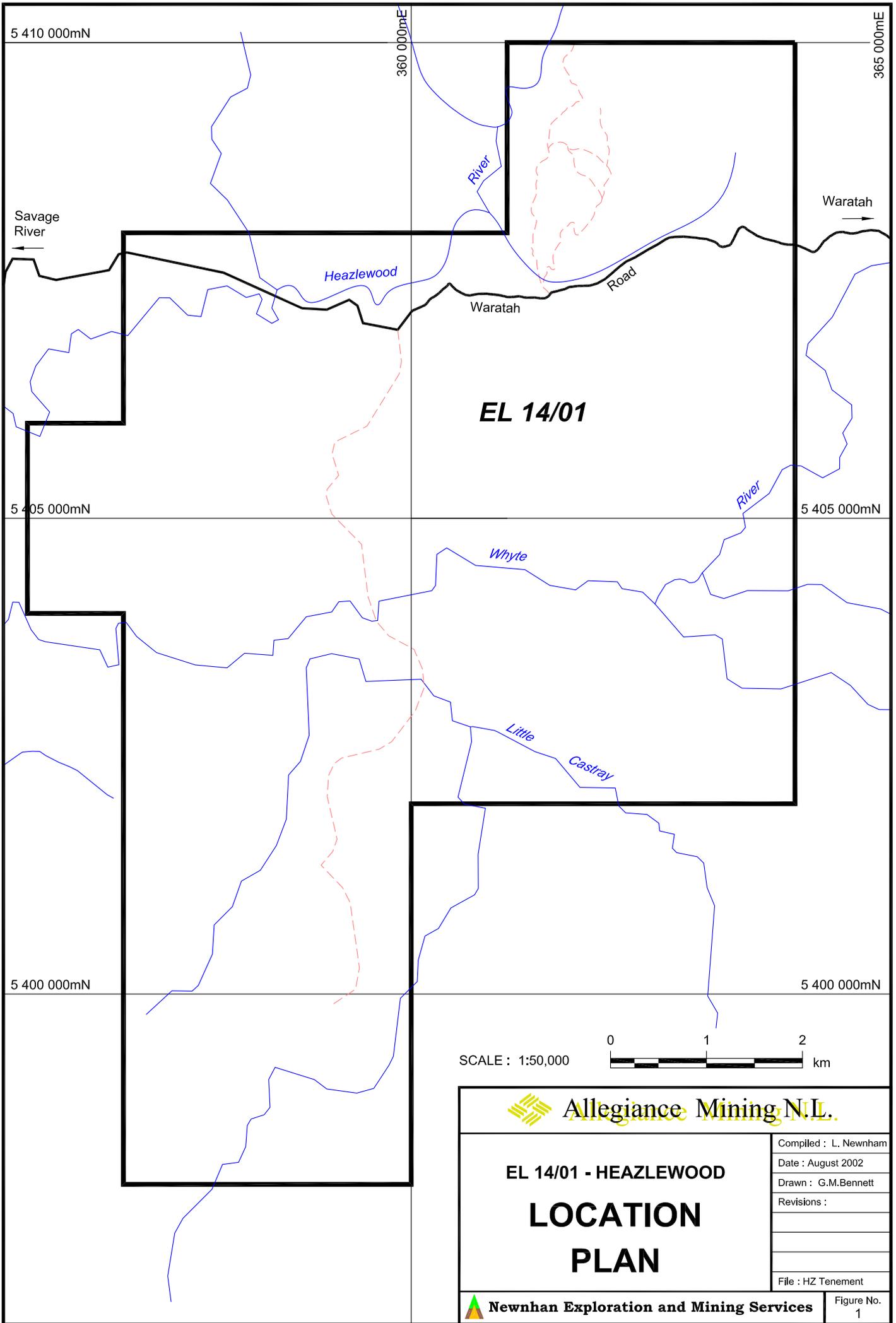
Expenditure in the 12-month period was \$42,931.

### **3. WORK PLANNED 2004-05**

In summer 2004-05, it is planned to complete ground mapping and sampling of several of the airmag anomalous areas in the Jasper area and the area south of Jasper.

Because of its remote nature, this program may require logistical support by helicopter.

Budget for this work is \$75,000.



**EL 14/01**

SCALE : 1:50,000



 **Allegiance Mining N.L.**

**EL 14/01 - HEAZLEWOOD  
LOCATION  
PLAN**

Compiled : L. Newnham
Date : August 2002
Drawn : G.M.Bennett
Revisions :
File : HZ Tenement

## **Appendix**

### ***Aeromagnetic Report***

**Allegiance Metals P/L**

**Helimag Survey in  
Western Tasmania**

**by  
Fugro Airborne Surveys**



**Quality Control Report  
and  
Preliminary Interpretation  
by  
Steve Webster P/L  
February, 2004**

## **1 Introduction**

An airborne magnetic and radiometric survey was conducted over the three areas in western Tasmania during January, 2004. The survey was contracted by Allegiance Metals P/L to **Fugro Airborne Surveys** (Fugro) and utilised a Jet Ranger helicopter, provided by **HeliAust Pty. Ltd.** from its Sydney base. The contract was prepared and supervised with quality control by Steve Webster P/L.

An **Operations and Processing Report** has been prepared by Fugro to outline the procedures taken to complete the project.

This report, by Steve Webster P/L, provides additional technical information on:

- i) equipment installation, operations and contract performance
- ii) certain processing procedures needed to enhance the data and map presentation
- iii) a preliminary interpretation of the results to verify that the data sets will meet the Allegiance Metals objectives to assist geological mapping and define exploration targets.

The survey areas are located in the west of Tasmania, as shown in figure 1. The survey flight plans are shown in figures 2 a-c, with East – West flight lines spaced 50m apart and North – South tie lines spaced 500m apart, except for the Zeehan/Trial Harbour area where lines are orthogonal to the above.

## **2 Survey progress**

The survey areas are located in the West Coast district of Tasmania, Figure 1. The actual helicopter flight plans are shown in figures 2 a-c, with East - West flight lines spaced 50m apart for the **Renison East** and **Heazlewood** areas and North - South tie lines spaced 500m apart. For the **Zeehan-Trial Harbour** area the flight lines are oriented North – South at 50m spacing and tie lines flown East – West.

The survey equipment was installed at Sydney in the HeliAust Jet Ranger III aircraft in January, 2004. The magnetometer was in located in a stinger (as shown in accompanying photographs) mounted in the front of the helicopter to remove it as much as possible from the magnetic effects of the aircraft. These effects were further reduced by calibrations that allow real-time computations of the magnetic effects of aircraft maneuvers—described in the following section 3a.

The aircraft and crew mobilised to Tasmania on 13<sup>th</sup> January, 2004. The survey statistics, as itemised in the accompanying table 1, show that the progress of the survey included 8 production days (~3 – 6 hours/day) and 2 days were lost due to bad weather, Figure 2d. Aircraft maintenance problems were fixed in Hobart on 17 & 18th January and 2.5 days were lost due to these problems. Thus in operation mode the survey averaged 360 km per production day.

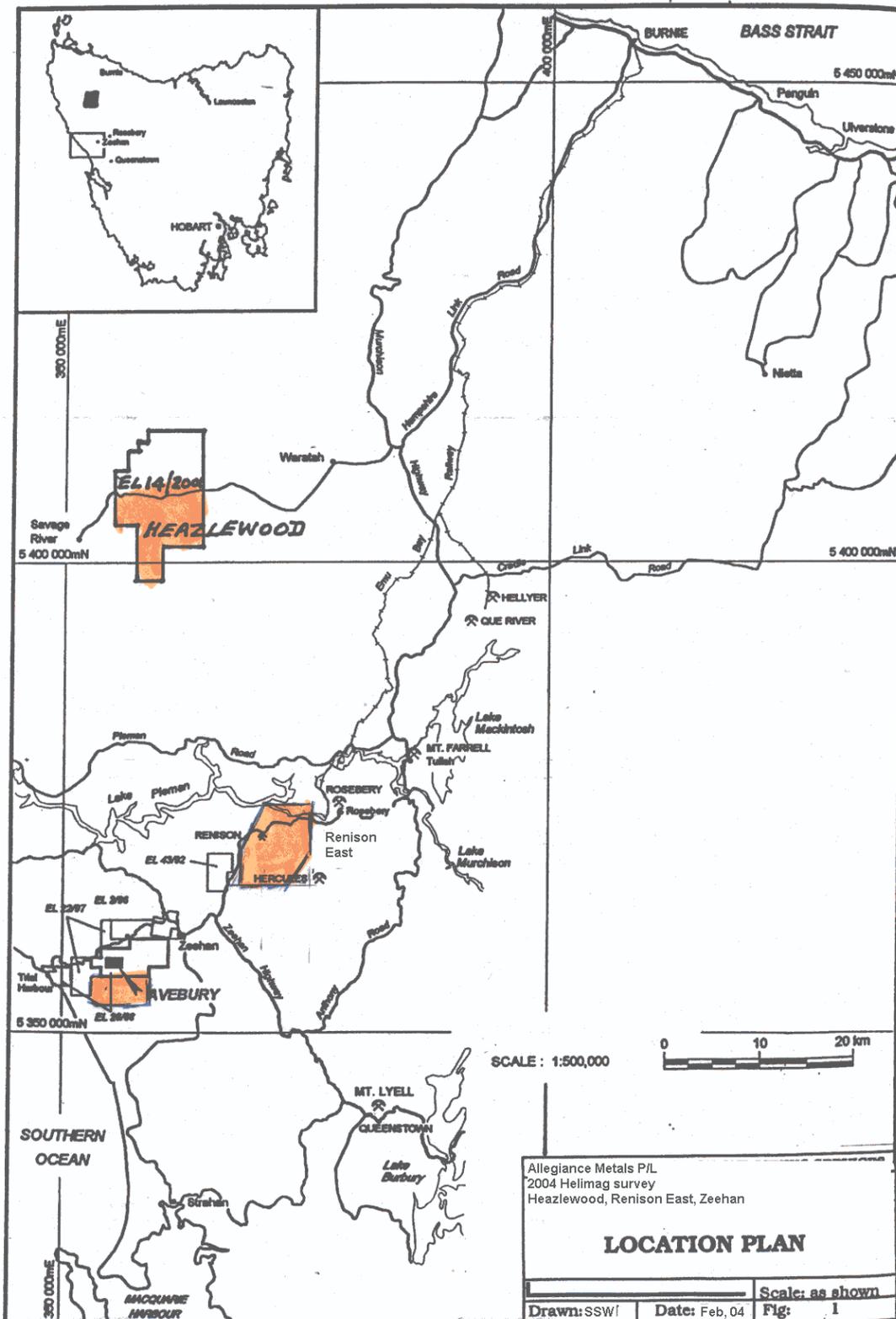
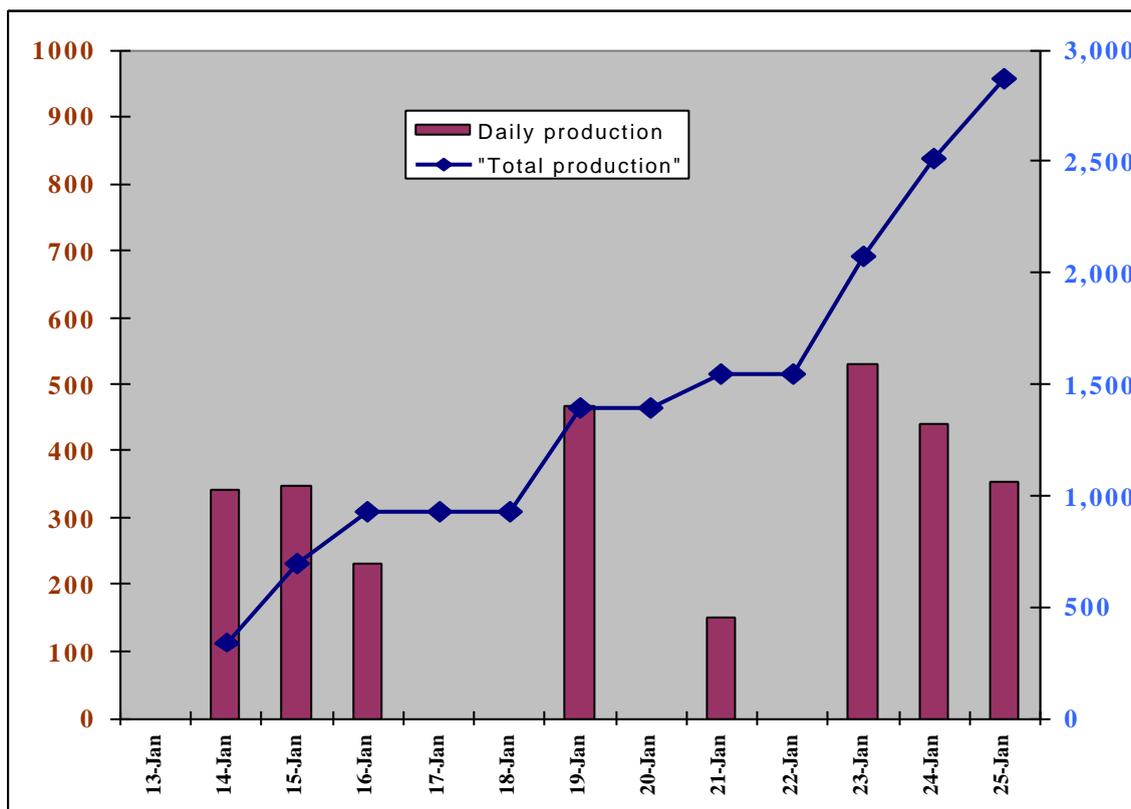


