NEWEXCO SERVICES PTY LTD

A.B.N. 89 088 316 901

EAST BULL LAKE

An Interpretation of the Moving and Fixed Loop EM Survey Novick Lake

March 2009



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SUMMARY

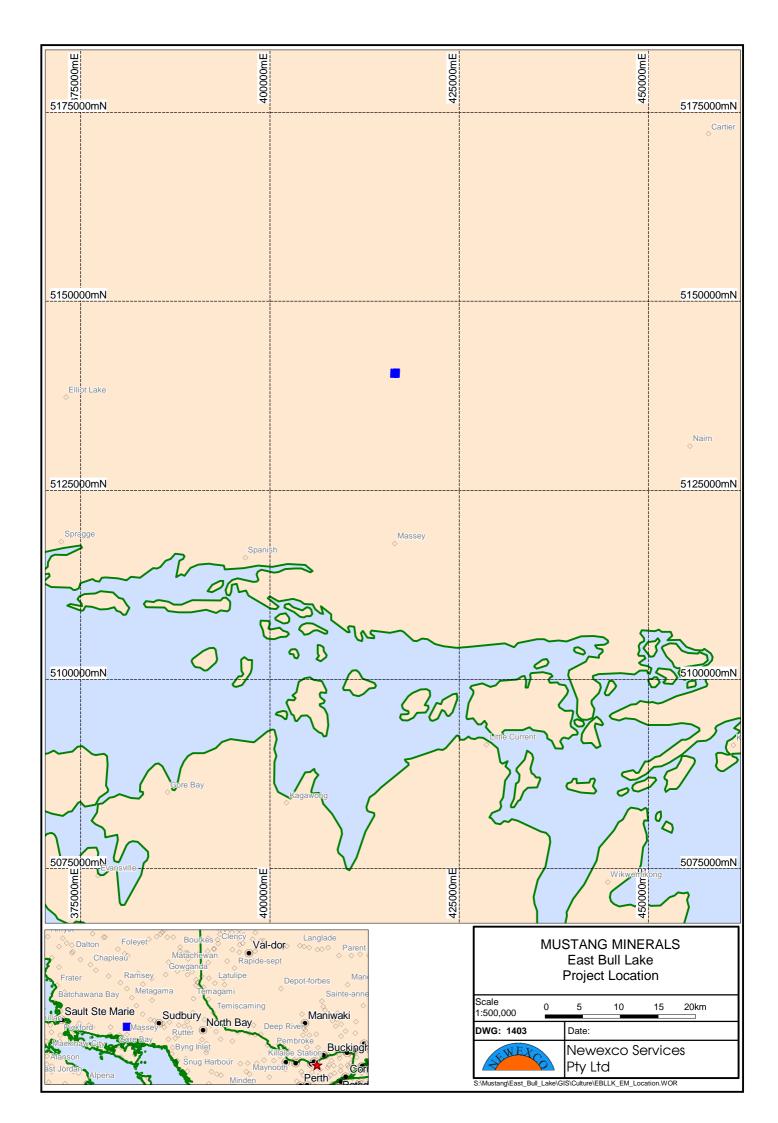
A Moving In-Loop Electromagnetic survey of 6 lines has successfully identified two anomalous zones at Novick Lake, first discovered by the airborne VTEM survey covering the East Bull Lake project. The first anomaly is interpreted as a deep, steeply dipping conductive source with a strike length in excess of 500 m; the second, a similarly steep dipping deep source with a strike length of ~ 200 m. Both anomalies support the VTEM interpretation but are identified in the dBz/dt response only, leaving the geometry of the conductors poorly defined. A Fixed Loop survey designed to further constrain these anomalies failed to respond. Three drillholes have been designed to test the best defined responses of the two conductors taking into account all geometrical variations that the anomalous dBz/dt responses will accommodate.

1. INTRODUCTION

In March 2009, a Moving In-Loop Transient Electromagnetic (MLEM) and Fixed-Loop (FLEM) survey was commissioned over the East Bull Lake prospects Sables and Novick Lake respectively. The surveys were undertaken by Abitibi Geophysics for Western Areas NL (Western Areas) and were designed by Newexco Services Pty Ltd (Newexco) to follow-up on and constrain the anomalous responses identified by the VTEM airborne geophysical survey completed in May of 2007. Initiation of the surveys was subject to successful line cutting in dense woodland. Eventually, the Sables grid was cancelled due to steep topography.

The MLEM survey covering the Novick Lake grid was completed successfully with six lines, one kilometre in length, surveyed. The identification of two poorly defined anomalies prompted the design of a FLEM survey to better constrain the identified sources.

This report documents the interpretation of both the MLEM and FLEM Novick Lake surveys.



2. PREVIOUS WORK

Airborne VTEM geophysical survey – flown in May 2007 for Mustang Minerals covering 938 km. Anomalous VTEM response at Novick Lake provided incentive for follow-up surface EM. See Ebner (2009).

Crone Deepem Fixed Loop EM survey – conducted in June 1997 immediately south of the present Novick Lake grid. Revealed no anomalous response.

3. SURVEY DETAILS

3.1 Personnel

Supervising Geologist:
Supervising Geologist:
Supervising Geophysicist:
Contractor:
Contractor Supervisor:
Crew Chief:
Charles Wilkinson
Robert Barwick
Nicholas Ebner
Abitibi Geophysics
Marin Dubois
Marc Nadon

3.2 Equipment

Data acquisition was achieved using a Protem geophysical receiver built by Geonics Limited. The receiver has the following specifications:

Transmitter Model: Protem EM 37 Receiver Model: Protem V.

3.3 Survey Specifications

Configuration: In-Loop, Fixed Loop Line spacing: 200. 100 m Loop Size: 200 m Line direction: North-South Station Spacing: 100, 50 m Number Turns: Components: X, Y, Z Coordinate System – Projected: NAD 27, NUTM Zone 17 Base Frequency: 7.5 Hz Typical Current: 20 A Stacked Data Recorded: No Time series Recorded: No GPS used: No

3.4 Coverage

The survey was conducted on the line cutters grid as provided in the coverage map below using a local coordinate system. The line cutters grid does not follow the original grid precisely but is skewed to the north-west. Stations have been located by interpolating between the GPS end-of-line locations provided by the line cutters. Line numbers use the local system; stations use the Datum and Projection: NAD 27, NUTM Zone 17.

