THIRD ANNUAL & FINAL REPORT

Ringwood EL32244

Titleholder : Gempart (NT) Pty Ltd

EXPLORATION LICENCE EL32244

FOR THE PERIOD 20/03/2020 to 10/02/2023

APPENDIX 3

GROUND EM INTERPRETATION REPORT

Memorandum

To:	Graham Bubner, Alistair Mackie
Date:	5th May 2022
From:	Kelvin Blundell
Subject:	**GEMPART NL — Ringwood (EL3244) 2022 Ground TEM Survey Results**

SUMMARY

Ground TEM surveys were conducted over four anomalous responses from the VTEM survey flown in 2021 – RW02, RW03, RW07, and NFB01. A moving loop configuration was used for RW02, RW03, and NFB01, and a fixed loop configuration was utilised for RW07.

The surveys were carried out by Zonge Engineering and Research Organization Australia during January to March 2022 using a SmartEM-24 receiver and 3-component fluxgate sensor.

The acquisition was disrupted several times due to equipment failures and extreme weather. The crew demobilised from site part way through the program on the 31st January due to inaccessible tracks and returned on the 19th February.

Overall, the results of the MLTEM and FLTEM surveys over the selected Ringwood and No 5 Bore targets are disappointing.

RW2 and RW3 look to be regolith responses probably related to preferential weathering over mafic units and/or structures. The FLTEM over RW7 did not confirm the original VTEM anomaly and is likely a drape effect of the helicopter altitude suddenly dropping on the northeast side of a ridge, coupled with the response of a blind regolith profile.

The MLTEM data over NFB01 mirrors the VTEM response and does not reveal any "sweet spots" along the strike or down dip extents of the modelled formational conductor. The modelling of the MLTEM data suggests there are possibly two parallel sources in the area around the strongest VTEM anomaly at NFB01. The conductive horizons are shallow dipping and come close to surface at the southeastern up-dip extent, so should be a simple test with a shallow drill hole to determine the nature of the conductive source.

Some suspicious early-time effects were seen in the data from NFB01, and it is suspected these are due to the combination of the small loop size (100 x 100m) and the fluxgate sensor in an in-loop position. It is recommended that a larger loop or a slingram configuration is used for future surveys acquired with a B-field sensor.

1. Introduction

This memo summarises the results of the ground TEM surveys completed on the Ringwood and No 5 Bore Projects in the Northern Territory during January to March 2022.

The surveys were designed to follow-up four anomalous responses from the VTEM survey flown in 2021 – RW02, RW03, RW07, and NFB01. A moving loop configuration was used for RW02, RW03, and NFB01, but due to severe topography, a fixed loop configuration was utilised for RW07.

2. Survey Details

2.1 Survey Equipment and Specifications

The ground TEM surveys were carried out by Zonge between the 19th of January and 8th of March 2022. The acquisition was disrupted several times due to equipment failures and extreme weather. The crew demobilised from site part way through the program on the 31st January due to inaccessible tracks and returned on the 19th February.

The System specifications are summarised below, and details of the fixed loop and local grid parameters are summarised in Tables 1 and 2.

Contractor Details

Operator	: Zonge Engineering and Research Organization Australia
Survey Date	: 19th January – 8th March 2022

Survey Design

Configuration	: In-loop and Fixed Loop
Line Spacing	: variable (100–300m)
Stn Spacing	: 25m–50m
Datum/Projection	: GDA94/MGA53

Receiver

Receiver	: SmartEM-24
Sensor	: EMIT SmartFluxgate 3-component B-field

Transmitter

Transmitter	: Zonge ZT-30
Base Frequency	: 1.0 – 2.5 Hz
Time Base	: 100– 250 msec
In-loop Size	: 100 x 100m (2 turns)
In-loop Current	: 38–40A
Fixed Loop Size	: 400 x 300m (RW07)
Fixed Loop Current	: 30A

Table 1. FLTEM Loop Details

Loop ID	Size	NW Corner		NE Corner	
RW07	600 x 400m	518838	7344361	519010	7344607
		SE Corner		SW corner	
		519337	7344377	519337	7344377

Table 2. Local Grid Parameters

Local Grid	Rotation	Local E/N		MGA E/N	
NFB01	300° — 120°	10000	70000	495645.1	7327385.9
RW03	324° – 144°	4000	70000	501060	7329128
RW07	205° – 035°	3200	70000	518815	7343980

2.2 Survey Coverage

The survey coverage is shown in Figure 1 and detailed in Table 3. A total of 187 stations were recorded over eight lines for total of 8.0 line-km.

Table 3. March-April 2022 TEM Coverage

Target	Configuration	Line	Freq (Hz)	Stn Spacing	Line Start	Line End	No Stns	Line Km
RW07	FLTEM	3100E	2.5	25/50m	70350	70800	15	0.45
RW07	FLTEM	3200E	2.5	25/50m	70350	70800	15	0.45
RW02	MLTEM	517900E	1.0	50m	7341050	7342450	29	1.40
RW02	MLTEM	518200E	1.0	50m	7341100	7342850	36	1.75
RW03	MLTEM	4200E	1.0	50m	70000	71000	21	1.00
NFB01	MLTEM	70150N	1.0	50m	10000	11000	21	1.00
NFB01	MLTEM	70300N	1.0	50m	10050	11000	20	0.95
NFB01	MLTEM	70450N	1.0	50m	10000	11000	21	1.00
							178	***8.00***