Figure 1. Location map of 2004 Helimag survey areas

Date	Flights	hours	Km. flown	total flown	Km remaining	Comments
13-Jan	1	1.4			2870	mob & calibrations
14-Jan	2,3 & 4	5.1	344	344	2526	
15-Jan	5,6 & 7	6.2	349	693	2177	
16-Jan	8	3.4	233	926	1944	
17-Jan				926	1944	helicopter repairs
18-Jan				926	1944	helicopter repairs
19-Jan	9 & 10	6.5	466	1392	1478	
20-Jan	11	0	0	1392	1478	weather
21-Jan	12	2.9	150	1542	1328	
22-Jan		0	0	1542	1328	repairs & weather
23-Jan	13 & 14	7.0	529	2071	809	
24-Jan	15 & 16	6.0	439	2518	352	
25-Jan	17	5.4	352	2870	0	

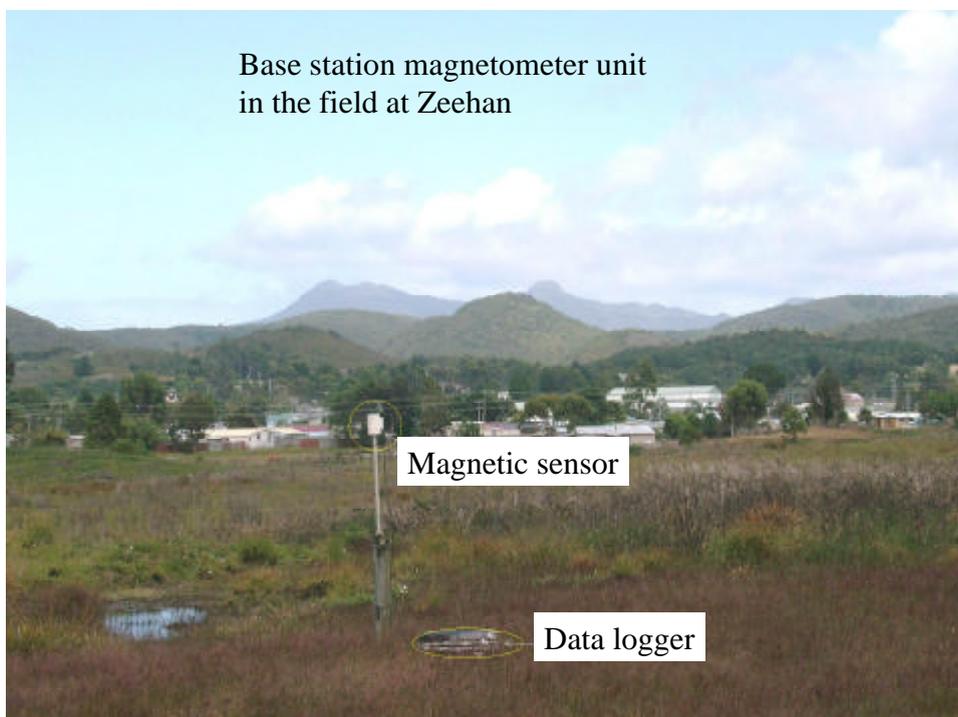
**Table 1.** 2004 survey operation statistics



**Figure 2d.** Graph of daily and cumulative flight production



**Figure 3a** Helicopter with stinger instrument mount



**Figure 3b** Base station magnetometer



**Figure 3c Helimag data acquisition unit**

Console of Fugro AS data acquisition system to record magnetic and GPS survey data. The compact unit is mounted behind the pilot's seat.

### **3 QUALITY CONTROL**

#### **a) Survey Aircraft Figure-of-Merit (FOM)**

The only quantitative parameter utilised in airborne magnetic surveys as an estimate of survey data quality is the Figure of Merit (**FOM**). This parameter is an estimate of the compensation required to correct the airborne magnetic measurement for the effects induced by the aircraft manoeuvres as it acquires data.

The procedure to compute this parameter is described by Ward & Hood (1969) as follows:

“It is necessary to carry out a series of pitches and rolls of the aircraft in low gradient areas in order to separate the effects of the various components. The excellence of compensation of a given aircraft is measured by its *figure of merit*. This index is obtained by summing the amplitudes of the 12 magnetic anomalies recorded when the aircraft carries out 20° rolls, 10° pitches and 10° yaws peak-to-peak on N, E, S, and W headings.”

There is not a number cited in the literature as an absolute standard for this parameter and *quality control experts* variably quote a number from 1.2nT to 2.4nT.

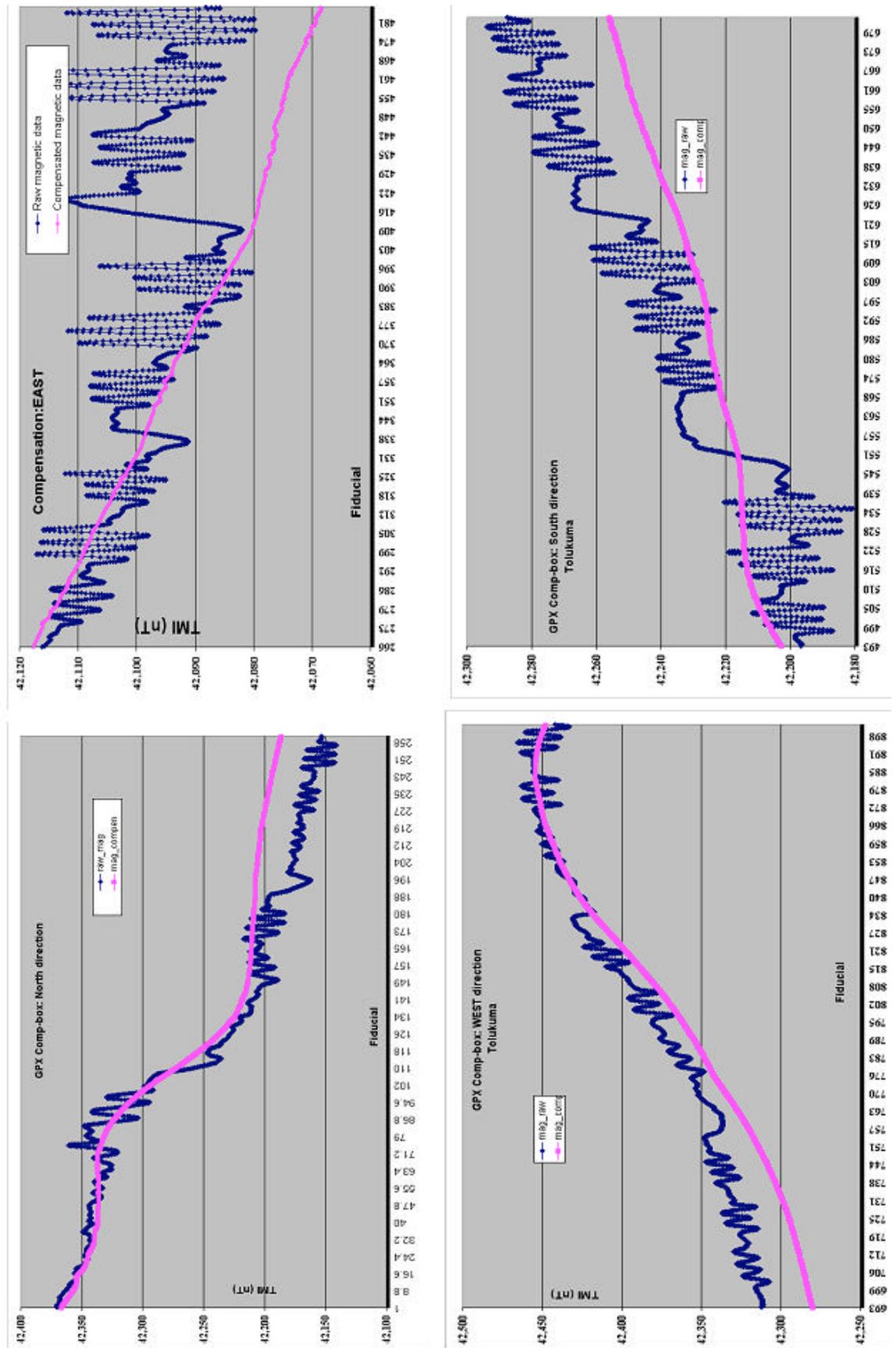
Fugro AS has a standard procedure, termed a ‘*compensation box*’, to estimate **FOM** and this requires the aircraft to be put through a set of 5 pitches (of 10° to 20°), 5 rolls (up to 10°) and 5 yaws along line and 5° and 10° from both sides of line direction. Thus five sets of readings are averaged for each manoeuvre in the four principal directions. For the **Allegiance Metals** project, the FOM determination was made at the start of the flying programme and the FOM value was less than 1nT.

The original FOM procedure was designed for regional and petroleum surveys where the magnetic data were to be used for mapping basement geology and required the effects of surface and shallow geology to be effectively eliminated. Thus the surveys were flown at relatively high altitude (in excess of 1,000 feet) and wide line spacing (equal to depth-to-basement) and the FOM was a measure of compensation to low frequency responses.

Modern surveys for mineral exploration, however, are designed to measure a wide range of responses from shallow sources through to basement and a new parameter needs to be introduced to quantify the compensation of high frequency anomalies. The standard ‘comp. box’ data can be analysed to derive the high frequency component of the manoeuvre noise and the reduction obtained by compensation. The data are high-pass filtered to remove the geology derived signal and the noise level is then computed by rms analysis.

For the Allegiance survey data, the averaged ‘raw’ FOM value is 0.82nT and compensated (average) FOM is 0.045nT. The absolute value of ‘raw’ FOM of less than 1nT is encouraging, but the noise reduction factor of 15 to 20 times reduction to less than 0.1nT is significant. To maintain this accuracy, for final corrected data, requires low noise levels in the raw magnetic data and high compensation parameters to reduce the noise to much less than the minimal anomaly signal.

Tolukuma, 2003: airborne geophysical survey  
 magnetic compensation tests by GPX Airborne Surveys



#### **4 Additional Processing--Reduction to Pole**

Magnetic anomalies can vary considerably in pattern depending on several factors, including:

- i) inclination of the inducing Magnetic Field vector, which changes with latitude
- ii) the presence and attitude of any **magnetic Remanence** component
- iii) strike and dip of the magnetic source material.

The inclination of the earth's magnetic field varies from vertical at the poles to horizontal at the equator. As shown in the sketch, the lines of (Primary Field) force may be assumed to intersect the susceptible body at the angle of inclination and polarise the source to generate a secondary magnetic field. This secondary field will either add to or subtract from the Primary Field producing an anomaly that is measured by the magnetometer in the aircraft.

The resulting anomaly patterns for a symmetrical body may be grouped into three types, as shown in the accompanying sketch:

**Polar:** with vertical inclination, the secondary field will be adding to the primary field over the source and subtracting from the primary only at some distance from the source. Thus the pattern is for a strong ***positive anomaly over the source*** with a weak flanking negative aureole.

**Equatorial:** with a horizontal primary field the pattern will be reversed as the secondary field will add to the primary ***over the source giving a negative anomaly*** with a flanking positive aureole.

**Mid-latitude:** for other latitudes the primary field will be intersecting the polarisable body at an angle giving rise to an asymmetric secondary field that will be mainly positive at steep inclinations and mainly negative at shallow inclinations. The positive and negative pattern is termed a dipolar anomaly.