Line	East_min	East_max	North_min	North_max	Stations	Distance
ML_0	415994	416021	5140000	5141000	11	1000
ML_200	416192	416269	5140000	5141000	11	1000
ML_400	416393	416464	5140000	5141000	11	1000
ML_600	416593	416615	5140000	5141000	11	1000
ML_800	416792	416873	5140000	5141000 11		1000
ML_1000	416992	417050	5140000	5141000	11	1000
				All	66	6000
FL_400	416393	416464	5140000	5141000 19		1000
FL_500	416492	416583	5140000	5141000	5141000 19	
FL_600	416593	416615	5140000	5141000 19		1000
FL_700	416693	416781	5140000	0 5141000 19		1000
FL_800	416792	416873	5140000	5141000	19	1000
				All	95	5000
Datu	m/projection: I	NAD27, NUM	Γ Z17	Total	161	11,000

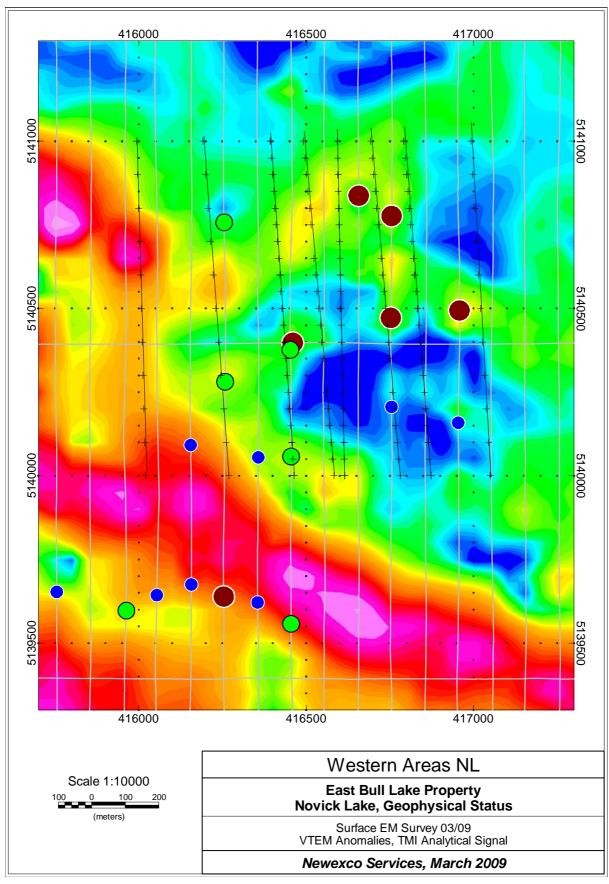


Figure 2: Novick Lake surface EM coverage, VTEM anomalies (cat 1 to 3 – largest to smallest) and Magnetic Analytic Signal colour image.

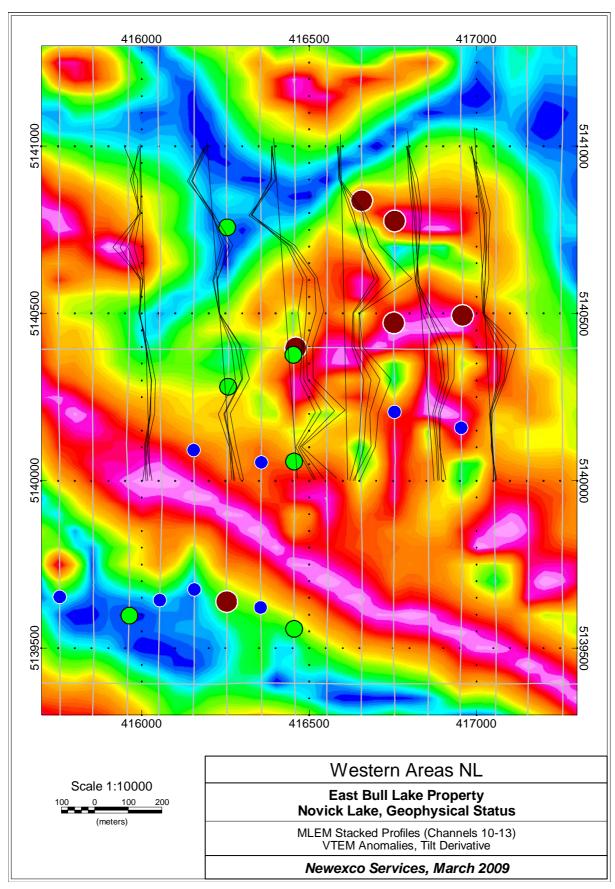


Figure 3: Novick Lake stacked profiles of dBz/dt channels 10 to 13 overlain on VTEM anomalies and Magnetic Tilt Derivative colour image.

4. DATA PRESENTATION AND PROCESSING

Digital data were supplied by Abitibi Geophysics at the end of each field day. The recorded response (mV) was normalised by transmitter current (A) and area and converted from mV into nV/Am².

Field data were inspected for repeatability and consistent decays. Windowed survey data are located in Appendix 1. Windows use the standard Protem window widths and are specified in the data header. Stacked data are held by Newexco for three months after the survey completion.

Logarithmic response profiles versus distance are located in Appendix 2. Selected window times have been contoured and imaged and are displayed within the text. Provided to aid interpretation are MapInfo *.tab files of the coverage and selected time channels in addition to a 3D *.dxf file of all modelled plates for use with mining packages such as Surpac, MapInfo and Micromine: see Appendix 3. Plates *must* be viewed in conjunction with the interpretation to avoid the misuse of poorly constrained conductors.

The coil receiver measures three orthogonal dB/dt flux components where dBz is positive upwards, dBx is along line positive east and dBy is across line positive north.

5. INTERPRETATION CRITERIA

Interpretation was carried out with the objective of identifying anomalies that may be sourced by confined bedrock conductors such as massive sulphide accumulations. These anomalies were then modelled to determine the source position and conductivity. Each modelled anomaly source was then classified by the following scheme and where possible on high category anomalies, drill holes were designed to test the position of the modelled source conductor.

Interpretation was done on 1:10,000 scale profile plots produced by Maxwell, Appendix 2. Modelling was carried out using MAXWELL v 4.13.1

The primary criteria used for anomaly selection and prioritisation were:

- 1. Good spatial definition. Coherent response over several stations along a line.
- 2. Good decay shape. A clear exponential decay evident in the presence of the host response power-law decay.
- 3. Estimated time constant from decay rate. Calculated over several late time channels. Time constants greater than 20msec are sought for Kambalda Style Nickel Sulphide.
- 4. Corroborating spatial response from orthogonal components where recorded e.g. Fluxgate Bx and By.
- 5. Supporting evidence from neighbouring lines where appropriate line spacing was recorded.

Anomalies for the surface EM are ranked as follows. VTEM anomalies do not follow the following criteria and should be assessed according to Ebner (2009).

Category 1: Highest priority. A well defined anomaly demonstrating all of the primary criteria. Anomalies ranked as 1 warrant immediate consideration as a drill target.

Category 1.5: High priority. Clear anomaly that is slightly weak in one ore two of the criteria. Anomalies ranked as 1.5 also warrant immediate consideration as a drill target.

Category 2: Moderate priority. Displays good TEM characteristics overall but has some detractive quality, possibly 2 of the 3 primary criteria or, geological knowledge such as a proximity to a conductive black shale or several drill holes in the area. Category 2 anomalies may warrant drill testing where supported by encouraging additional information such as geochemical anomalism, or geological favourable position.

Category 3: Low priority. A poorly defined anomaly displaying just one of the three primary criteria. Category 3 anomalies do not warrant drill testing without additional (better quality) EM data to confirm the response, regardless of other encouraging information.

6. INTERPRETATION

A long wavelength anomaly (1) traversing the Novick Lake grid from the south-west to north-east and initially identified from the VTEM survey, has been confirmed with the MLEM survey, Section 6.1. This category 2 anomaly manifests itself as a twin-peaked response in the dBz component suggesting a deep vertical conductor, but is nowhere confidently supported by a corroborating dBx response. Subsequent FLEM designed to properly constrain the target failed to reveal an anomalous response; either downgrading the target or the efficacy of the FLEM configuration/location: see Section 6.3.