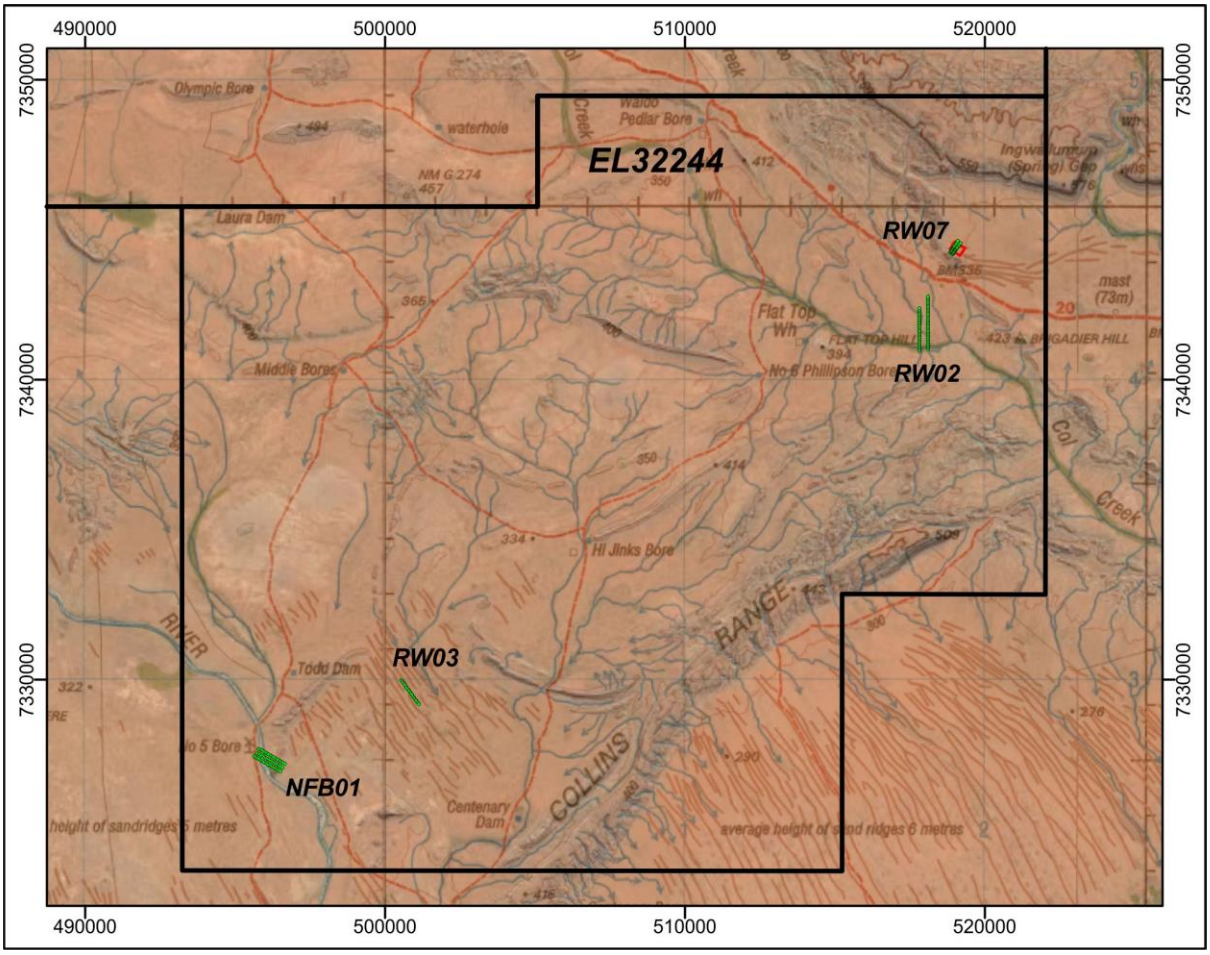

Figure 1. Location map of 2022 ground EM surveys within E32244

3. Results

3.1 RW02

RW02 is a complex zone of at least six conductors (Figure 2a). Some may be fault-offset/repetitions of the same conductive horizon. The overall strike length of target is more than 6km.

The structural location of the anomalies is interesting, within RW2b, RW2d, and RW2f located within the nose of a tight fold, and RW2a and RW2c aligned along the fold hinge. Of interest is the fact that RW2d and RW2f are coincident with strong magnetic units that map the limbs of the fold, but the association between strong magnetic and EM responses only occurs over a 2.6km zone on the northern limb of the fold (Figure 2b), whereas the same magnetic horizon elsewhere has no TEM response.

The VTEM anomaly profiles (Figure 2c) suggest shallow-dipping sources and relatively shallow depths. The amplitude of the VTEM anomalies at the latest times are well above noise levels, although the decay of the amplitudes suggests relatively weak conductors.

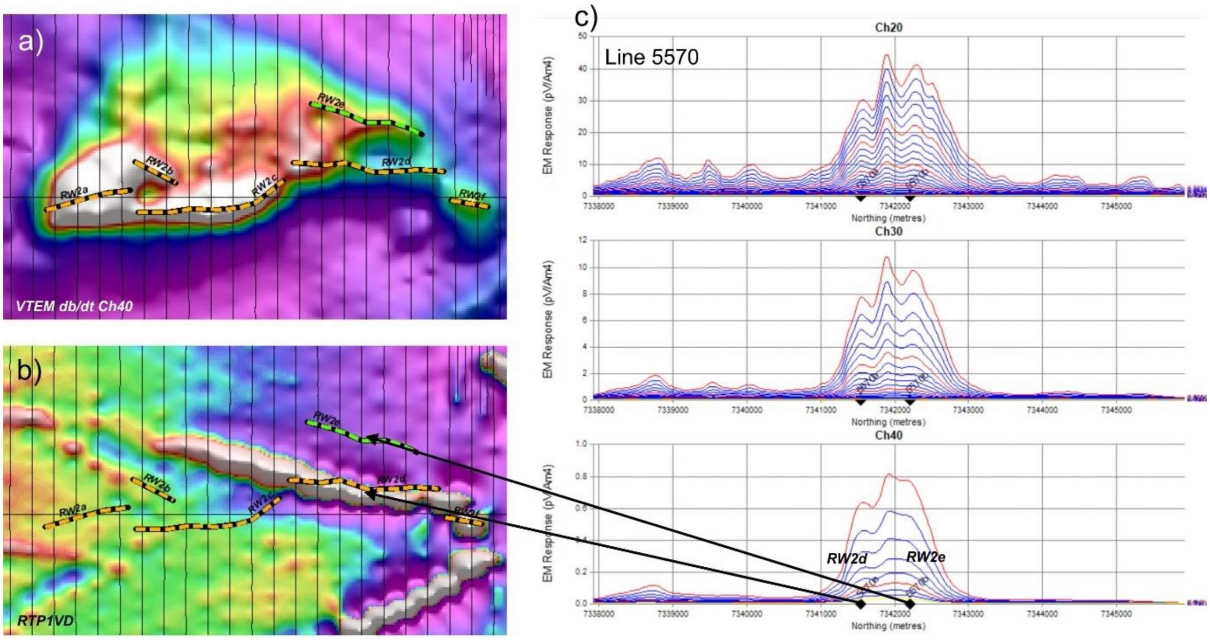

Figure 2. Location of conductors RW02 relative to a) Late-time VTEM image and b) RTP1VD image, and c) Z-component profile over RW02d and e on the eastern end of the trend

The initial proposal at RW2 was to cover the part of the VTEM anomaly that is coincident with the magnetic response (RW2d) and the VTEM anomaly to the north (RW2e) with up to five lines at 300m spacing, covering a strike of 1.2km. The survey started with the easternmost line, but only two lines were completed (Figure 3) after the initial results were disappointing.