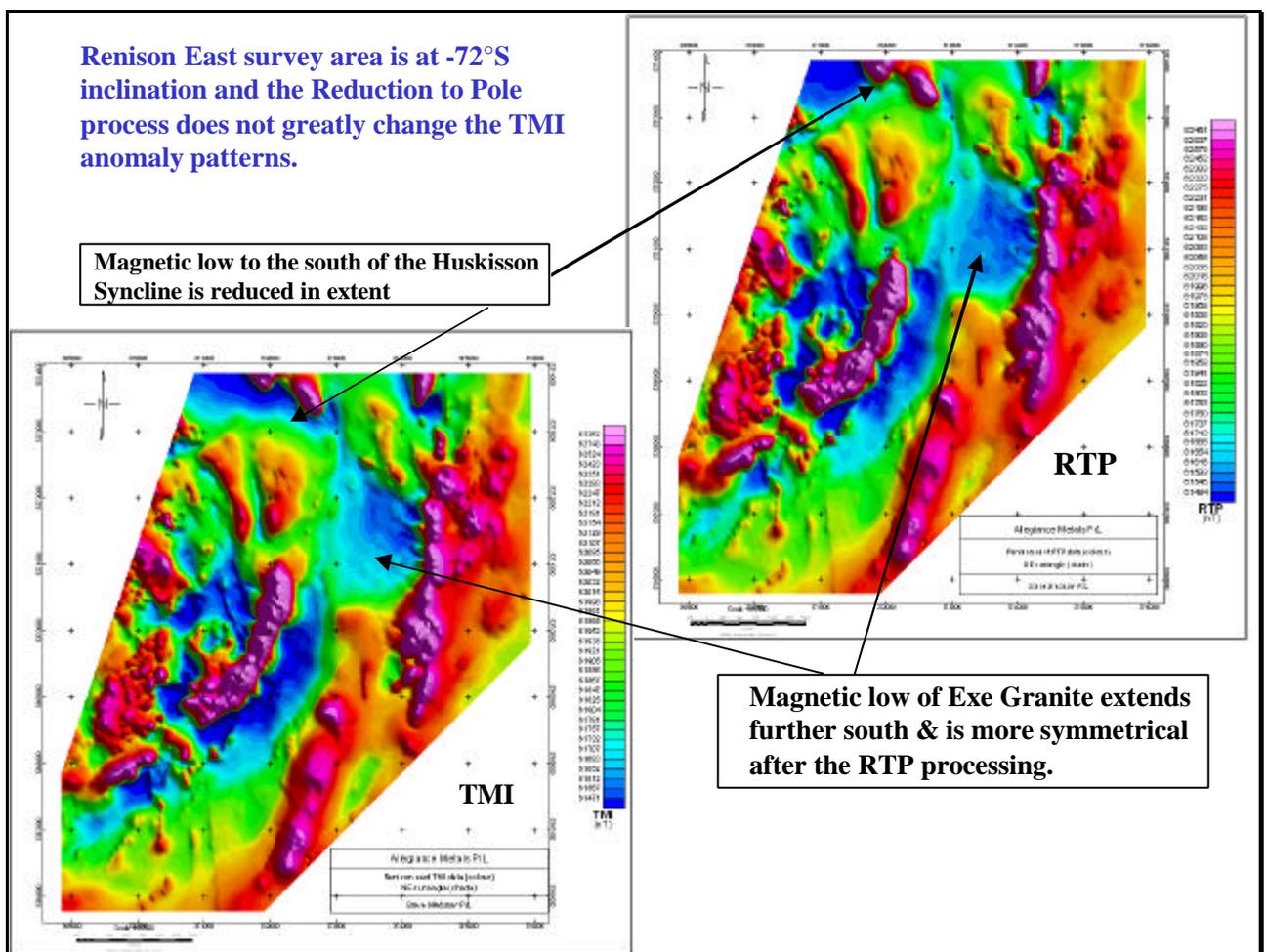
The *reduction to pole* technique is a filtering procedure that recomputes the observed data set to that which would have been observed if the inclination were vertical, ie at the pole. The result is to remove the negative component of the anomaly and re-locate the positive peak to a position over the source with a symmetrical shape. The RTP data set should be easier to interpret as the patterns are less complicated and superimposed anomaly patterns, ie shallow upon deep sources, more easily separated.

In the attached figure 3, showing part of the TMI and RTP data for western Tasmania (**inclination = -72° S**), there are two anomaly patterns that illustrate the benefit of the procedure:

**Anomaly one** is located to the east of Renison, and the anomaly pattern is a magnetic 'low' due to the Exe Granite. The RTP process results in the 'low' shifting to the south and becoming more symmetrical—typical of a non-magnetic granite signature.

**Anomaly two** shows the dipolar anomaly on the western side of the Huskisson Syncline, with the negative components in the TMI image changing shape but still present to indicate a dip to the north.

If there is a remanent component in the magnetic anomaly pattern then the RTP process will not totally remove the dipole pattern and an asymmetric anomaly will still be evident. There are several anomalous zones in the RTP data set that have residual dipole patterns. A strong 'negative' anomaly pattern is observed over the interpreted extent of the Pine Hill Granite and this 'low' is stronger than would be expected for the presence of non-magnetic granite. It is proposed that this intrusive has re-set remanent magnetism in the vicinity and increased the amplitude of the negative anomaly.



**Figure 4. Comparison between Total Magnetic Intensity (TMI) and Reduced to Pole (RTP) magnetic images for the Renison East area survey area, illustrating the extent of changes in anomaly shape with RTP conversion.**

5 Preliminary Geological Interpretation and Notes on Targets –  
5a Zeehan Trial Harbour

A new nickel deposit has been found to the south of Zeehan by Allegiance Mining NL. The ore generally occurs as high-grade pentlandite located in massive sulphides at the contact between altered ultramafic and country rock. The ore (pyrrhotite and pentlandite) has been mobilised out of the serpentinised nickeliferous ultramafic by the intrusion of Carboniferous granites and accumulated in trap-sites around the fringes of the ultramafic. As magnetite is also generated by the metamorphic effects of the granitoid, the ore is observed to be associated with magnetic anomalies, however, magnetic anomalies are also associated with non-mineralised geology.

As shown in figure 5a, the TMI magnetic data for the vicinity of the Avebury Ni deposit exhibits several strong anomalies that reflect known geology. The Heemskirk granite is weakly to non-magnetic but is surrounded by a strongly magnetic metamorphic aureole that reflects the erratic effects of the thermal alteration. Some geological units are altered to show high magnetism and others produce little response, giving a fragmental appearance to the aureole. Some ultramafic units in very close proximity to the granite have been modelled to show at least three-fold increase in magnetic properties where the serpentine has been altered to skarn material. Some of these zones will be highlighted for exploration attention.

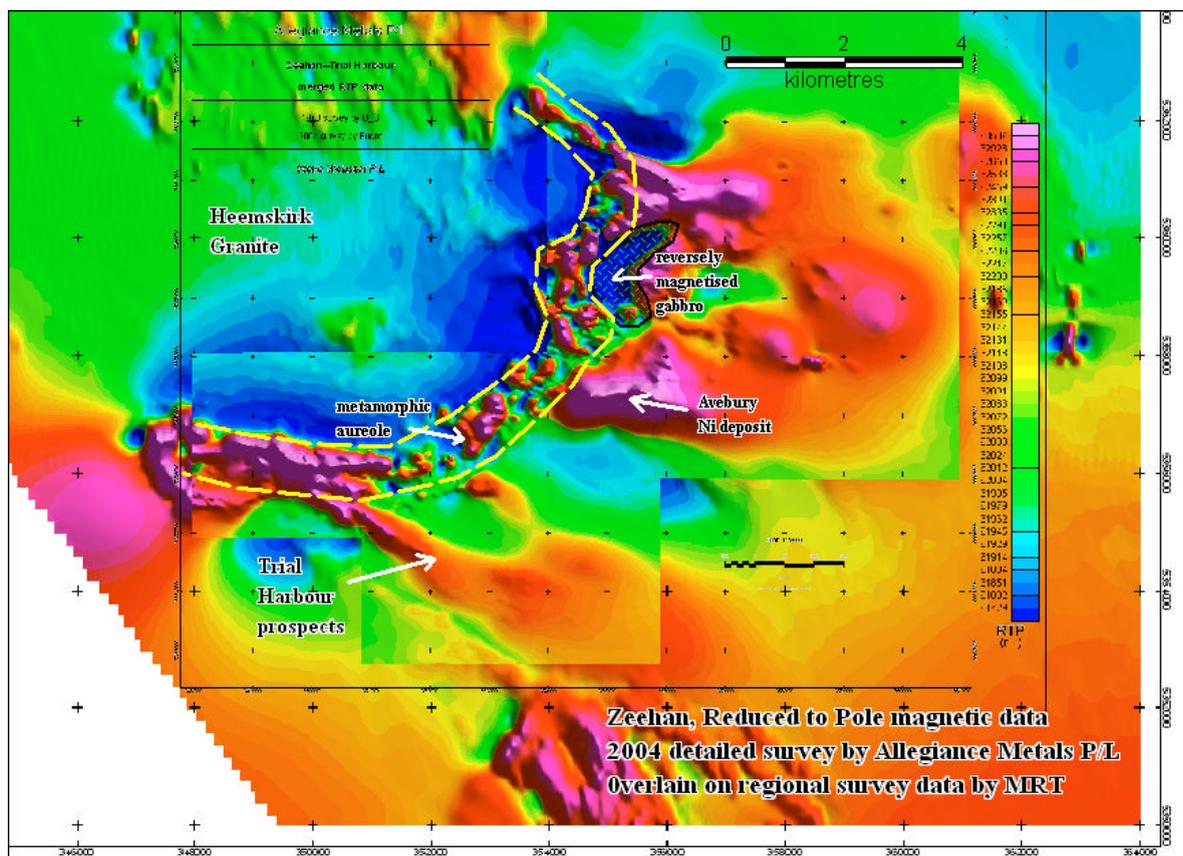
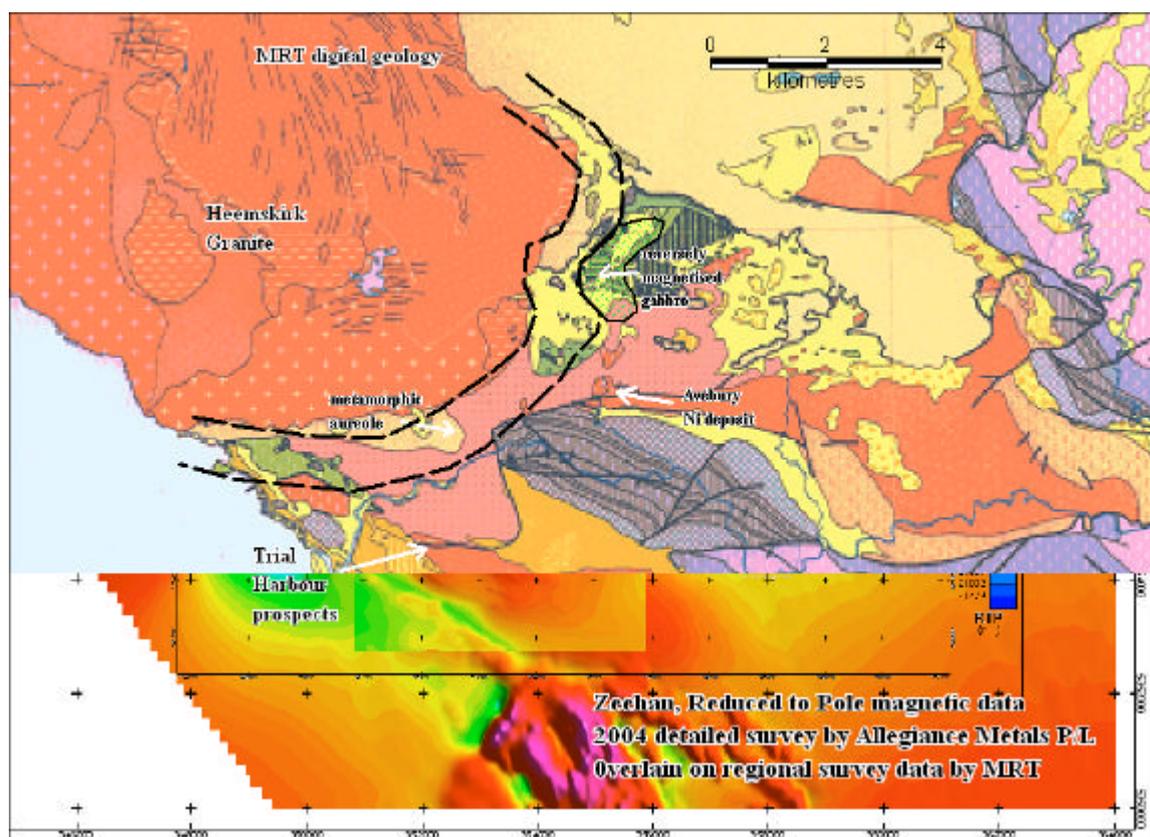


Figure 5a. TMI data for the vicinity of the Heemskirk Granite and the Avebury Ni deposit

The interpretation features marked on the TMI image (Fig 5a) are shown in Figure 5b superimposed on digital geology supplied by MRT.

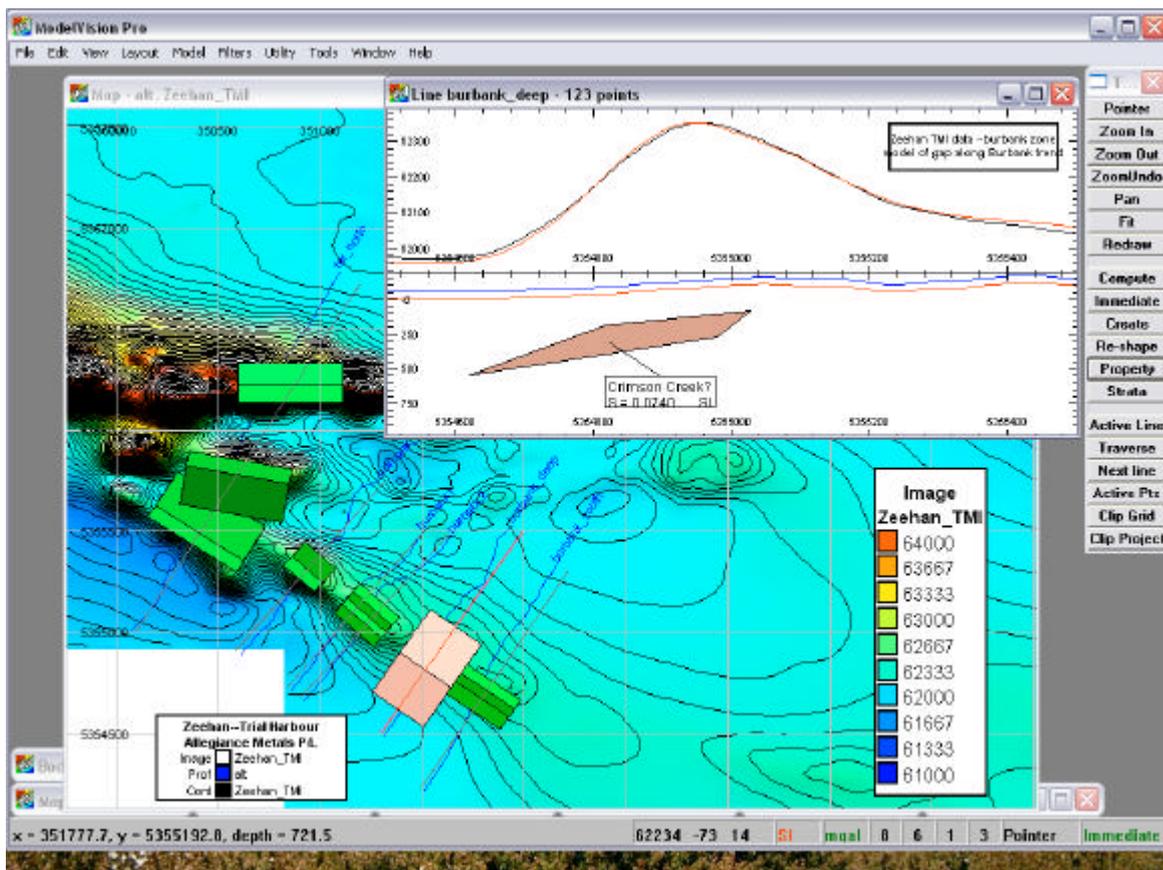
For example, a gabbro unit to the north of Avebury exhibits a strong negative anomaly as the magnetic properties of this unit have been reset to oppose the earth's current magnetic field. The strong magnetic anomaly zone to the north of Avebury is due to magnetite generated, by the thermal effects, in sediments without any economic significance. Thus the presence of strong magnetic anomalies is not a sufficient condition for the presence of mineralisation and anomalies need to be screened prior to being chosen for exploration follow-up.