A second category 2 anomaly has been identified to the south of Novick Lake (MLEM line 400) again confirming the anomalous VTEM response on at least two adjacent lines, Section 6.2. The puzzling lack of a dBx component response remains a concern with the only available explanation being the strong noise component.

Three drillholes have been designed to target the two anomalies as presented in Section 6.4, Drill Proposal.

6.1 Anomaly 1

Adjacent category 1 VTEM anomalies on lines 1490 to 1440 have been confirmed by the MLEM survey, which shows a clear response on three lines 600 to 1000 through the centre of the survey area, Figure 4. It is believed that the poor coupling to the primary field due to the steeply dipping nature of the interpreted geometry explains the missing response in the FLEM survey which was designed to improve constraints on this conductor.

It must be noted that this anomaly was initially identified from only three lines of the VTEM data. Further analysis of the VTEM data reveals the anomalies do exist on six adjacent lines, confirming their continuity along strike. The VTEM anomalies are however difficult to pick as they adjoin neighbouring anomalies along line to the north and subsequently exhibit the response of a broad conductive body.

The strongest MLEM response displays twin-peaks on line 600 of the dBz response, Figure 5. Neither line 600 or 800 exhibits corresponding dBx responses which fall below the noise envelope. Inversion was undertaken with the purpose of defining the range of model conductor geometries which adequately describe the response. The depth-extent was constrained from a minimum of 90 through to 150 m for which the minimum achievable error was guaranteed. No significant change in position was recorded, although as expected, the larger plate returned a slightly greater depth estimate.

The conductor strike direction has been estimated from the VTEM responses due to the lack of dBx,y components in the MLEM data. Drillhole, DH 1 has been designed to test all conductor geometries for line 600 simultaneously. See Section 6.4, Drill Proposal for a table of proposed drillhole attributes.

Decay curve analysis reveals a time-constant of 4 ms on line 600 with an excellent fit to an exponential decay. Anomalies to the east revealed similar 5 ms time-constants. This is considered a category 2 MLEM anomaly.

Further analysis of the model results from lines 800 and 1000 shows support for the geometry of a steeply dipping conductor as modelled on line 600. Both lines 800 and 1000 exhibit a twin-peaked dBz response with a proportionately greater southern shoulder indicating a slight dip to the east, see Figure 6 and Figure 7. Significantly, line 1000 provides substantiation of the single source interpretation based on several corroborating dBx component channels; most dBx channels are affected by noise. A second drillhole is proposed on this line to test the full suite of possible conductor geometries and is presented in Figure 8 and Figure 4, with the hole attributes presented in Section 6.4, Drill Proposal.

Parameters below describe the best-fit modelled MLEM dB/dt conductors (Figure 4). Plates modelled for the entire conductor are provided in the 3D *.dxf file in Appendix 3.

Line	600	800	1000	E
East (centre top)	416604	416835	417020	mE
North (centre top)	5140454	5140530	5140535	mN
Depth	233	296	281	m
RL				
Dip	87	68	81	degrees
Dip Direction	345	172	172	degrees
Rotation	0	0	0	degrees
Strike Length	400	300	300	m
Depth Extent	150	170	150	m
Conductance	250	160	230	S

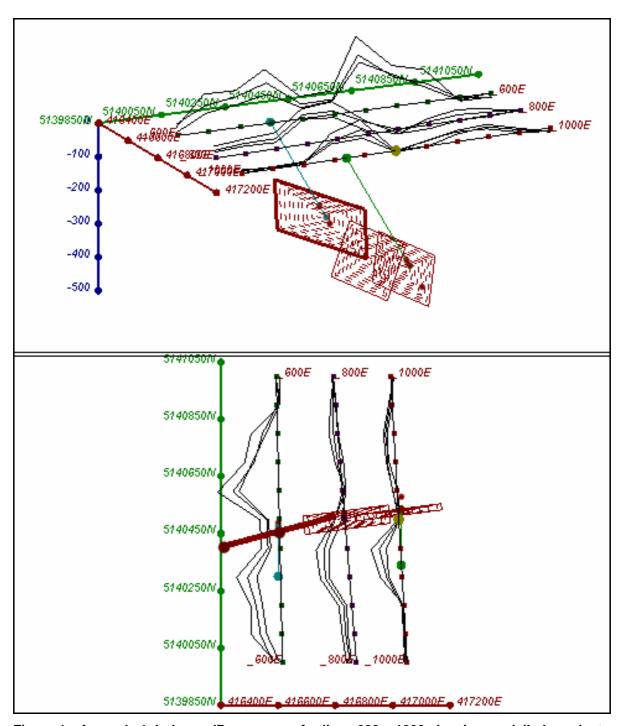


Figure 4: Anomaly 1, In-Loop dBz response for lines 600 – 1000 showing modelled conductor geometries. View from south-east and above. Proposed Drillholes 1 and 2, displayed in blue and green (lines 600 and 1000) respectively.

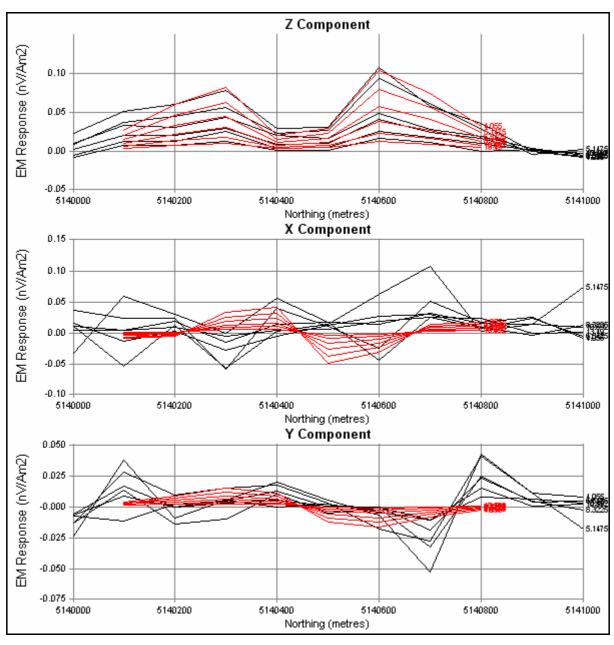


Figure 5: Line 600, MLEM response, channels 12 to 17 (4.5 – 11.8 ms). Black and red profiles represent observed and modelled response respectively. Inversion performed on dBz response only.