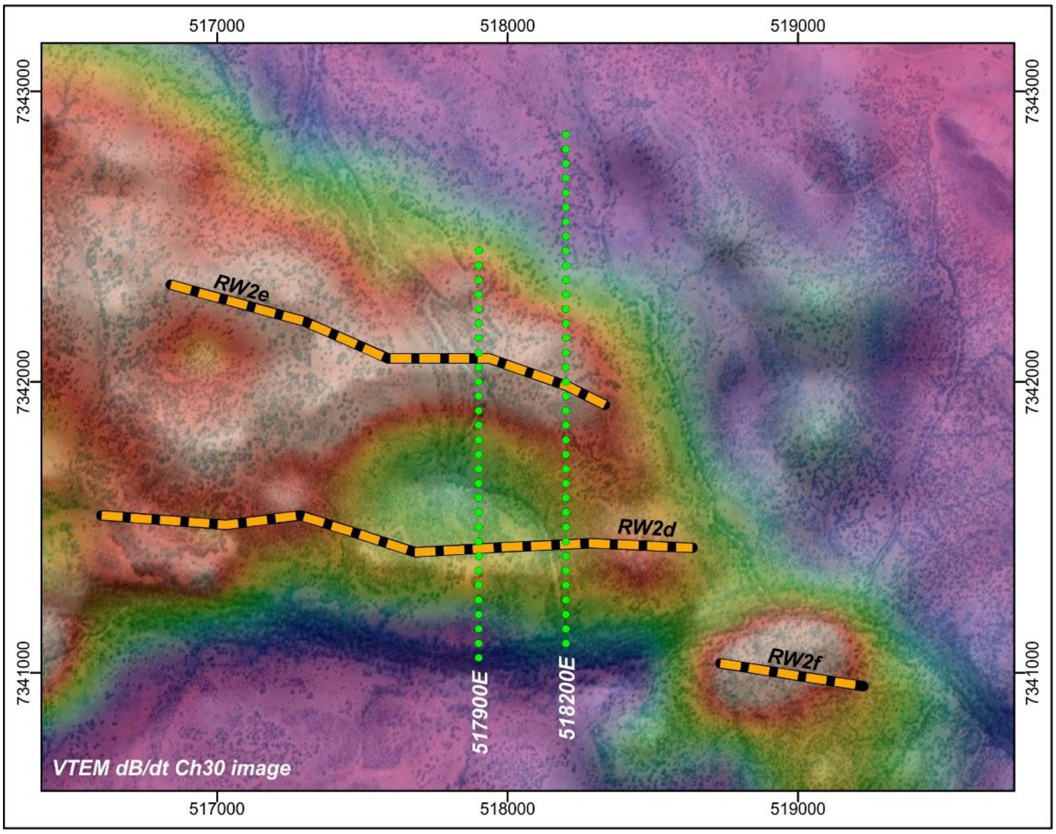

Figure 3. Completed MLTEM lines over RW02d and RW02e

The MLTEM profiles (Figure 4) mirror those seen in the VTEM data, with the corresponding anomalies persisting beyond the base-time of the VTEM system, but only to about 18 msec before the amplitude fall below noise levels. Therefore, the MLTEM data confirms a relatively weak source. The anomaly profiles do not show the characteristics of a bedrock source and could not be modelled adequately with plate models, and it is likely the EM response seen in this area is from a shallow regolith source — i.e. preferential weathering over structures and/or specific lithologies — which may explain the strong differences between the AEM and magnetic patterns in this area.

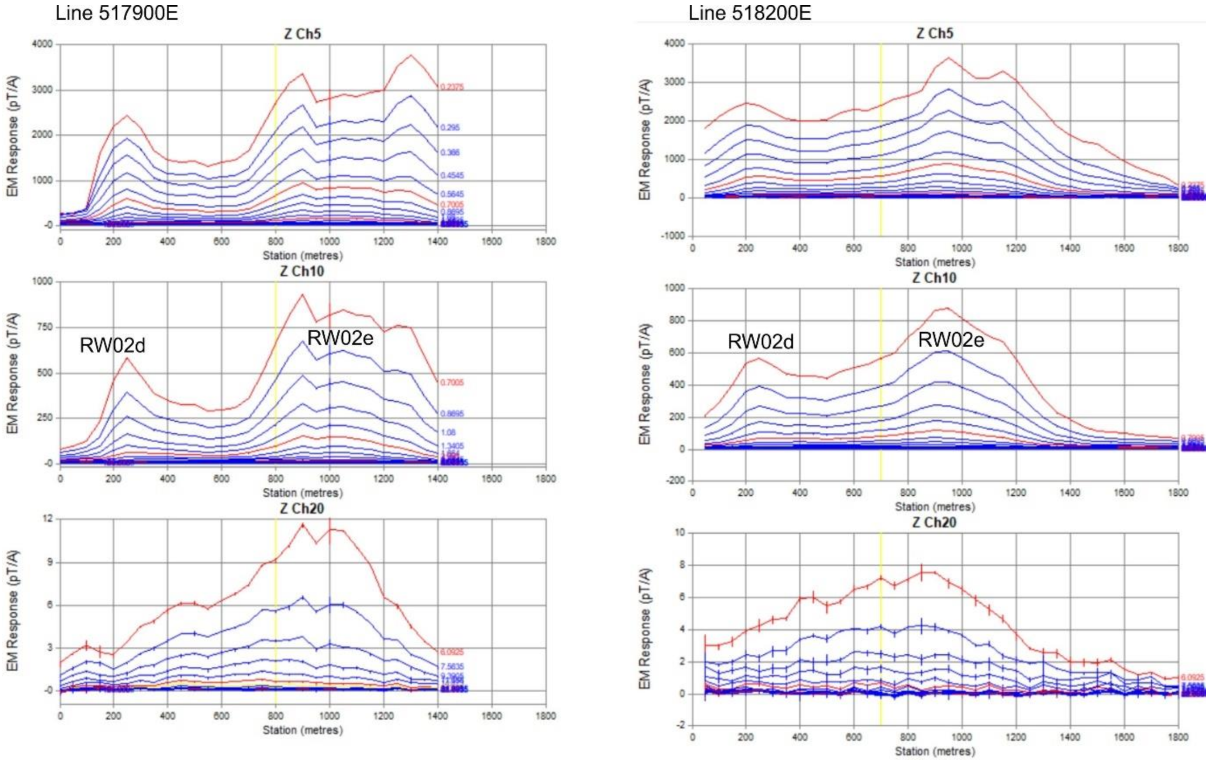

Figure 4. MLTEM Z-component profiles for RW02d and RW02e

3.2 RW03

RW03 is in an interesting position at the junction of two domains with quite different structural/lithological orientations (Figure 5a).

It is orthogonal to the main NW-SE lithologicial trend, as defined by the majority of other conductive horizons in this area, and is coincident with a magnetic feature that is consistent with the dominantly NE-trending magnetic trend seen in the No 5 Bore area to the SW (Figure 5b).