**Figure 5b. Digital geology provided by MRT with magnetic data interpretation, from Fig 5a, superimposed.**

The linear magnetic zone trending SE –NW, labelled the Trial Harbour Prospects, contains the Burbank zone of TMI anomalies (500 – 700nT) that have been modelled to ascertain physical properties and attitude of the magnetic sources. The zone can be divided into four magnetic sources, three of which are presumed to be ultramafics and the fourth is likely to be units of the Crimson Creek Formation, as shown in Figure 5c.

The susceptibility assumed for the three ultramafic units is relatively uniform, between 0.18 to 0.226 SI, which is consistent with values observed elsewhere for altered serpentinite in proximity to granite. The susceptibility assumed for the Crimson Creek model is lower, at 0.074 SI, but in the range observed when altered by thermal effects.



**Figure 5c. Trial Harbour linear magnetic zone divided into four sources with model profile over Crimson Creek unit superimposed.**

The interpreted depth for the various magnetic sources varies from very shallow in the north (<50m depth) to deep (>125 m) at the southern end of the zone. It is possible that the northern anomaly is actually due to multiple units, as shown in figure 5d, but the modelling is not able to resolve this interpretation from the option that the source is just of greater width. This ambiguity is caused by the inflection in the anomaly profile, which hints at the existence of a second source, being located where the topography may be affecting the data acquisition.

The interpreted depth to the assumed Crimson Creek unit (on the central traverse line) is estimated at the order of 250m, but that depth is difficult to ascertain as the anomaly is influenced by neighbouring strong (ultramafic) sources.

### **Proposed targets**

- i) the magnetic source model geometry proposed in figures 5c - 5d needs to be checked against drilling results at Burbank over the past summer season for revision of the simple geometry. Thence further target zones could be proposed.
- ii) The contact metamorphic aureole around the Heemskirk granite contains some strongly magnetic ultramafic skarns, as modelled by the author in a report to MRT. These skarns may not fit exactly into the Avebury model, being too close to

the granite margin, however they still need to be checked for the presence of massive sulphide mineralisation in case an alternate model exists.

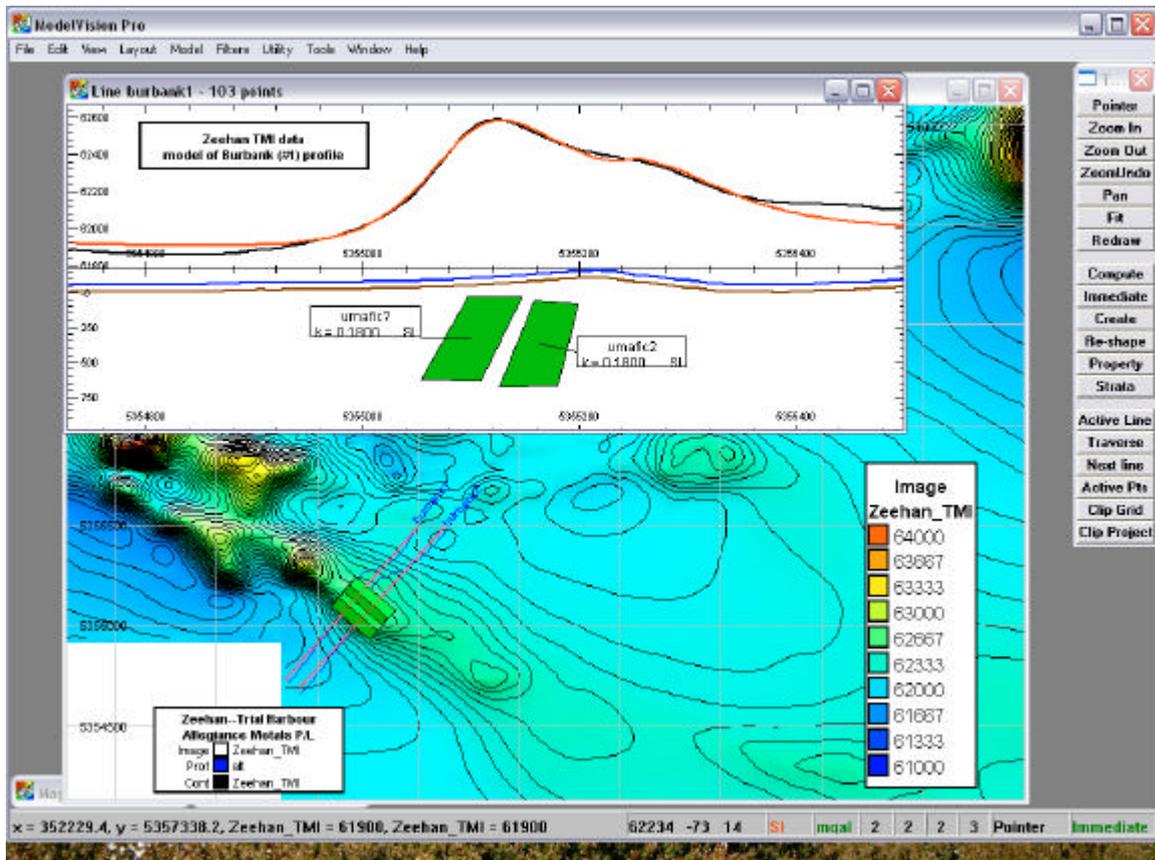
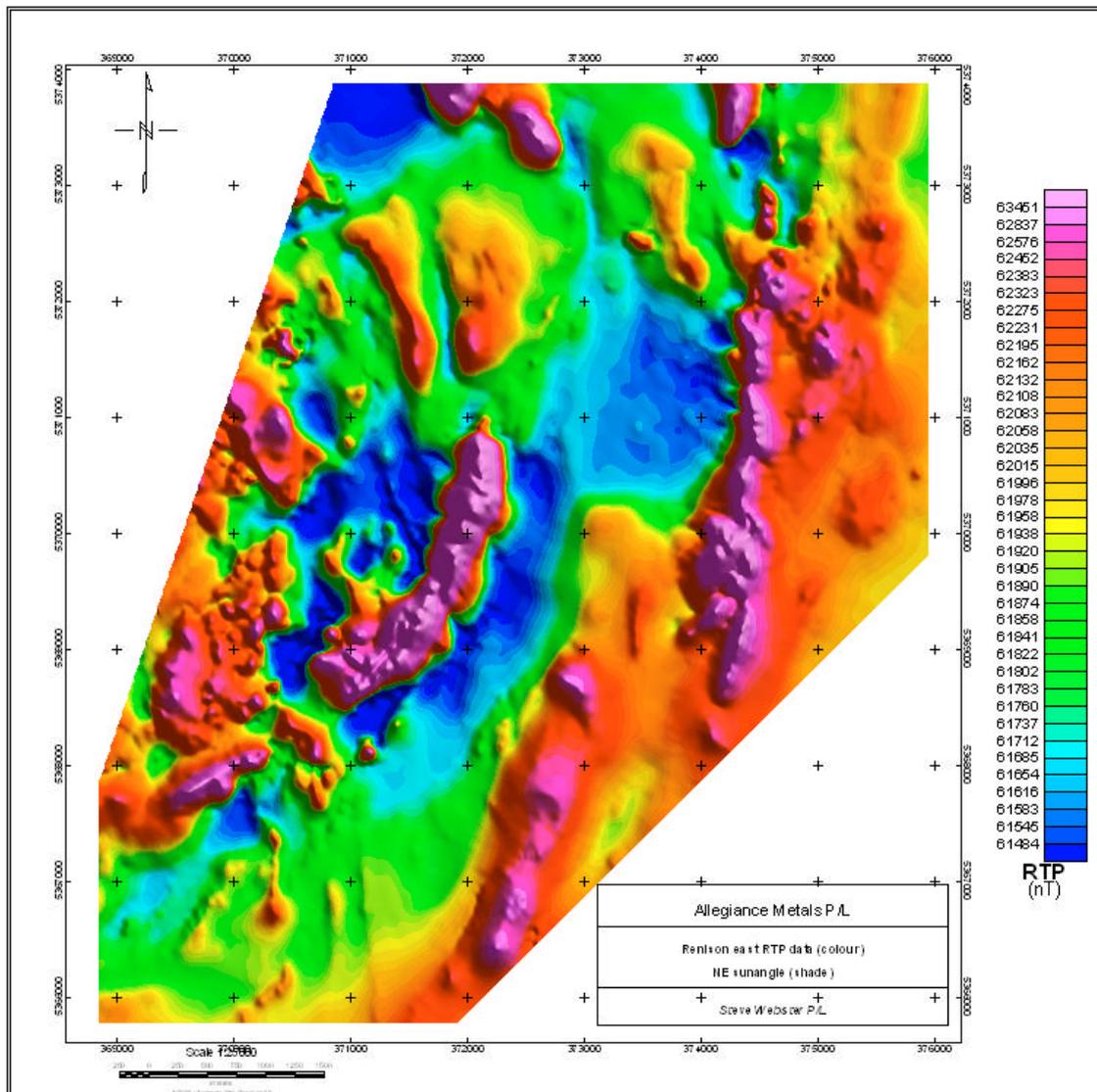


Figure 5d. Model of TMI data across Burbank zone showing the possibility of multiple ultramafic units.

**6. Renison East**

Compilation of geological mapping in the Renison East area (by Allegiance Metals P/L) shows that two main belts of ultramafic complex trend approximately north – south through the tenure area. These ultramafic units are located between the Cambrian Dundas Group metasediments and the Eocambrian Crimson Creek or Success Creek units, perhaps marking the limbs of a major synclinal fold.



**Figure 6. Reduced to Pole magnetic image for the Renison East area**

A brief overview of figure 6 indicates that linear, strong magnetic anomalies reflect the extent of ultramafic units. The fragmented magnetic highs in the west of the survey area reflect the location of the Crimson Creek units, where the apparent magnetic susceptibility has been influenced by the thermal alteration effects of granitoids. The zones of low magnetic relief (green shading) marks the Dundas Group units, while the stronger magnetic lows (blue shading) indicate areas that are interpreted to be intruded by Devonian granite. This synopsis is schematically illustrated in Figure 6a.