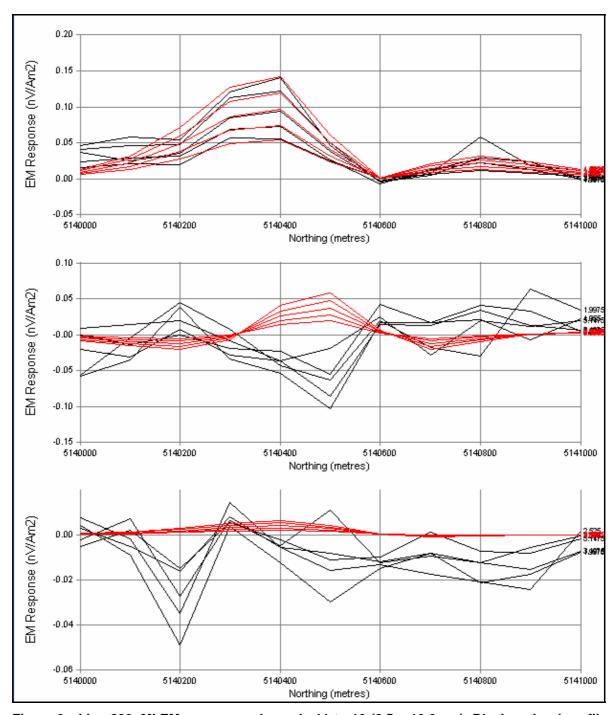


Figure 6: Line 800, MLEM response, channels 11 to 16 (2.5 – 10.6 ms). Black and red profiles represent observed and modelled response respectively. dBz profile supports a single steeply dipping conductor as modelled. No source geometry could be found to simultaneously fit dBx.

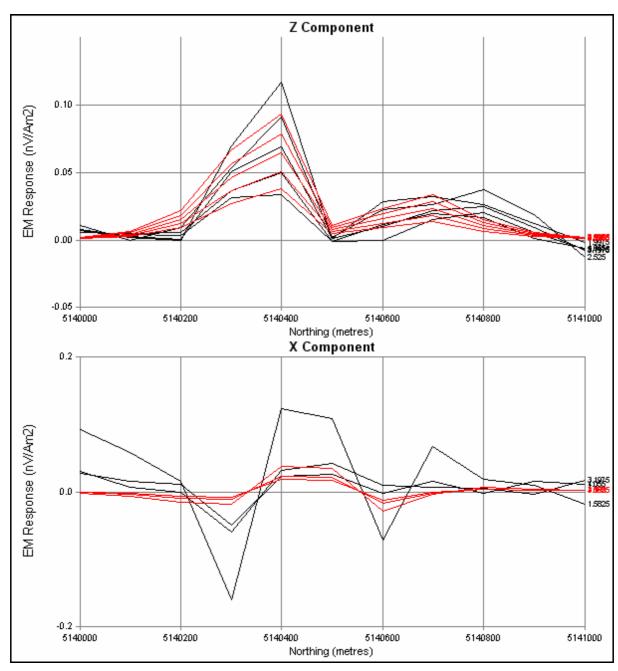


Figure 7: Line 1000, MLEM response, channels 8 to 13 (dBz) and selected dBx channels. Black and red profiles represent observed and modelled response respectively. Selected dBx channels confirm the conductor geometry and rule out the possibility of two individual sources.

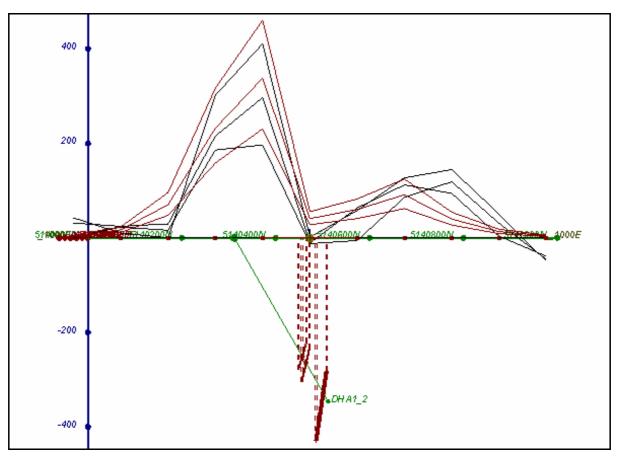


Figure 8: Anomaly 1, line 1000. Moving Loop dBz response and three successful models inverted on a constrained depth-extents with and without dBx channels. DH 2 in green is designed to simultaneously test all model variations.

6.2 Anomaly 2

A category 2 VTEM anomaly has been confirmed at the southern end of line 400. The strike length of the conductor is constrained best by the VTEM system (due to its 100 m line separation) to ~ 200 m, as it is also detected weakly on the adjacent line to the west (blue and green circles, Figure 9). This MLEM anomaly displays a clear, twin-peaked dBz response; however, the sources geometry is poorly constrained due to the low amplitude of the dBx,y components being within the noise envelope. In addition to this, Anomaly 1 is present immediately to the north and may affect the modelled geometry of this conductor, Figure 9. The VTEM response is presented in Figure 11.

Decay curve analysis reveals a time-constant of 5 ms with a good fit to an exponential decay.

Inversion was undertaken with the purpose of defining the range of model conductor geometries which adequately describe the measured response. The DE was constrained from a minimum of 30 through to 110 m for which the minimum achievable error was guaranteed. These results are presented in Figure 12, with drillhole DH_3 designed to test the range of geometries.

This conductor presents a valid target for drilling based on the support from the VTEM response. It is considered a category 2 MLEM anomaly.

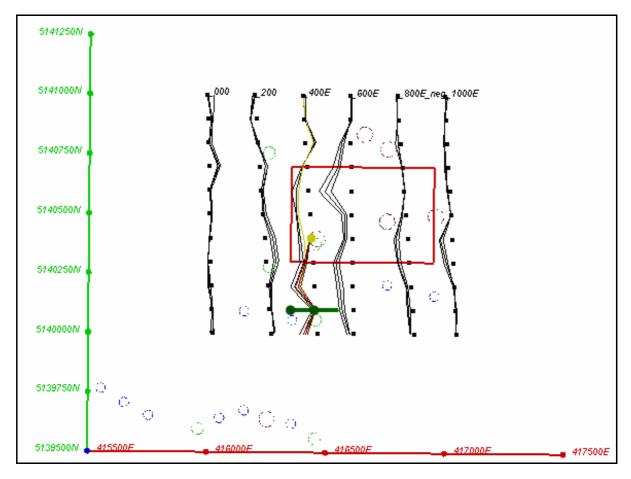


Figure 9: Anomaly 2, green plate and stacked profiles of channels 11 to 16 (2.5 – 10.6 ms).

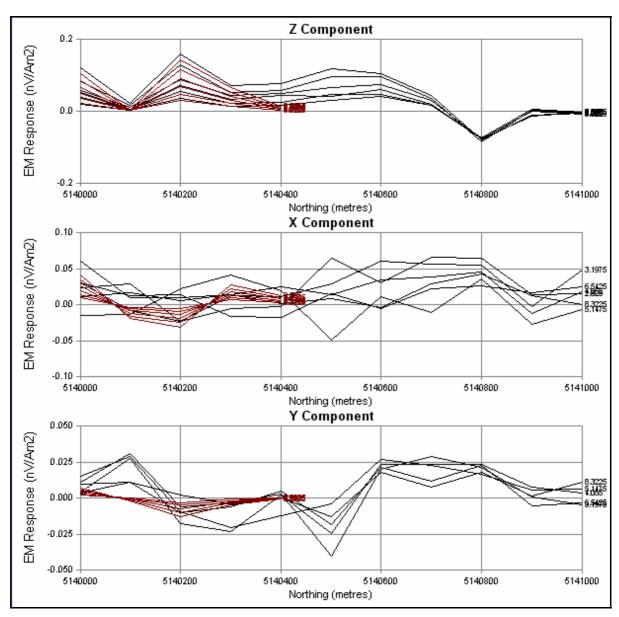


Figure 10: Line 400, MLEM response, channels 11 to 16 (2.5 – 10.6 ms). Black and red profiles represent observed and modelled response respectively.