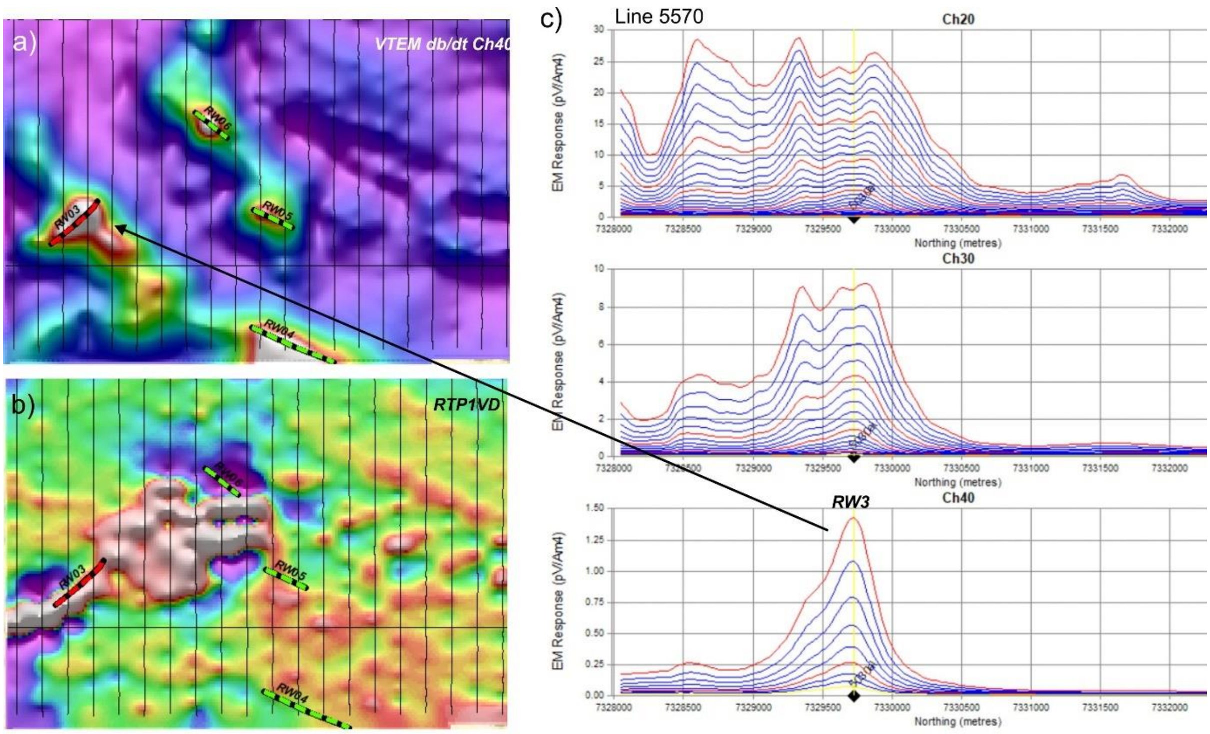

Figure 5. Location of conductors RW02 relative to a) Late-time VTEM image and b) RTP1VD image, and c) Z-component profile over RW02d and e on the eastern end of the trend

The VTEM anomaly profiles (Figure 5c) suggests a shallow-dipping to flat-lying source at a relatively shallow depth. The amplitude of the VTEM anomaly at the latest times is well above noise levels, although the decay of the amplitudes suggests a relatively weak conductor.

The initial proposal at RW3 was to cover the VTEM anomaly three lines at 200m spacing. The survey started with the central line, and that was the only line completed (Figure 6) after the initial results were disappointing.

The MLTEM anomaly looks a bit different in character to the corresponding VTEM anomaly, but this is likely due to the different line orientation. There is also a single station early time peak, but if real, this is not considered of interest due to the size and rapid decay of the response.

The main MLTEM anomaly persists to around 20 msec before falling below noise levels. Therefore, the MLTEM data confirms a relatively weak source. The anomaly profiles do not show the characteristics of a bedrock source and could not be modelled adequately with plate models, and it is likely the EM response seen in this area is from a shallow regolith source — likely preferential weathering over a mafic lithology localised to the area where the magnetic unit is truncated by a major NW–SE structure.

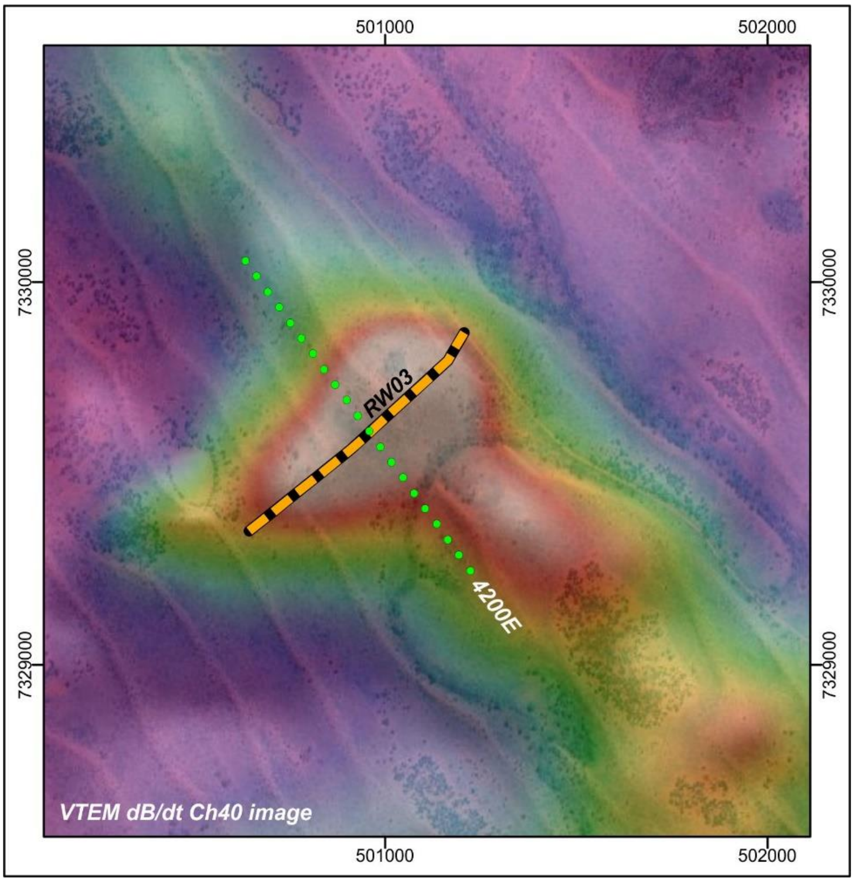

Figure 6. Completed MLTEM line over RW03

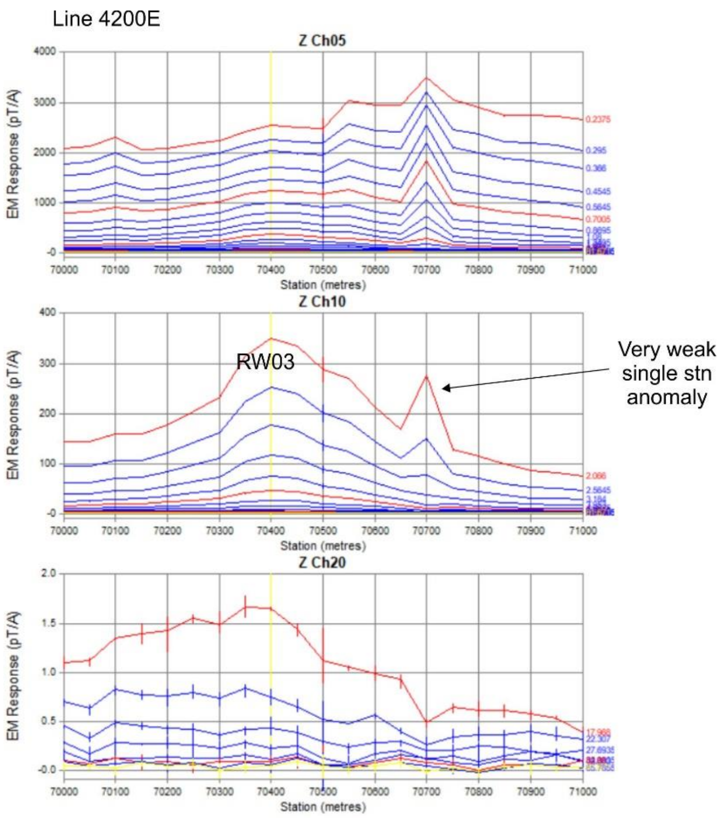

Figure 7. MLTEM Z-component profile for RW03

3.3 RW07

RW07 was identified as a local, single-line, late-time VTEM anomaly (Figure 8) in the NE part of the Ringwood area. The terrain Immediately to the SW of the anomaly is too steep to acquire MLTEM data, so this anomaly was followed up with a fixed loop survey. The VTEM anomaly shape suggests a shallow to moderate NE dip, so the fixed loop was positioned to best couple with that geometry.