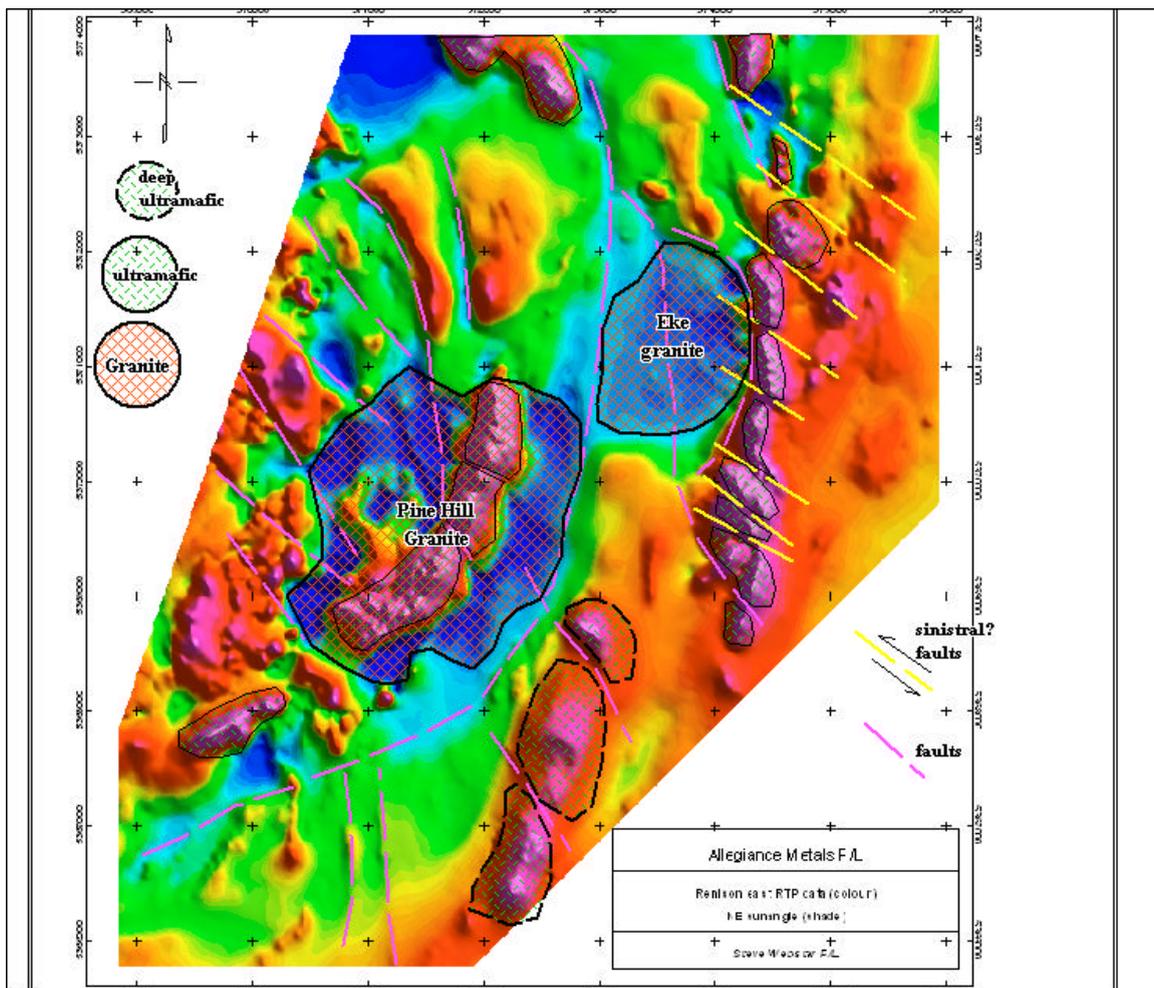


Figure 6a. Schematic interpretation of RTP magnetic data, Renison East

The *eastern ultramafic unit* is shown to be discontinuous, as its trend is broken by several NW-SE trending faults, which are probably sinistral in orientation. The magnetic 'low' to the west of the ultramafic is interpreted to reflect the presence of a non-magnetic granite, called the Exe granite. Several magnetic profiles (figures 6b and 6c) across this zone have been modelled and the presence of granite is required to explain the lower magnetic background in the western portion of the traverses.

The northern modelled line (along 5,371,725N) shows a limited amount of ultramafic, at shallow depth, causing a 2,000nT anomaly, with some magnetic (Crimson Creek?) lithology in the east at Colebrook Hill. The Exe granite is required in the west to explain the 500nT shift in base magnetic level. The central modelled line (along 5,371,000N) shows a vertical ultramafic with greater depth extent (750m) to explain a 3,000nT anomaly. The southern modelled line (along 5,369,900N) has a 5,000nT anomaly and requires a more extensive ultramafic, at shallow depth, extending more than 1,250m in depth. A steep dip of the ultramafic to the east is implied from the data unless remanent magnetism is present, as the direction of remanence would confuse dip interpretation.

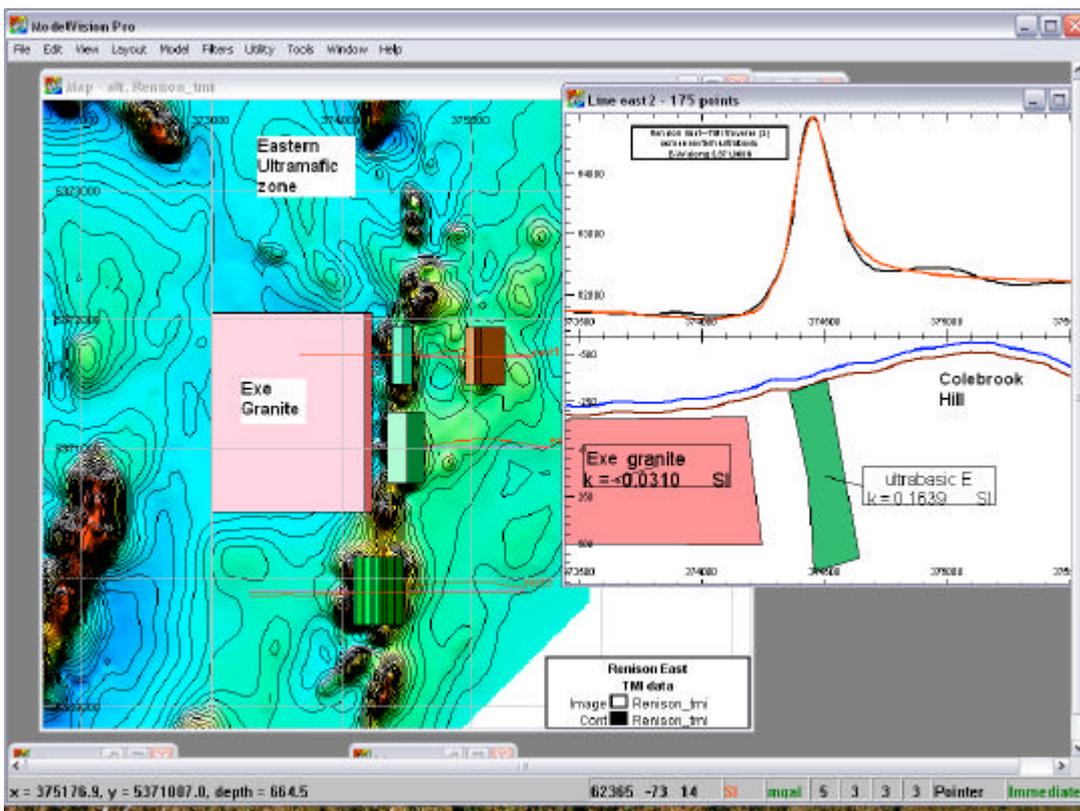


Figure 6b. Interpretation of magnetic data near Colebrook Hill.

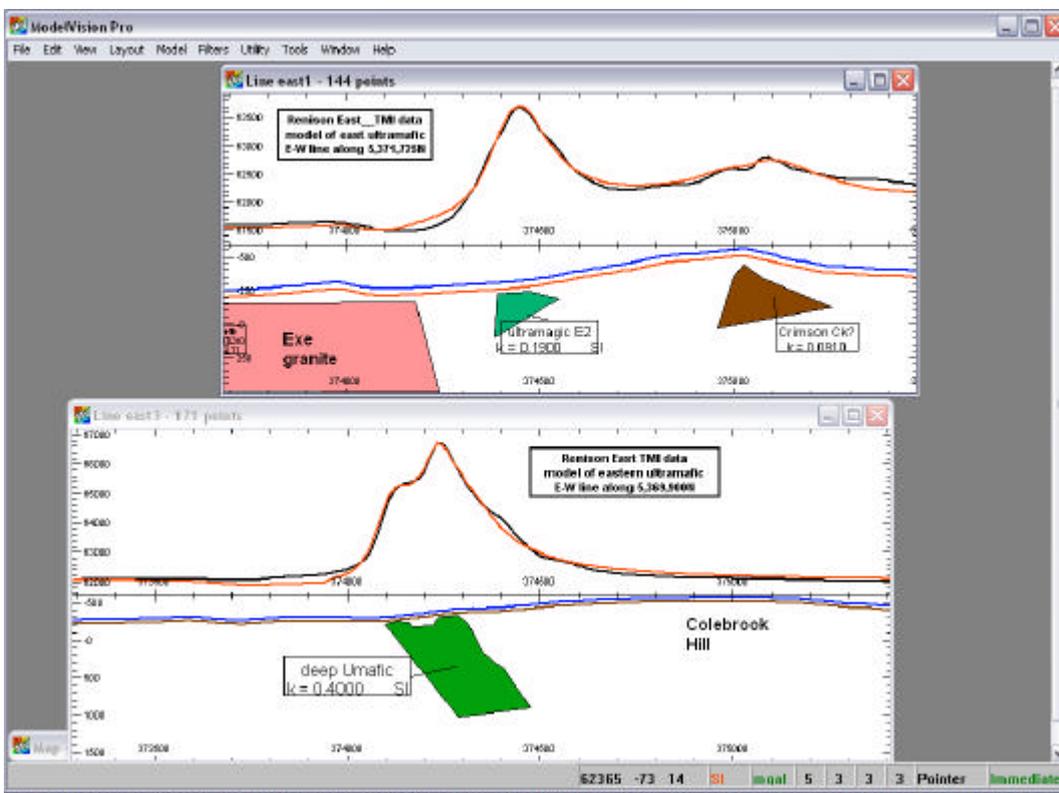


Figure 6c. Interpretation of magnetic anomalies near Colebrook Hill

## Quantitative Interpretation of Renison East TMI data

		anomaly	<-----	ultramafic unit	----->		<---other sources
Magnetic Zone	model profile	amplitude (nT)	interpreted k (SI)	depth (to top)	depth extent	attitude	granite
east ultramafic	east1	2000	0.19	outcrop	300m	unsure	yes
	east2	3500	0.164	outcrop	750m	vertical	yes
	east3	4500	0.4	outcrop	1250m	dip to east	no
Central ultramafic	central1	4500	0.385	100m	1100m	vertical	no
	central2	3000	0.25	outcrop	1200m	vertical	yes
	central3	2500	0.2214	100m	1000m	vertical	yes?
Southern U/mafic	southern u/m	2000	0.167	<100m	1250m	dip to west	yes
South-East U/M	south-east U/M1	1000	0.2	150m	1200m	dip to west	maybe?
	south-east U/M2	1000	0.2	250m	1600m	dip to west	no

The *central ultramafic* has been modelled using 3 traverses as shown in figures 6d (which shows the traverse relative to the TMI data) and 6e. The traverse in figure 6d is interpolated across the ultramafic in a NW-SE direction and may also cross the Pine Hill granite, which is now assumed to be more extensive than previously mapped. The ultramafic anomaly is 2,500nT in amplitude and is shown to be due to a complex source some 300 metres wide but narrowing in depth to greater than 1,000m deep. The interpreted susceptibility is only moderate, for this lithology, at  $k=0.22$  SI. The lower magnetic background to the east is assumed to be due to the presence of granite, however, this may also be explained by the low susceptibility of Dundas Group sediments.

To the north, along 5,370,000N, an east-west traverse (figure 6e) across the central ultramafic crosses the interpreted Pine Hill granite (which is modelled to have a lower 'negative' susceptibility than on the traverse modelled in figure 6d). The ultramafic exhibits a 3,000nT anomaly, is 200m wide and narrows as it deepens to a depth in excess of 1,000m. The interpreted susceptibility of 0.25SI is an average value for ultramafics in the area.

Another traverse along 5,370,500N crosses the central ultramafic where the amplitude is stronger, at 4,500nT, and requires a higher susceptibility of 0.385 SI that may indicate skarn development. The interpreted width of the shallow ultramafic is 200m, and a depth extent of 1km is assumed. This line is located at the upper extent of the Pine Hill granite and may be located in a better position to fulfil the conditions for the development of a nickel deposit of the Avebury type.