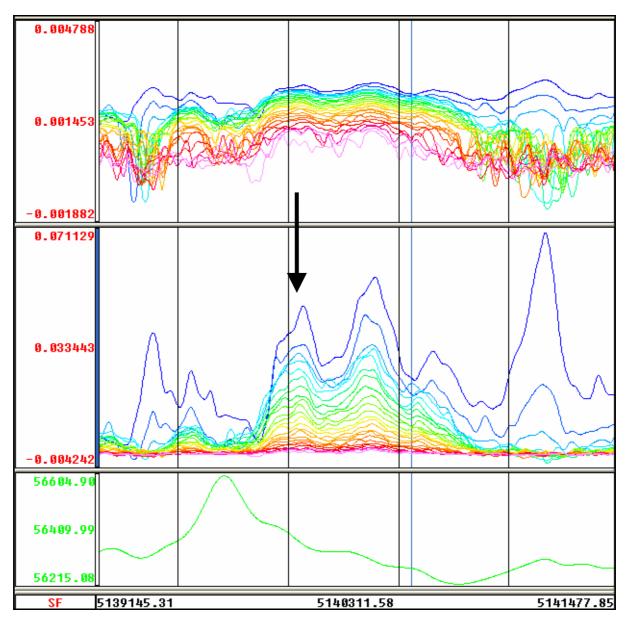


Figure 11: VTEM line 1490, coincides with MLEM line 400. Anomaly 2 is highlighted by the black arrow. Anomaly 1 sits immediately north.

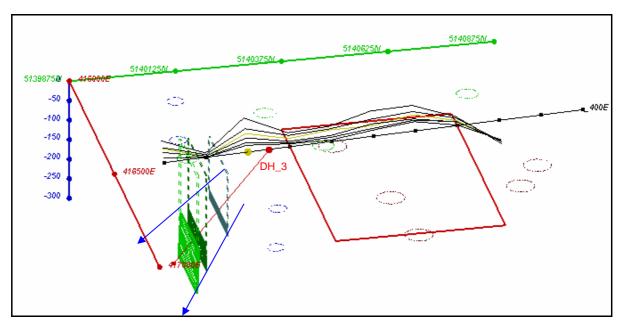


Figure 12: Anomaly 2, line 400. Moving Loop response and three successful models inverted on a constrained depth extent ranging from 30 to 110 m. The blue arrows indicate the envelope through which drilling should be targeted as suggested by DH1 in Red

Parameters below describe the modelled in-loop dB/dt conductor of Figure 12 (centre). Plates modelled for the entire conductor are provided in the 3D *.dxf file in Appendix 3.

East (centre top)	416450	mE
North (centre top)	5140080	mN
Depth	177	m
RL		m
Dip	90	degrees
Dip Direction	180	degrees
Rotation	0	degrees
Strike Length	200	m
Depth Extent	70	m
Conductance	520	S

6.3 Fixed Loop Survey

Subject to the lack of a convincing response from the deep conductors identified by the VTEM system in the Novick Lake survey area, a FLEM survey was proposed in the hope that the improved field strength from the large loop would provide a stronger response and hence help to constrain the geometry and properties of the target better than the MLEM. The loop was centered over the top of the VTEM anomaly (MLEM Anomaly 1), since geometry was not well understood; this configuration would place the strongest field at the target. All components were recorded.

Forward modelling of the FLEM response to the MLEM targets suggested that the target should respond above the noise level; however, no clear long wavelength response attributable to the deep conductors was identified. Figure 13 provides a comparison of the expected EM response superimposed on the observed response for line 700. With some imagination one can see evidence of the target in the observed response; however, this is subtle at best. Adjacent lines provide no indication of the presence of a deep source.

Numerous apparently anomalous, single station responses exist coincident with the transmitter loop which are caused by 'edge effects' where weakly conductive regolith can respond strongly in close proximity to the loop.

Although the FLEM configuration theoretically requires some a-priori knowledge of the conductor geometry before design of the loop, it is generally recognised that minimal coupling of the loop to a buried conductor is extremely unlikely due to the nature of a geological target. The In-Loop method suffers fewer uncertainties which substantiate the benefits of the configuration, despite the additional cost in time and line cutting.

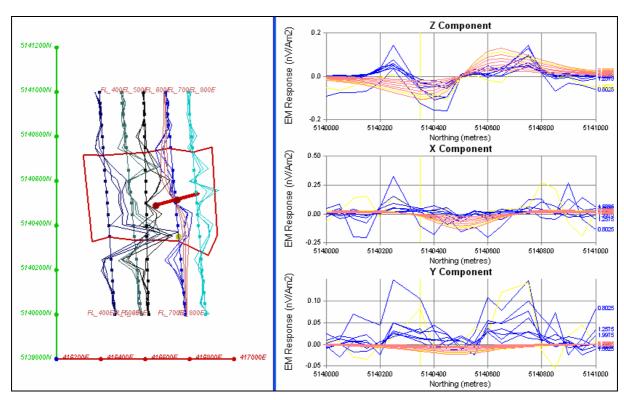


Figure 13: Forward modelling of MLEM Anomaly 1 with Fixed Loop configuration. Despite

6.4 Drill Proposal

Three drillholes have been designed on the NAD 27 datum. The first two test anomaly 1 whilst the third tests anomaly 2. Drill azimuth is not consistent and reflects the need to simultaneously test all satisfactory model variations and the steep dip of the modelled conductors. No priority has been placed on holes as there is not enough information to make this judgment effectively.

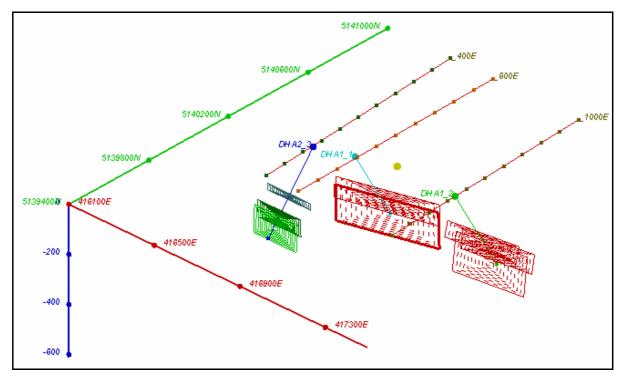


Figure 14: Proposed drilling, Novick Lake

Table 1 - Project Suggested Drillhole Locations

Number	Easting*	Northing*	Dip	Azimuth	Length	RL	Intersection
1	416600	5140300	60	0	350	370	~ 325
2	417030	5140340	60	0	410	360	290 - 390
3	416450	5140250	50	180	350	370	190 - 290

^{*} NAD 27, NUTM Zone 17.