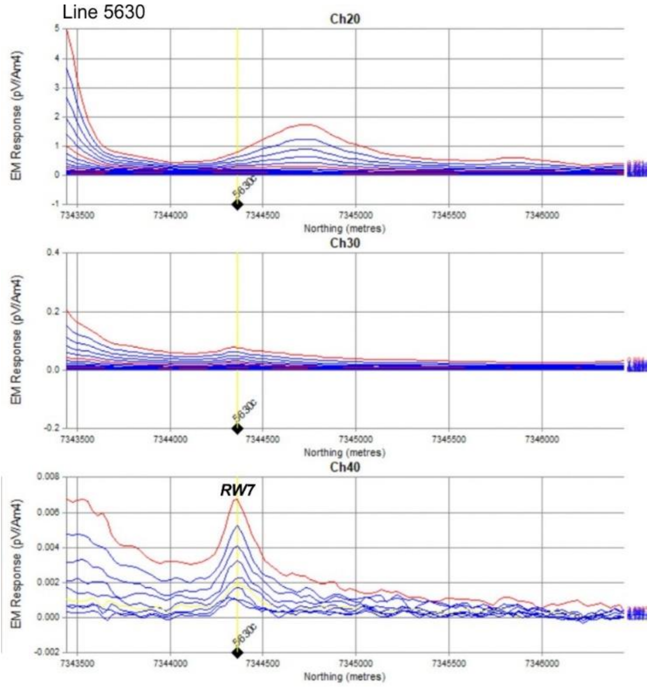

Figure 8. VTEM profile showing the interesting late-time anomaly for RW07

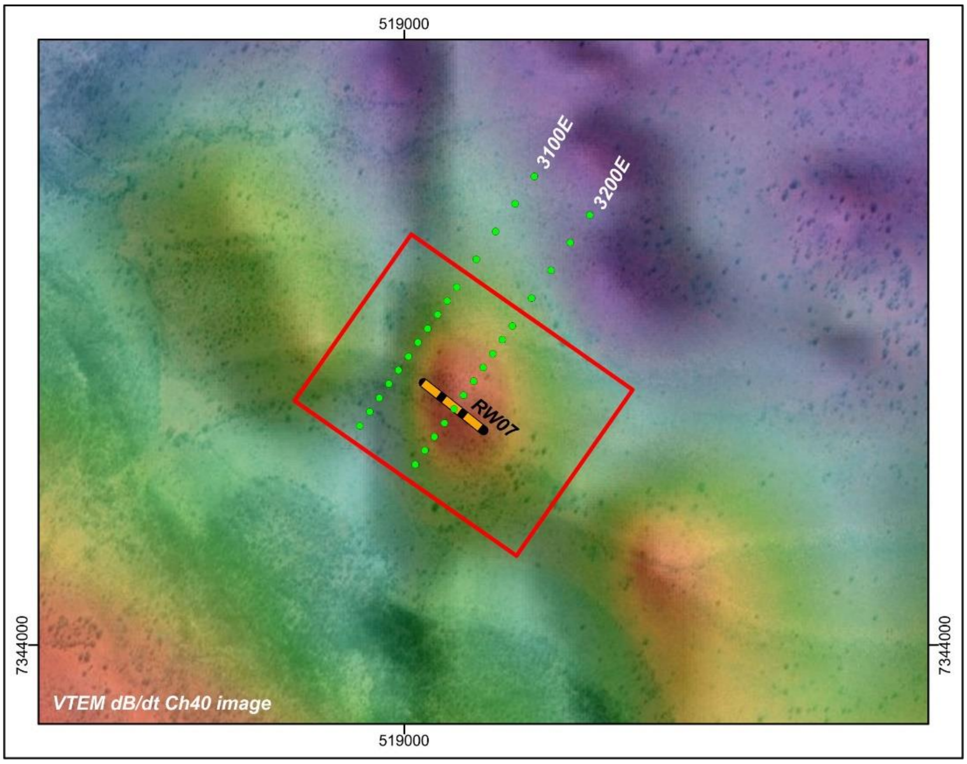

Figure 9. Completed FLTEM lines over RW07

The initial proposal at RW7 was for three lines at 100m spacing, but only two lines were acquired (Figure 9) due to initially disappointing results and time/budget constraints.

There is nothing in the FLTEM data to confirm the VTEM anomaly. Both lines show a spike in the Z-component at late times at the station immediately in-side the loop (Figure 10), but with no corresponding X- or Y-response, and this is clearly a loop effect.

The early-time profiles for this loop are different to the typical FLTEM response, whereby the near-surface ground response is measured as a positive amplitude inside the loop over the first few channels, and a negative amplitude outside the loop (Figure 10). In this case the amplitudes remain positive for significant distance outside the loop before the early times cross over to negative amplitudes. An explanation for this is an extremely resistive near surface, where the outward- and downward-migrating primary field ("smoke ring") has propagated so rapidly, that the positive component of the earth response has migrated to the readings outside the loop even in the earliest channels.

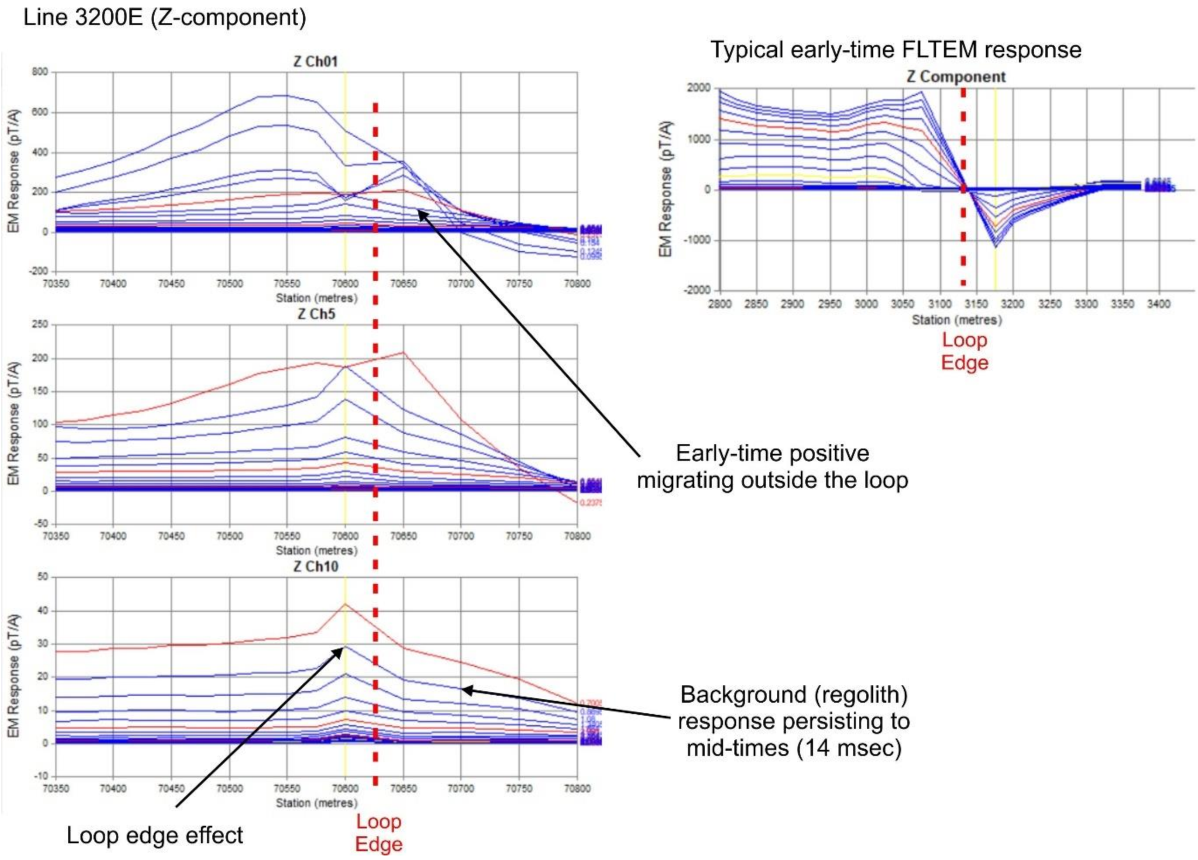

Figure 10. FLTEM Z-component profile over RW07 compared to typical early-time FLTEM response