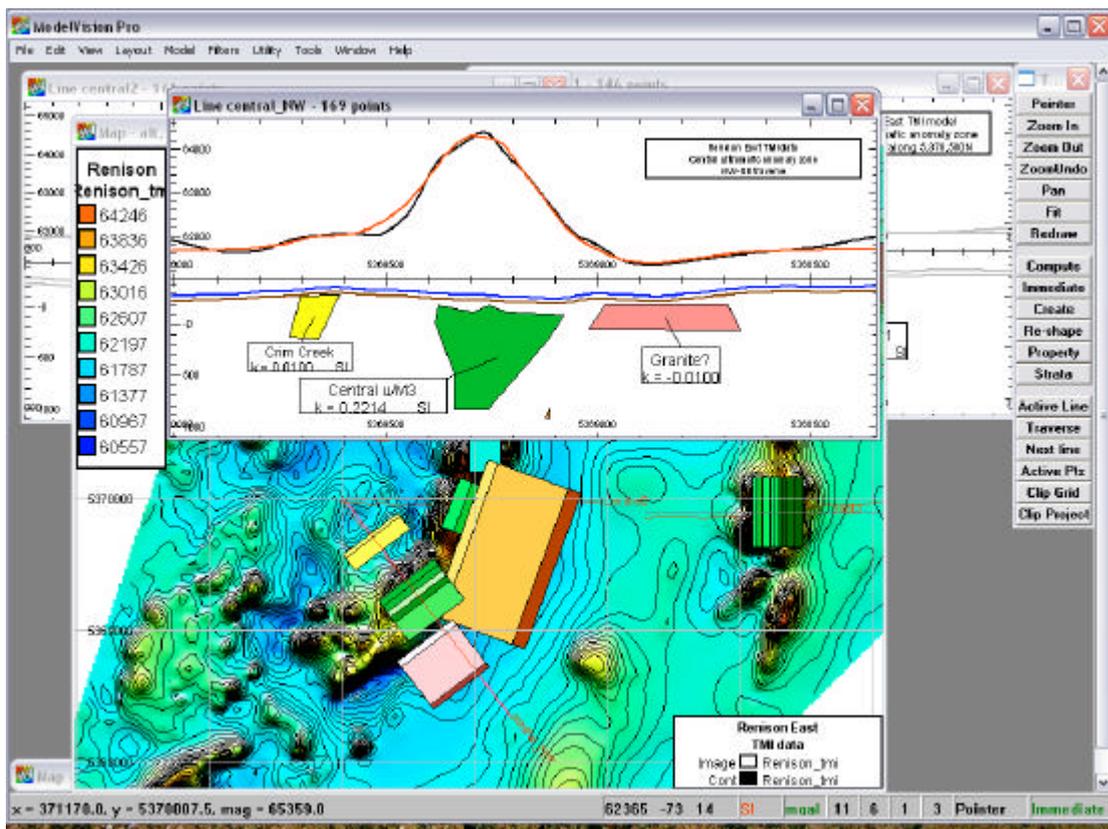


Figure 6d. TMI data and NW-SE profile across Central ultramafic

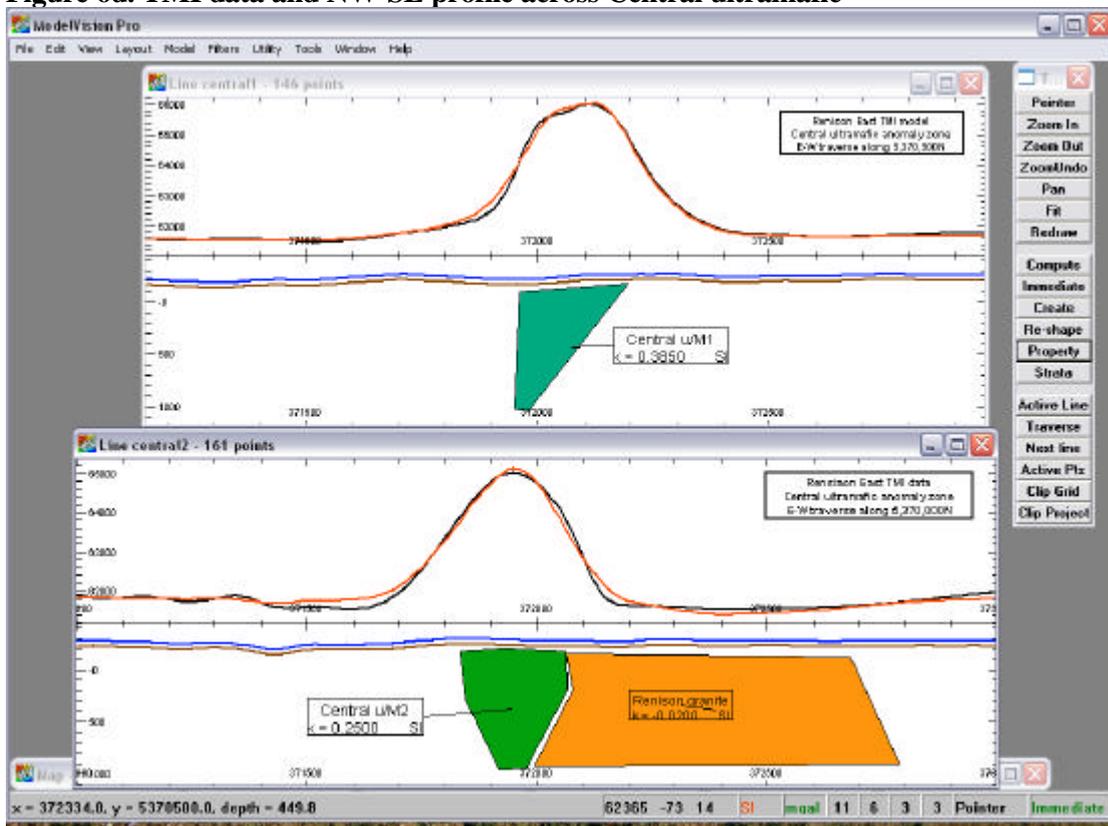
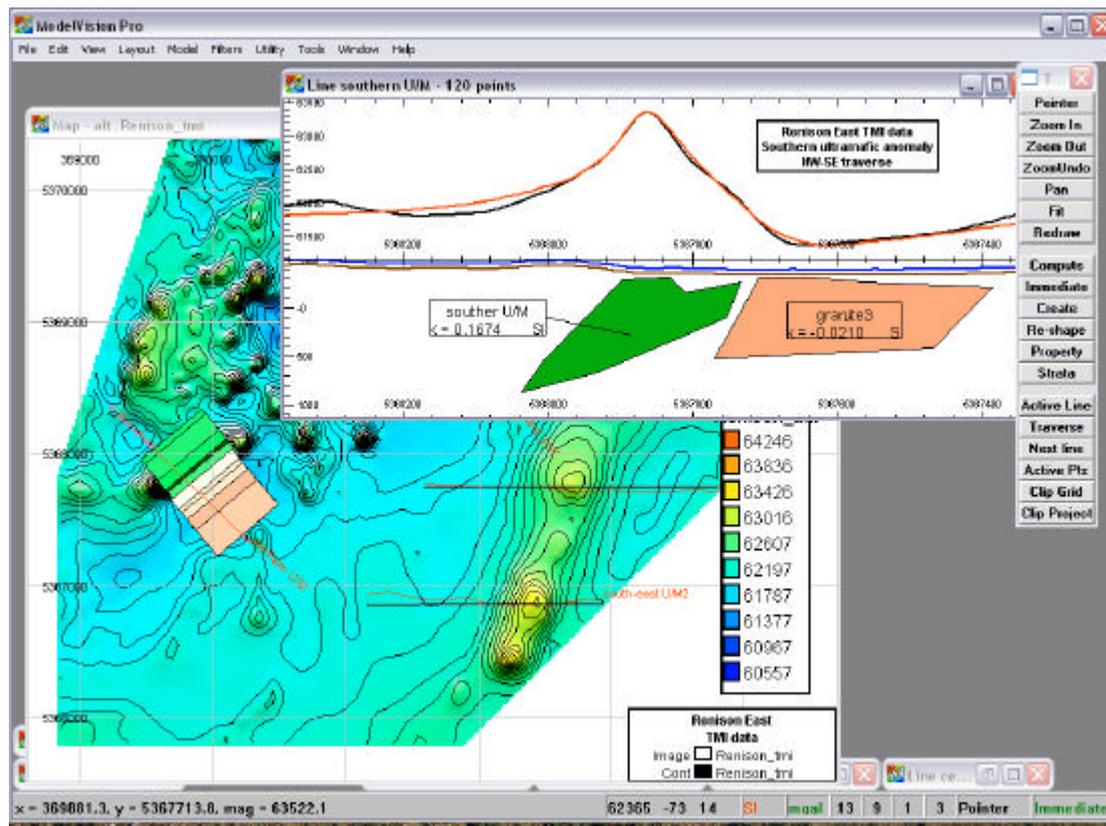


Figure 6e. Models of TMI traverses across the Central ultramafic

The *western ultramafic* is mapped as continuous to the south of the outcrop of Pine Hill granite, however, the magnetic anomaly trend is broken in this vicinity and the anomaly intensity is reduced in amplitude to less than 2,000nT. The anomaly of the south-western continuation of the trend is modelled in Figure 6f, with a traverse that is aligned NW-SE, as a NW dipping unit (of average serpentinite susceptibility of 0.20 SI) that is less than 200m wide and thins in depth. The magnetic low to the SE has been labelled as granite (with susceptibility 0.02 SI units lower than background) but this would not be the Pine Hill granite and may be Dundas Group units Cdb(?)



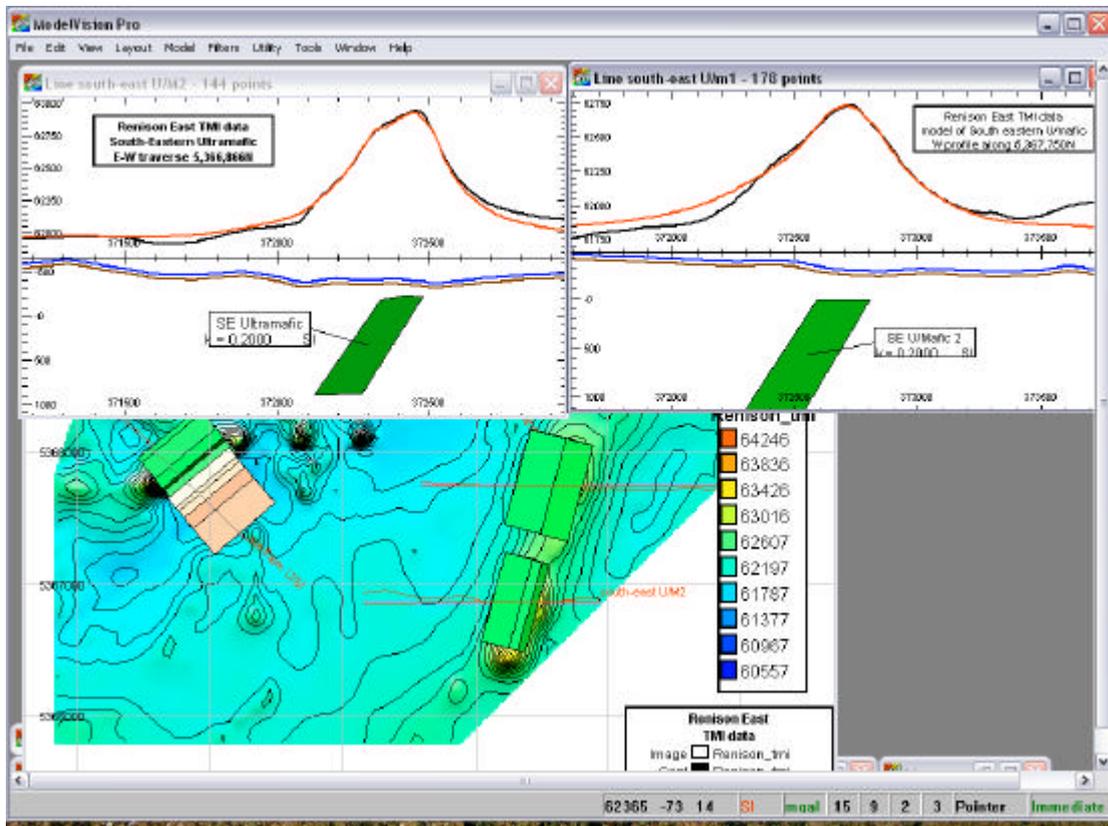
**Figure 6f. TMI data and profile over southern ultramafic anomaly**

The *south-eastern TMI anomaly zone* may reflect a displaced continuation of the eastern ultramafic, as it is a deeper anomaly trend that is off-set to the west of the other feature. Two traverses across this trend are modelled in figure 6g. Both anomalies can be explained by simple geometric sources of average susceptibility (0.2 SI units), less than 200 metres width, dipping to the west. The sources are modelled at depths of the order of 200 – 300m below surface. The northern of the two lines has a (western) magnetic background that is 250nT lower than the eastern background and may reflect some influence from the Pine Hill granite magnetic ‘low’.

**Structure**

Several major structural features are noted from the magnetic data (Fig 6a) including an arcuate feature that may extend through the whole area. A N-S trending structure is observed to be located between the Exe granite and Pine Hill granite and this feature is

extrapolated to pass to the west of the southern ultramafic and then swing to the SW, defining the southern extent of the Pine Hill granite. An example to support this feature: two parallel structures (linear magnetic highs) trend N-S from the southernmost extent of the survey, however, they terminate at the extrapolated position of this arcuate feature.



**Figure 6g. TMI data and model profiles for the SE anomaly zone**

**Proposed targets**

- i) the eastern ultramafic sub-crops for most of its strike length, thus cannot fit the Avebury model for cap-rock to trap mineralising solutions and form a massive sulphide Ni deposit. However, the strong structural deformation revealed by the current survey may provide alternate fault-trap locations for a deposit to occur.
- ii) The central ultramafic is ideally located in close proximity to the Pine Hill Granite and a favourable structural zone may be the preferred site for exploration.
- iii) The south-western ultramafic is not contiguous with the central ultramafic and is removed from the Pine Hill Granite and thus where covered could fit to the Avebury model.
- iv) the south-eastern ultramafic is shown to be non-outcropping and would be not too far removed from the Pine Hill Granite to be excluded from exploration follow-up, if located within Allegiance tenure.

## 7 Heazlewood area

The Heazlewood area was chosen for exploration as it was considered prospective for 'Avebury style' nickel deposits based on the following model parameters (as defined by L. Newnham in an internal Allegiance Mining review:

- i) *the necessary source rock is a nickeliferous ultramafic formation, probably either a dunite or olivine rich pyroxinite.*
- ii) *For Avebury style deposits to form, the ultramafic source rocks must lie within a major sulfur rich hydrothermal cell, resulting in intense widespread alteration (serpentinisation) of the ultramafics, accompanied by the formation of iron-oxide, iron sulfide and nickel-iron-sulfide mineralisation.*
- iii) *Faulted trap sites or repositories near the top of roofed serpentinised ultramafics are necessary for the formation and subsequent preservation of Avebury style nickel sulfide deposits.*

The Heazlewood area was chosen as prospective, by Allegiance Mining, due to the area being underlain by a layered sequence of middle-late Cambrian ultramafic and mafic bodies forming the Heazlewood River Complex in the north and the Mt. Stewart Complex in the south. These units are irregularly overlain by tholeiitic basalts and andesites plus Palaeozoic sediments which may provide trap sites for mineralisation. The package was intruded in the upper Devonian by the Meredith granite, which is interpreted (from regional gravity data) to extend under portion of the survey area at moderate depth of 3 – 4 km.