7. CONCLUSION AND RECOMMENDATIONS

The Surface EM survey conducted at Novick Lake was designed to follow up on encouraging results from the analysis of the VTEM airborne EM survey flown in May 2007. Two VTEM anomalies were corroborated by the MLEM data which were subsequently modelled and recommended for drill-targeting.

Due to the low amplitude and long wavelength of the response however, a well constrained model was not achieved for either source. The Geonics, Protem acquisition system was not capable of the signal to noise ratio required to verify the anomalous dBz response in both cross-components, dBx,y. It was hoped the surface EM survey would identify conductors with outstanding electrical properties, that is, decay constants of greater than 3.5 ms to which the VTEM system is limited (due to its base frequency). Whilst this was achieved, again either the lack of a strong conductor or the presence of noise prevented accurate measurements of the response out to a delay time at which such conductors can be identified.

As such, this MLEM survey has not ruled out the possibility of conductors with significantly greater time-constants from being identified within the survey area and the successful targeting of the modelled conductors may reveal matrix to massive style sulphide accumulations. The geometry of the modelled conductors precludes the identification of broad conductive sources. The thin-plate-like responses are most likely evidence of sedimentary graphitic conductors or thin conduits, 'feeders', of sulphide mineralisation.

Typically, FLEM surveys are performed in Canada due to the increased acquisition speed and reduced cost in line cutting. According to Malo-Lalande et al. (2005), the MLEM configuration is rarely employed in favour of the simpler FLEM surveys. Results from Novick Lake however, indicate that without a-priori knowledge of the source geometry especially for deep targets, the MLEM configuration is desirable. In this case FLEM missed the targets all together.

8. REFERENCES

Ebner, N., 2009, East Bull Lake, VTEM Airborne EM Survey Processing and Combined Interpretation with Historic Geophysics, Newexco Services.

Malo-Lalande, C., Chouteau, M., Marcotte, D., Boivin, M., 2005, Time-domain electromagnetic data interpretation using moving loop configurations for sheet-like base metal ore deposits in resistive hosts: Exploration Geophysics, **36**, 368-374.

APPENDIX 1 EMBEDDED DATA FILES IN AMIRA FORMAT

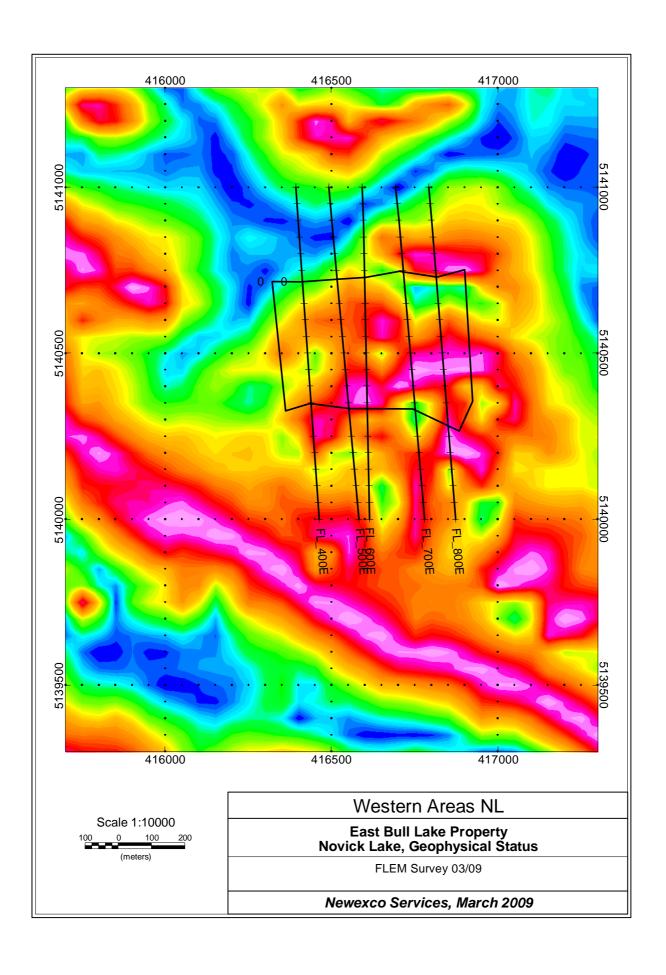
(Also available on CD included on back page of this Report)