However, the background earth response in this area persists until 14 msec, so there is some relatively conductive cover also present in the regolith profile. Overall, the measured response can be explained by a resistive layer of quaternary sands overlying a conductive horizon (e.g. weathered basement). This is supported by an attempt to model the late-time response, which resulted in a large, flat-lying weak conductor at around 50-60m depth (Figure 11).

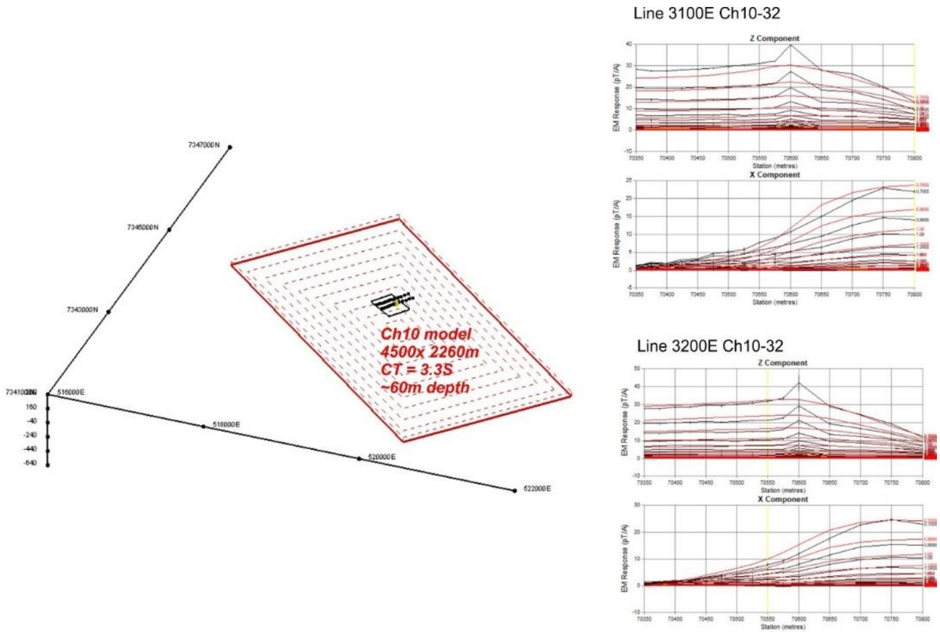

Figure 11. Best-fit mid-time modelling of the RW07 FLTEM response

It is possible the late-time VTEM anomaly here is a drape effect, whereby the transmitter and receiver are closer to the ground over a localised area (Figure 12), and therefore the measured EM response of the conductive regolith has a markedly higher amplitude over the same area. The reason why this manifests as a local mid- to late-time anomaly without an associated early-time anomaly might be explained by the geological model proposed previously, with the EM sensor less sensitive to variations in the response of the resistive cover compared to that of the underlying conductive regolith.

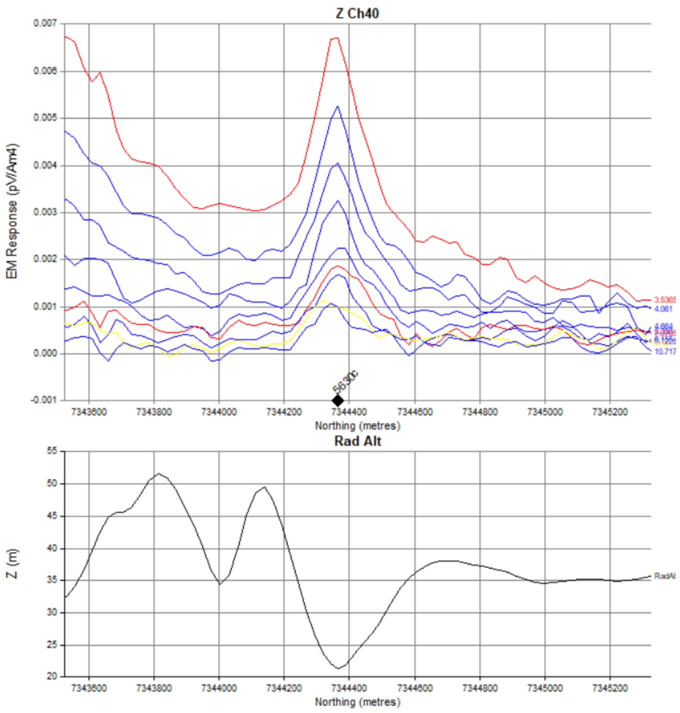

Figure 12. Late-time VTEM response of RW07 versus the altitude of the Rx/Tx showing the collation between relatively low acquisition height and apparent late-time anomaly

3.4 NFB01

NFB01 was identified as large strike-length (1km), good late-time conductor in the No 5 Bore area of the VTEM survey. The NFB01 anomaly looks to be part of a larger strike-length formational conductor that extends to the southwest by at least another 2km, but the anomaly is much stronger over this 1km zone. Plate modelling and CDIs indicate a very shallow northwest dip (Figure 13), with the conductive horizon deepening gradually to the southwest, so it may be that the elevated response is due to a local shallowing of a larger stratigraphic horizon.

Due to the complexity of some of the VTEM profiles and the significant amplitude at the latest channels, it was deemed worthy of follow-up with a few MLTEM lines to test for possible "sweet spots" that could represent accumulations of sedimentary hosted sulphide mineralisation