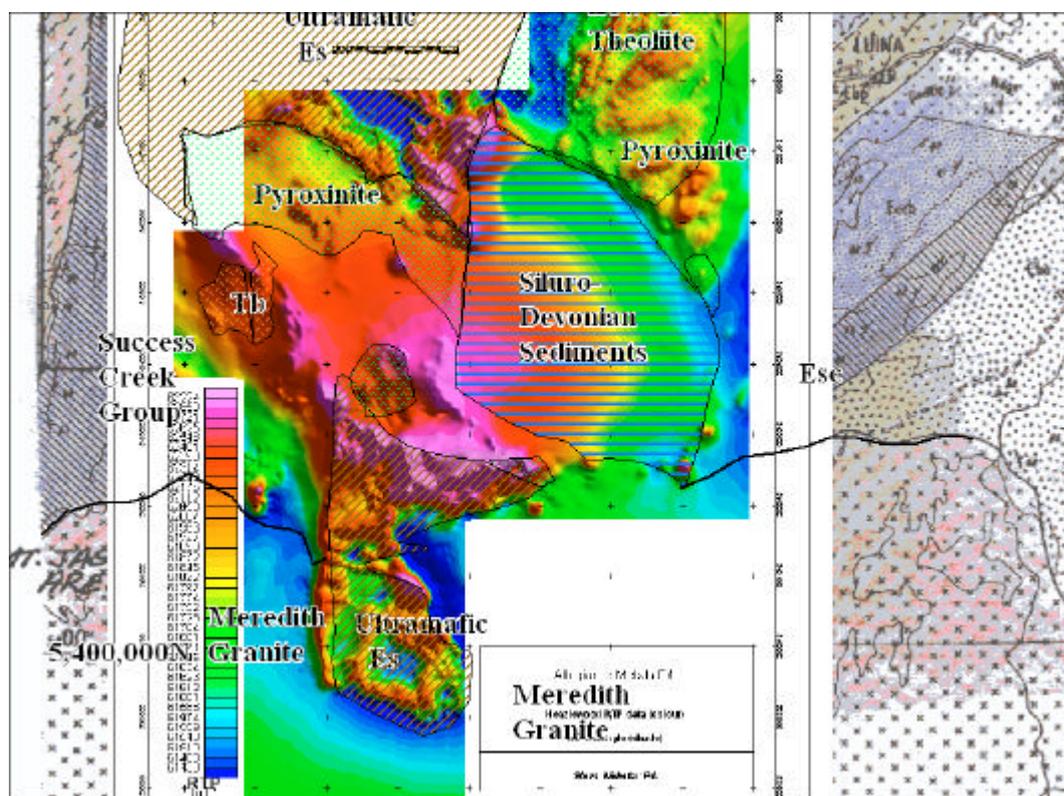
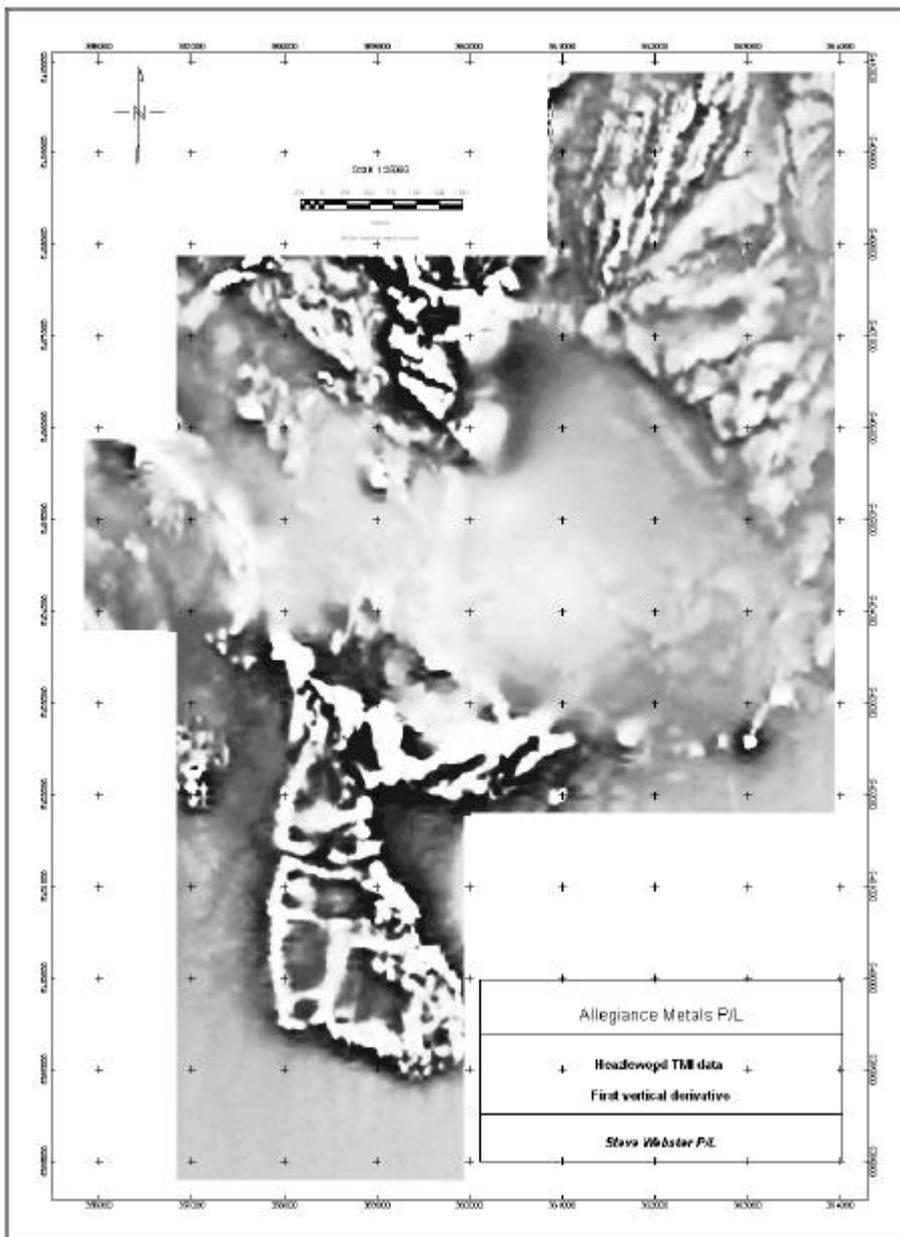


Figure 7. Regional geology of Heazlewood area overlain on RTP magnetic data

Figure 7 is a schematic overlay of the regional geology framework superimposed on the RTP magnetic data for the area. The main geological units have characteristic responses (as noted from south to north) as also seen in the 1VD image (Figure 7a):

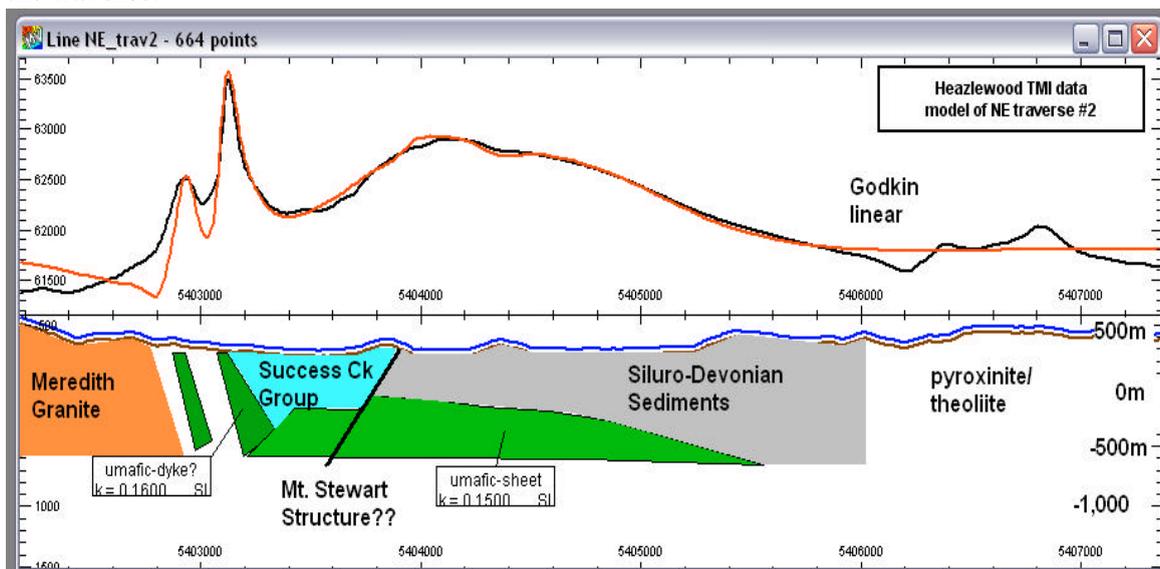
- a) the Meredith granite is relatively featureless in the magnetic data
- b) the Mt. Stewart ultramafic complex (in the south) shows the response of a thin roof-top pendant with high frequency anomalies reflecting structural variation. It is presumed that the ultramafic complex is not prospective for exploration as the granite contact would be far too shallow to develop an Avebury style Ni deposit.



**Figure 7a. First vertical derivative data, Heazlewood area.**

- c) the northern portion of this complex exhibits a stronger magnetic response, indicating a thicker sequence, which trends as an arcuate-linear to the NW under the Success Creek Group (Csc) sediments. However, the magnetic anomaly amplitude decreases to the NW and may, in part, be reflecting Cambrian Gabbro units which are mapped in the vicinity. The extension of this complex may be prospective as the sediments could provide a trap for re-mobilised Ni-rich fluids.
- d) The strong magnetic high appears as a broad circular anomaly to the north, probably indicating a (sheet-like) dip to the north under the Siluro-Devonian sediments and Csc units. The contact between these two lithologies is marked by a deep-seated linear magnetic high (previously named the Mt. Stewart linear) and may represent a fault-step in the dipping ultramafic unit.
- e) The proxinite and tholeiitic lithologies in the north-east of the survey area have significant magnetic relief in contrast with the sedimentary units, however, in the west their magnetic grain is much less than the ultramafic units (Cs), which dominate responses in that area.

The magnetic data has been modelled by several profiles across significant features. A **NE-SW profile (traverse #2 in figure 7b)** crosses the broad magnetic high (>1,250nT), which can be simulated by a flat sheet dipping to the north-east. The exact thickness and susceptibility cannot be determined, due to the depth of 500+ metres, however values of approx. 500m and  $k=0.15$  SI units are assumed. The strong, shallow magnetic anomaly of 2,000nT at 5,403,000N appears to be due to a steeply dipping 'dyke' of ultramafics (with similar susceptibility,  $k=0.16$  SI) which probably joins with the deeper unit. The Meredith granite (shown in figure 7b) has not been used in the model simulation, but its effect would be to lower the magnetic background to that observed at the southern end of the traverse.

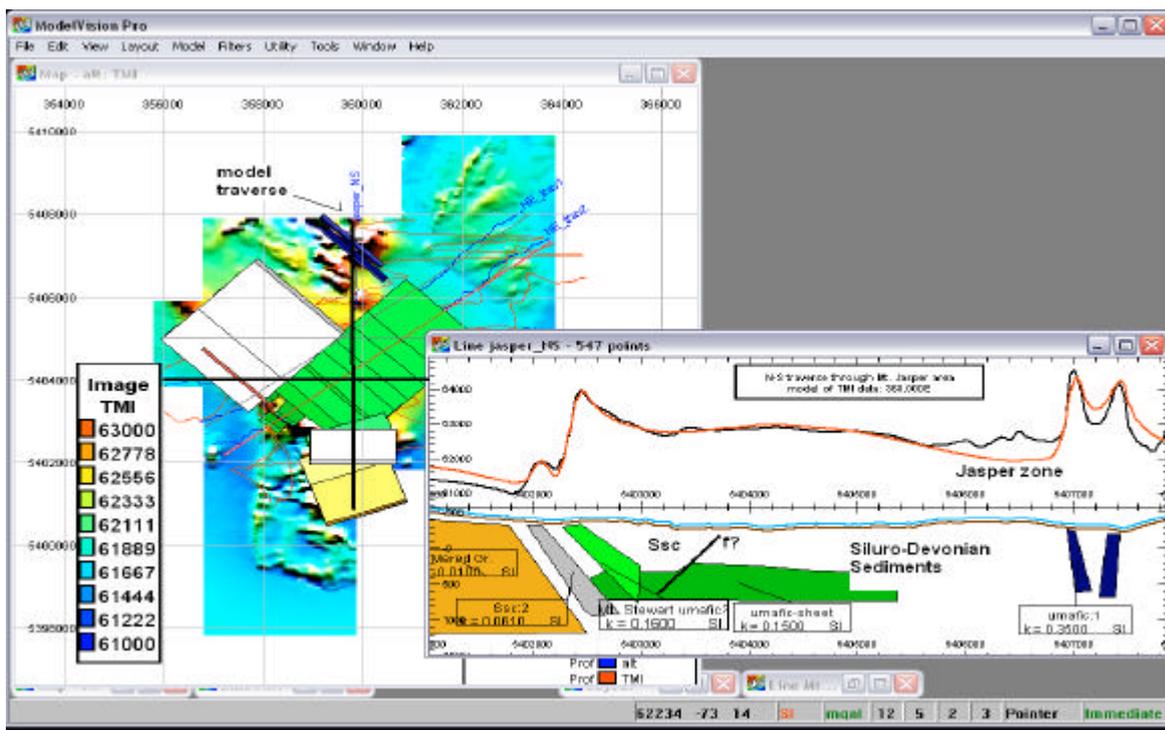


**Figure 7b. Model of TMI profile in NE direction across Heazlewood area**

The magnetic anomalies at the northern end of traverse #2 are due to the contact between the Siluro-Devonian sediments and the pyroxinite/theoliite units. This contact is the locus of the Godkin – Whyte River linear zone of mineral occurrences and is clearly observed in the magnetic data (Figure 7e).