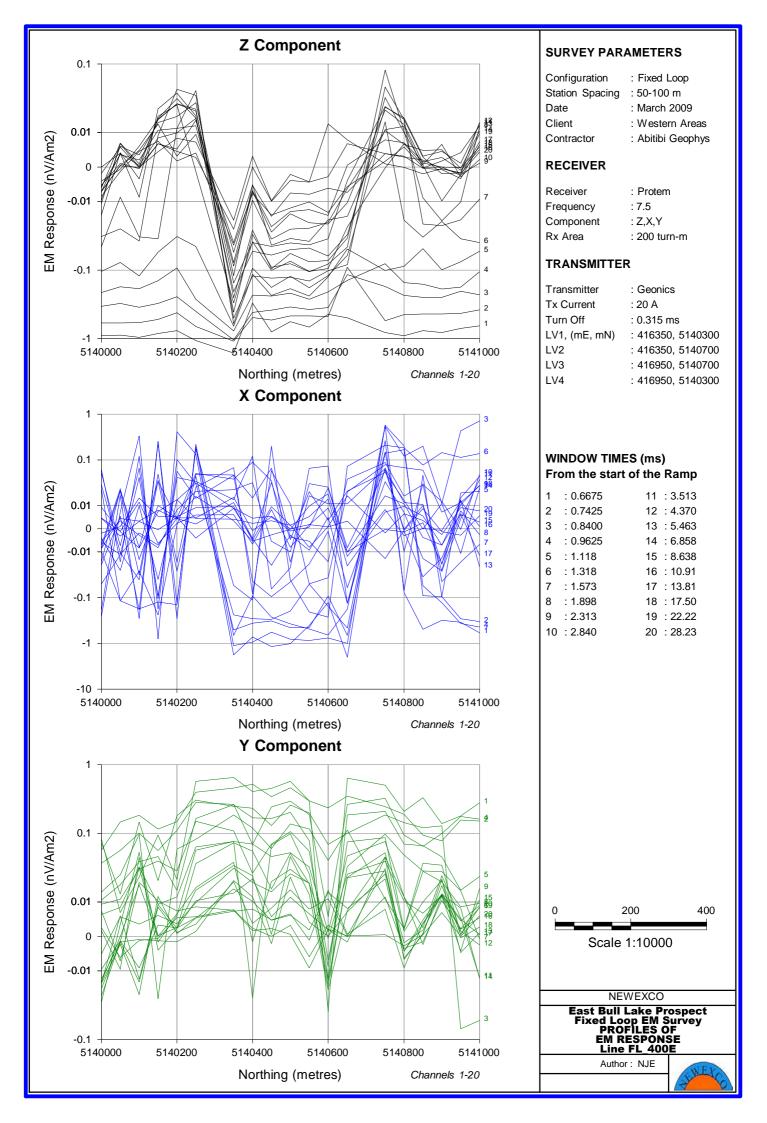


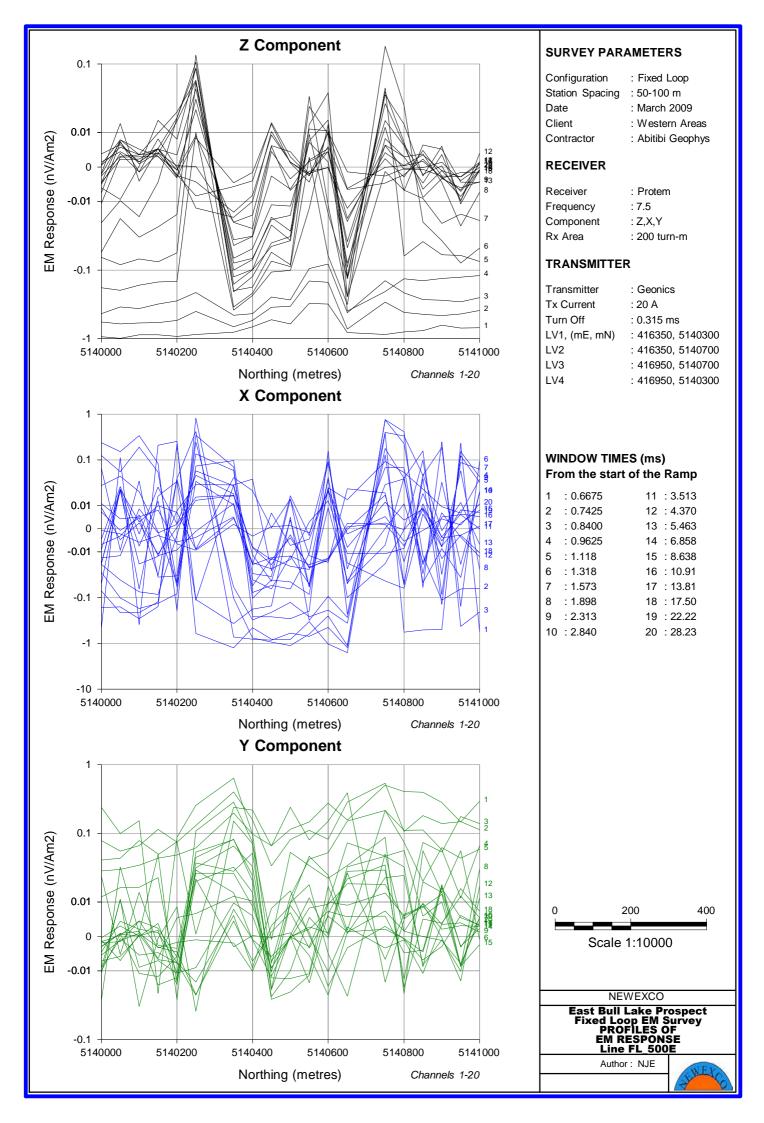
All Data Combined

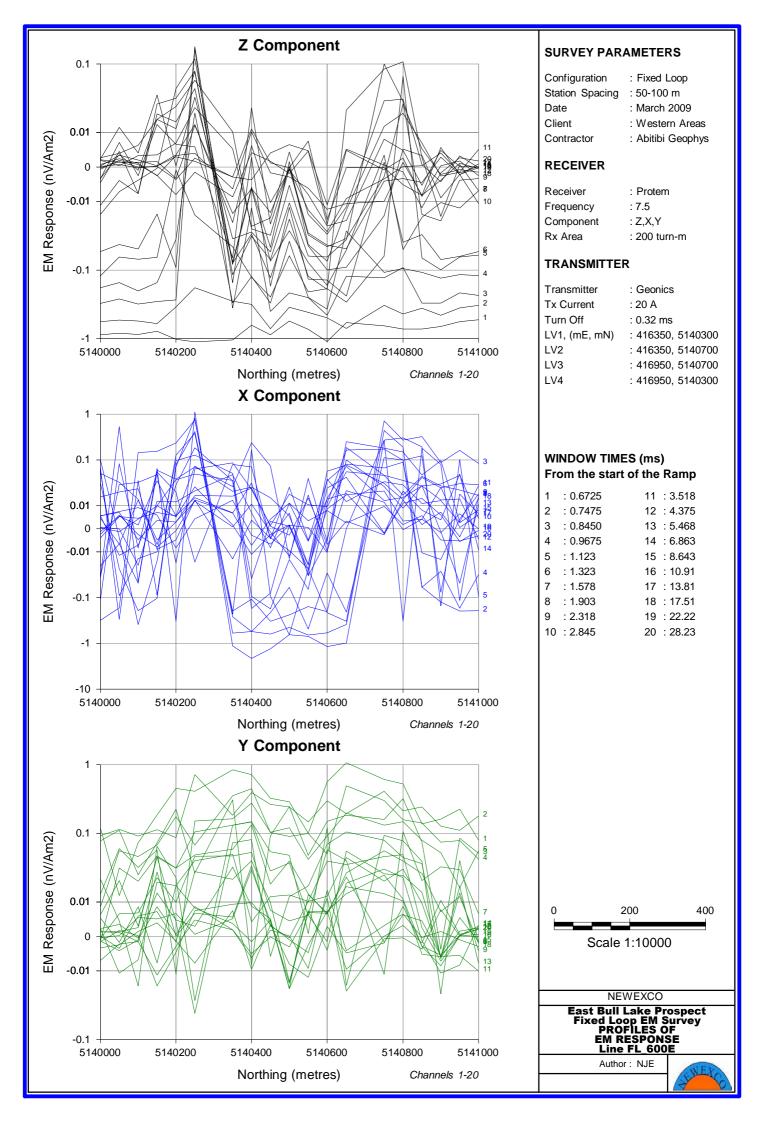
APPENDIX 2 LOGARITHMIC AND LINEAR PROFILE PLOTS