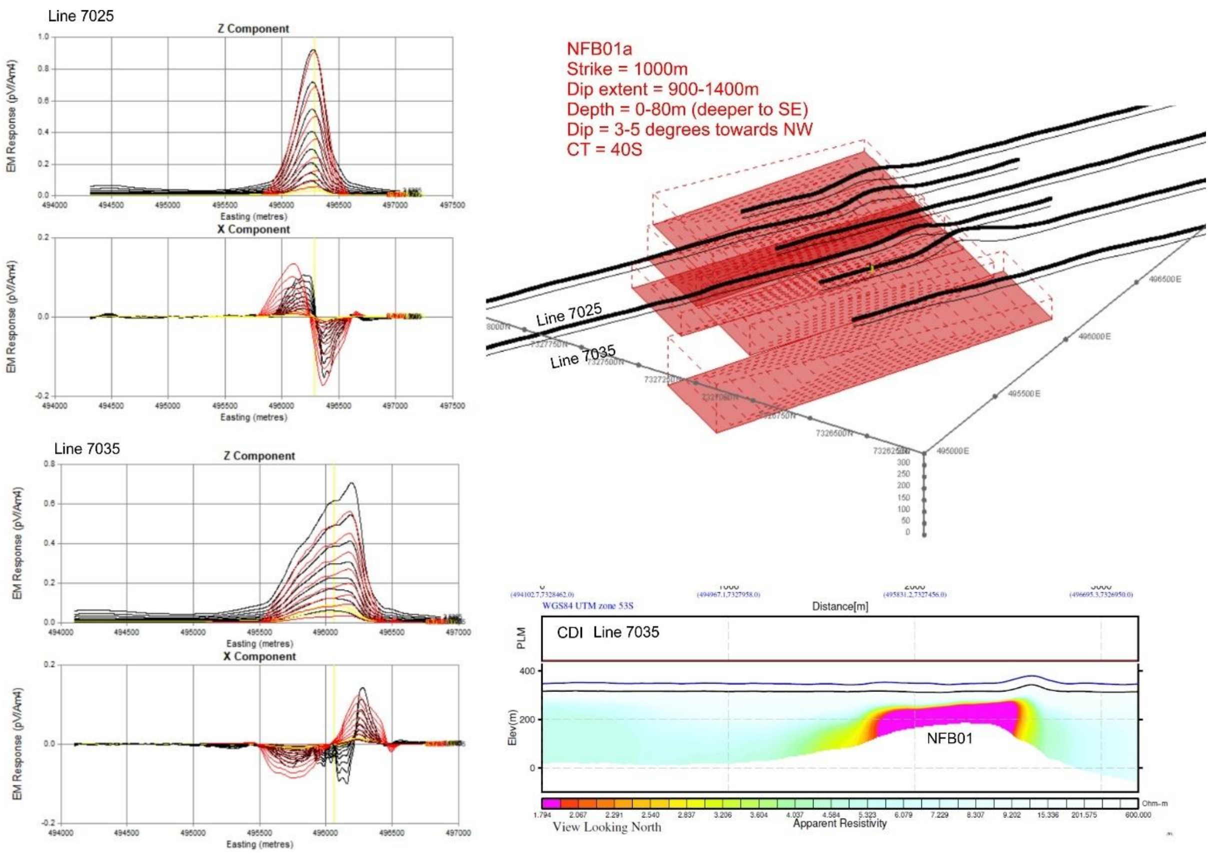

Figure 13. VTEM profiles, modelling, and CDI for NFB1

Three lines of MLTEM data were acquired across the highest amplitude part of the VTEM anomaly (Figure 14).

The early time data from these lines look quite odd and raised some concerns, with large single station spikes, mostly in the Z-component data, and sometimes associated with spikes in the X- and Y-components (Figure 15).