An alternate magnetic traverse has been generated across these zones and is aligned N-S along 360,000E to also cross anomalies in the Mt. Jasper area. The model data is illustrated in Figure 7c and also shows the Mt. Stewart ultramafic complex (source of sharp 2,500nT anomalies) dipping steeply to the north to join with the deeper, flatter lying ultramafic source of the strong broad anomaly. A step (fault?) in the flat dipping ultramafic unit is used on this line to potentially explain the source of the linear (N-S) magnetic feature in this vicinity. The sense of movement has not yet been established and the portrayal in figure 7c is schematic only.

The low magnetic response of the Meredith Granite is used to lower the magnetic background to the south and additional ultramafic units are employed to simulate strong anomalies in the Mt. Jasper area (the circular feature shown in figure 7e). An additional source has been added between the granite and ultramafic units to simulate possible magnetic units within the Success Creek Group (its depth extent is probably excessive).



**Figure 7c. Model of N-S magnetic TMI profile along 360,000E**

An addition traverse in this vicinity has been modelled to check these source parameters. Figure 7d shows the TMI data and model curve for an E-W traverse along 5,405,000N with granite in the west, followed to the east by a block of Success Creek Group units (with moderately low susceptibility of 0.01 SI). This zone includes a wedge of ultramafic/gabbro to explain the 500nT anomaly in the NW trend. The same ultramafic

sheet as in the above examples explains the broad magnetic anomaly, with a step fault introduced to explain the weak trend of the “Mt Stewart fault”. The determination of the true attitude of this fault will need a more detailed model study, if required.

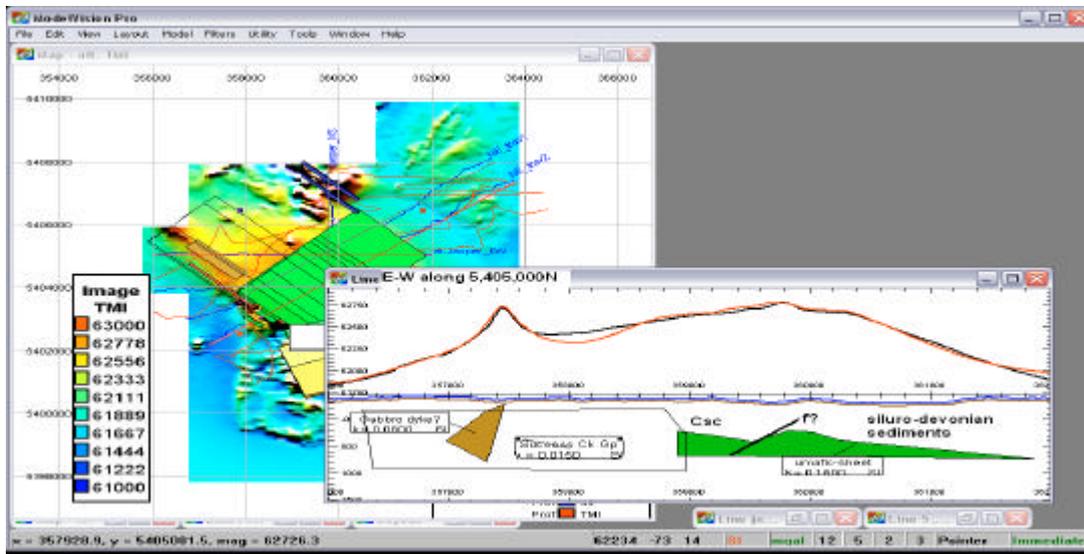


Figure 7d. Model of E-W section along 5,405,000N

### Recommended prospects vs the Avebury model

Figure 7e summarises the magnetic features that may be associated with mineralised zones within the Heazlewood area.

- i) a NW-SE trending weak magnetic low marks the contact between the Siluro-Devonian sediments and mafic units that is also the locus of mineral occurrences between Godkin and Whyte River mines. There does not appear to be ultramafics associated with this zone and thus it is not prospective for Avebury style Ni deposits.
- ii) The ‘*Mt. Stewart*’ fault is marked by a weak N-S magnetic linear that coincides with the contact between the Success Creek Group and the Siluro-Devonian Sediments. This magnetic anomaly may be related to a step displacement in the deep ultramafic sheet that is the source of the broad high that dominates the magnetic data in the vicinity. As this area is probably underlain by shallow Meredith granite the combination of features fits the proposed model for the development of an Avebury style deposit and is a zone for future exploration. A target zone could be where the “Mt. Stewart trend” meets the proposed NW trending structure (360,000E/5,403,000N) and increased magnetic response, due to shallow ultramafic.

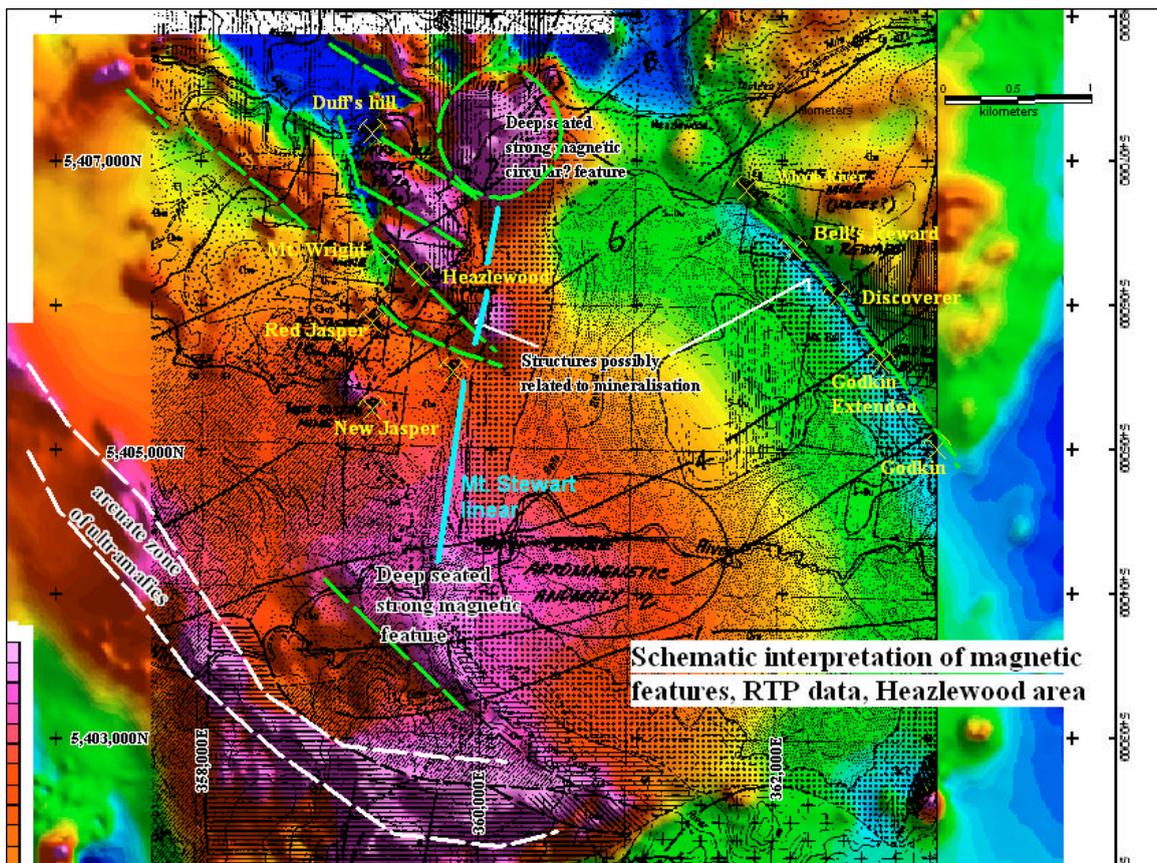


Figure 7e. Overlay of local geology on RTP magnetic data showing features of potential exploration interest

- iii) The various mineral occurrences in the Mt. Jasper area (Heazlewood, Mt. Wright) are associated with several parallel *NW trending magnetic linears/splays* that have been modelled (Figure 7g) as due to possible ultramafic units of limited strike length. However, the interpreted susceptibility of these units is lower than normal for ultramafics (0.080 – 0.125 SI) and these values may reflect severe alteration of the units.
- iv) Of possible significance in the Mt. Jasper area is *the strong magnetic circular high* on the Mt. Stewart linear (360,000E/5,407,000N) that would also be intersected by several of the splay features and *the magnetic 'low' zone* to the north of Duff's Hill prospect (Figure 7e). This strong magnetic low is similar to the magnetic low observed at Zeehan where gabbro units have been altered by shallow granite and may indicate that the Meredith granite is shallower in this vicinity than the 8+ kilometre depth proposed from gravity interpretation. (The resolution of the gravity interpretation could suffer from the lack of observed stations in the area). Thus to define a prospect, one would look at a strongly magnetic zone within an aureole around the magnetic 'low' and the circular anomaly to the east of Duff's Hill Prospect would fit that definition.

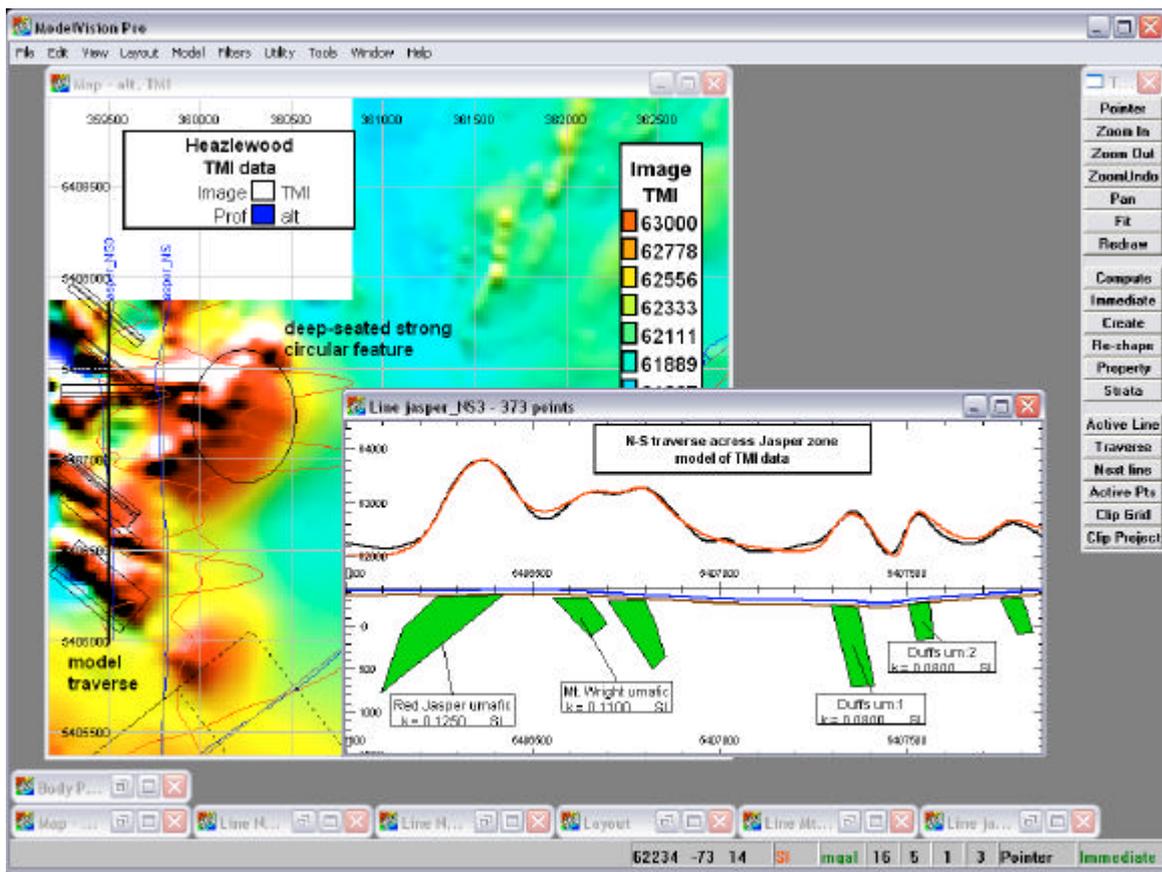


Figure 7g. Model of TMI anomalies in vicinity of Mt. Jasper

## **8 Conclusions**

The high-resolution helimag survey of three areas in Tasmania provided greater definition of geological features than was available from the reconnaissance MRT data set. A preliminary interpretation used the new data in conjunction with the MRT data and collated geological information to indicate prospect areas for exploration follow-up. The preliminary interpretation needs to be reviewed to define targets for Avebury style nickel mineralisation.

New results included:

**Zeehan/Trial Harbour:** the merged coverage of the TMI data provided a more complete perspective of the metamorphic aureole around the Heemskirk Granite and indicated skarns of potential interest. The prospectivity of the Burbank area will have to be reviewed in light of drilling results over the past season.

**Renison East:** the new data revealed the extent of the Exe granite and its impact on the eastern ultramafic unit, in particular the structural deformation that could provide traps for mineralisation that differ slightly from the standard Avebury model. In addition, the revised extent of the Pine Hill Granite is defined by magnetic lows that probably equate to thermal metamorphic impact on the country rocks, which should assist in locating zones of high exploration potential.

**Heazlewood:** outcropping and buried zones of the ultramafic complex are analysed in a preliminary interpretation that showed structural elements which equate to known mineralisation trends and previously unidentified parallel features of similar character. Some of these features are associated with strong magnetic anomalies that may indicate new targets that fit the Avebury model and have high priority for exploration.