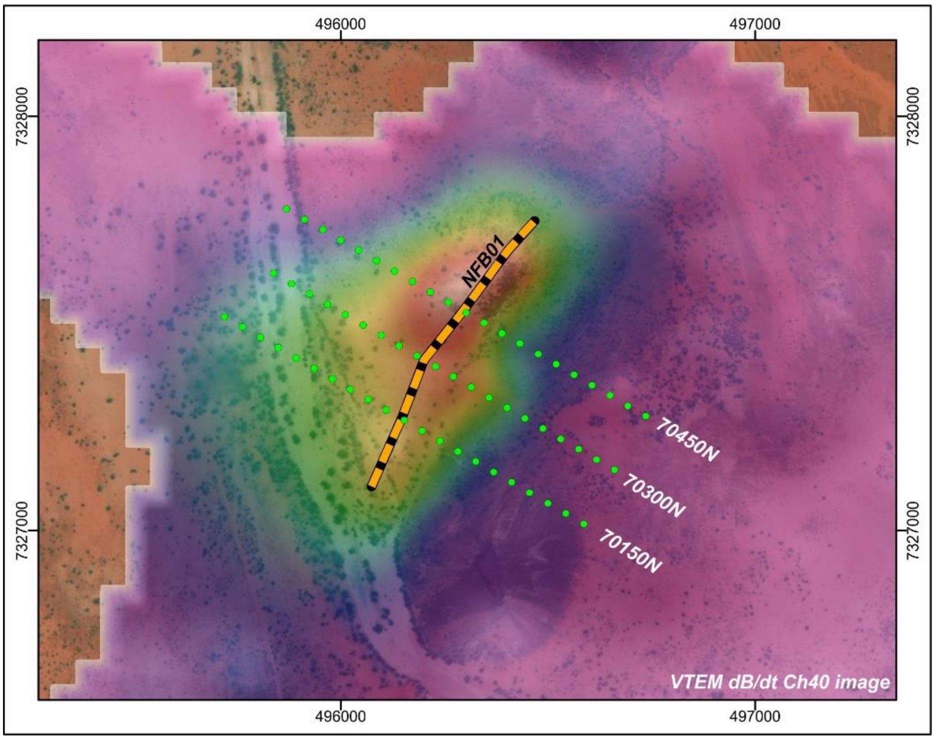

Figure 14. Completed MLTEM lines over NFB01

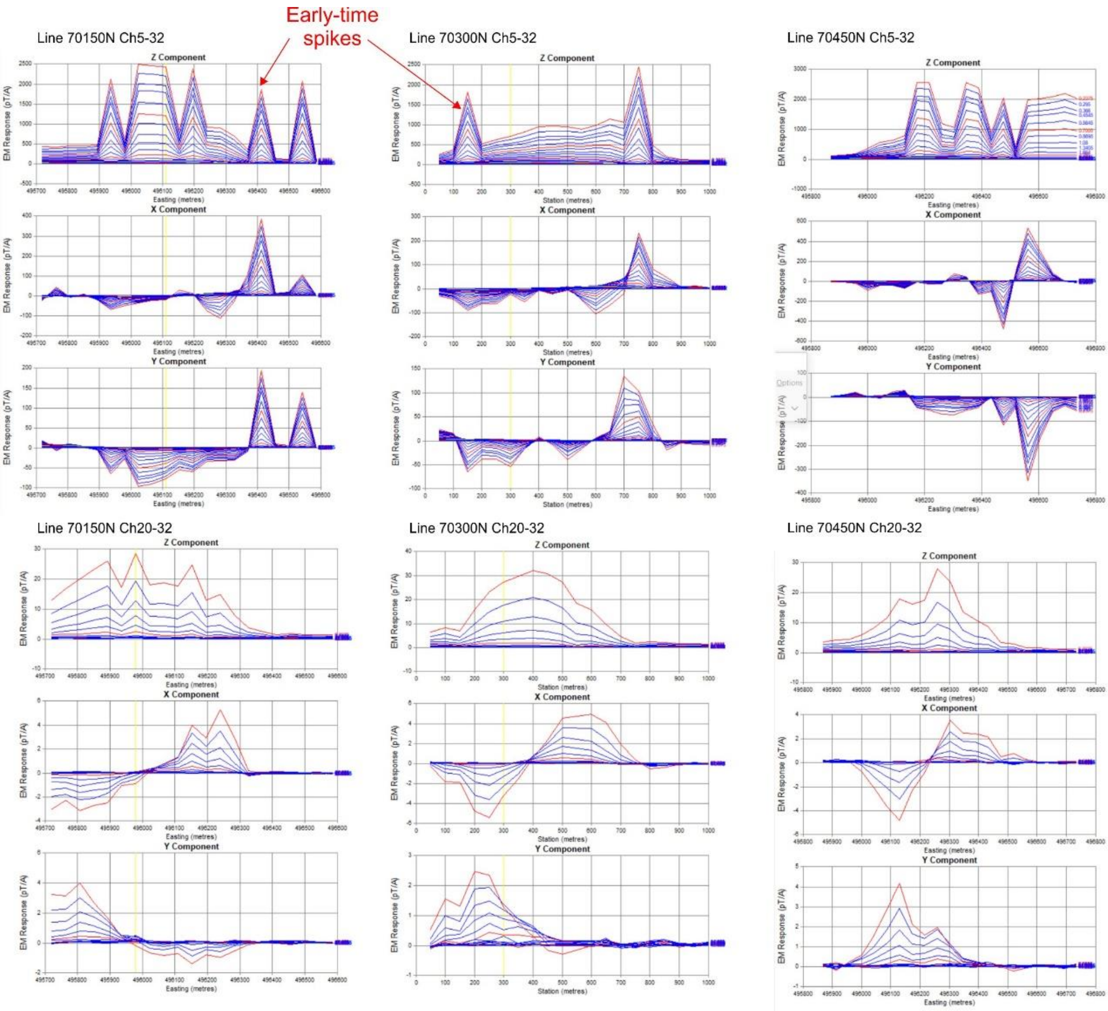

Figure 15. Early- and mid-time profiles for the three lines acquired over NFB01

The subject of using 100 x 100m moving loops with the Fluxgate sensor was discussed in the planning stage due to strange effects from this configuration noted in a previous survey by this author, but up until this area, the use of the smaller loop had not been a problem. The effects here are different to those seen previously, but suspicious none-the-less. The severity of the effect may be dependent on the local ground conditions and may have something to do with terrain. In this case, these apparent artefacts are short-lived, and most attenuated by around 3 to 4 msec, so do not appear to affect the time-windows of interest for the purposes of the survey, although there are a couple of short-wavelength anomalies line 70150N at later times that may be related to this effect (Figure 15). Alternatively, they could be reflecting some local variations in conductivity along the plane of the target horizon.

The coherent, broad later-time amplitudes general attenuate by 30-40msec, so persist well beyond the latest channel of the VTEM survey, but there are no local late-time responses in the data indicative of massive sulphide mineralisation.

Given the geometry of the source (i.e. large dip and strike extent, shallow-dipping stratigraphic horizon), it is difficult to obtain a good model fit to the data using simple plate models, which are best suited for confined bed-rock conductors. However, an attempt at modelling the profiles (Figure 16) suggests there could be two parallel horizons in this area, which may be the reason for the elevated VTEM response in this area compared to the more subtle response along strike to the south.

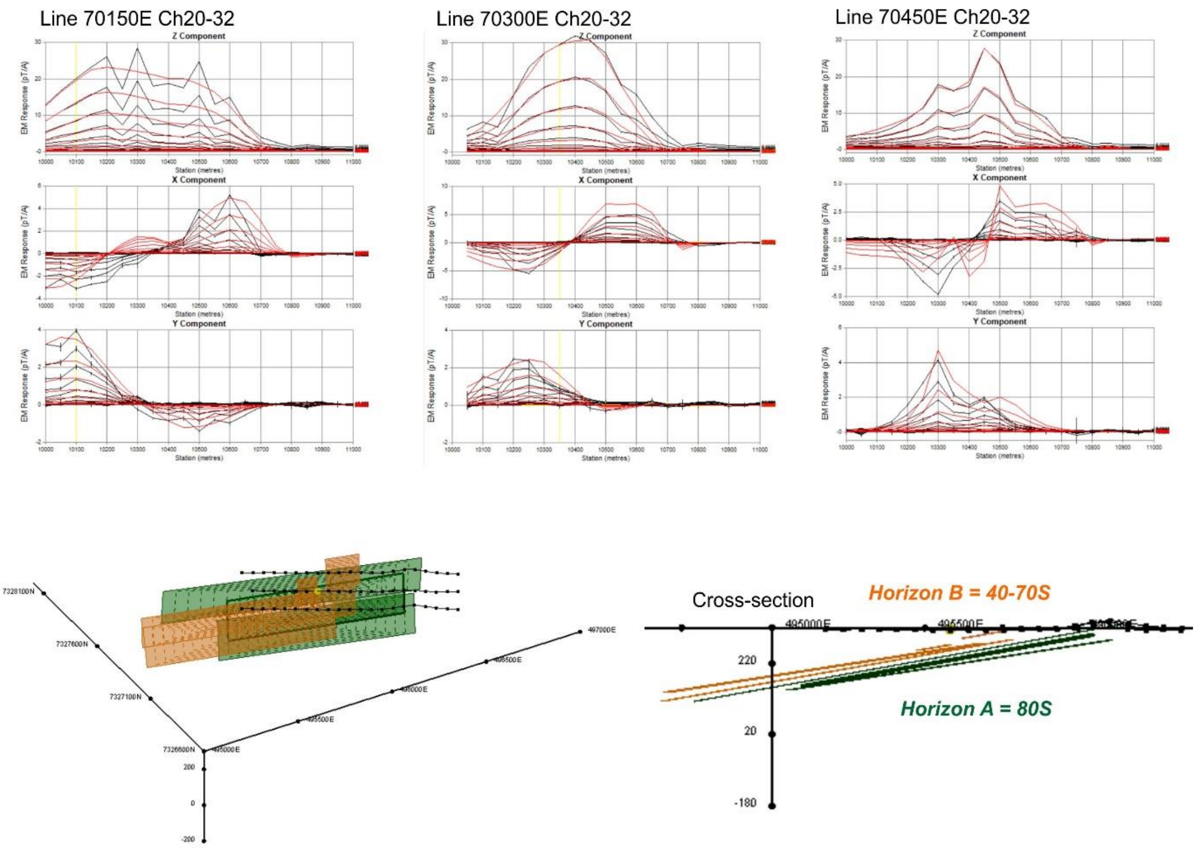

Figure 16. MLTEM modelling results for NFB01

3. Conclusions and Recommendations

Overall, the results of the MLTEM and FLTEM surveys over the selected Ringwood and No 5 Bore targets are disappointing, especially given the cost of logistical issues and weather delays experienced during the acquisition.

RW2 and RW3 look to be regolith responses probably related to preferential weathering over mafic units and/or structures. The FLTEM over RW7 did not confirm the original VTEM anomaly and is likely a drape effect of the helicopter altitude suddenly dropping on the northeast side of a ridge, coupled with the response of a blind regolith profile.

The MLTEM data over NFB01 mirrors the VTEM response and does not reveal any "sweet spots" along the strike or down dip extents of the modelled formational conductor. The modelling of the MLTEM data suggests there are possibly two parallel sources in the area around the strongest VTEM anomaly at NFB01. The conductive horizons are shallow dipping and come close to surface at the southeastern up-dip extent, so should be a simple test with a shallow drill hole to determine the nature of the conductive source.

It is recommended that a larger loop or a slingram configuration is used for future surveys acquired with a B-field sensor to avoid the spurious early-time effects were seen in the data from NFB01.