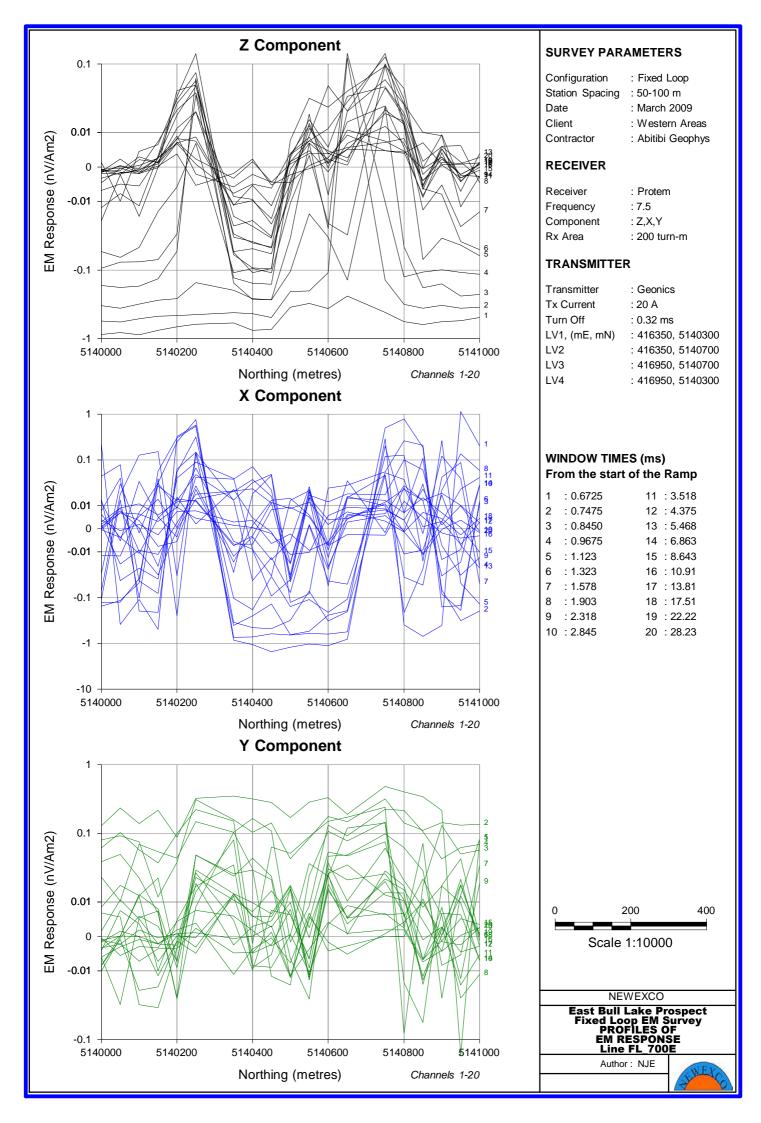
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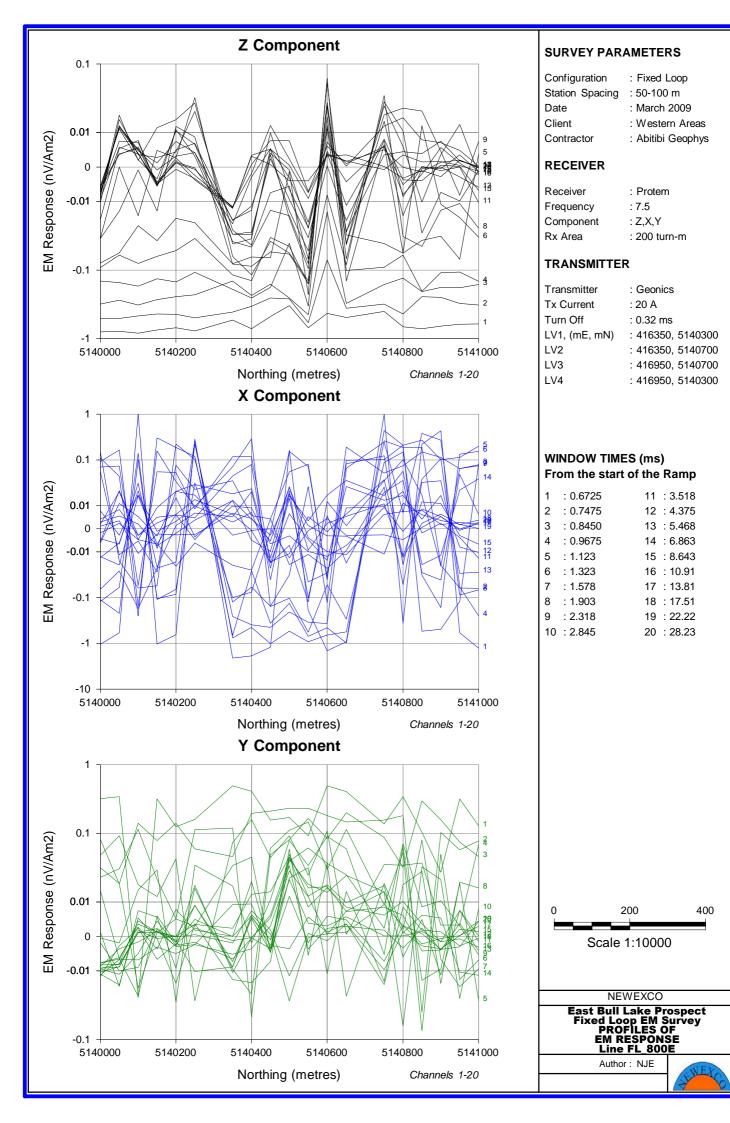


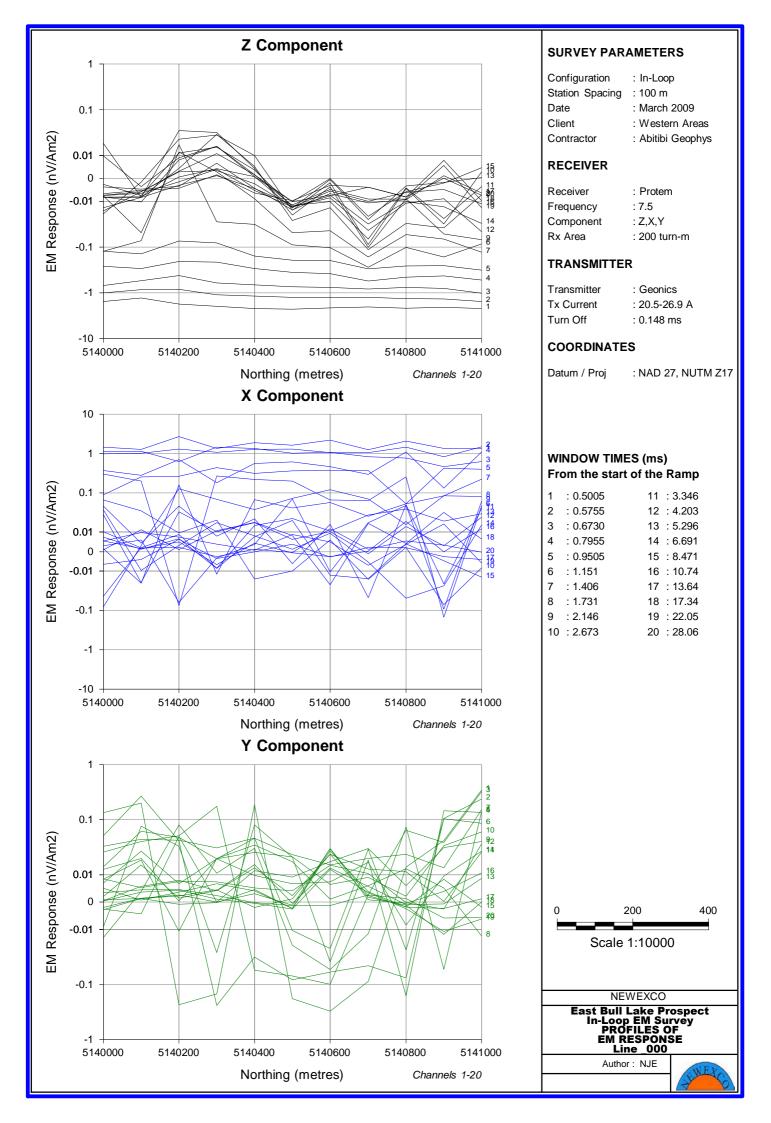


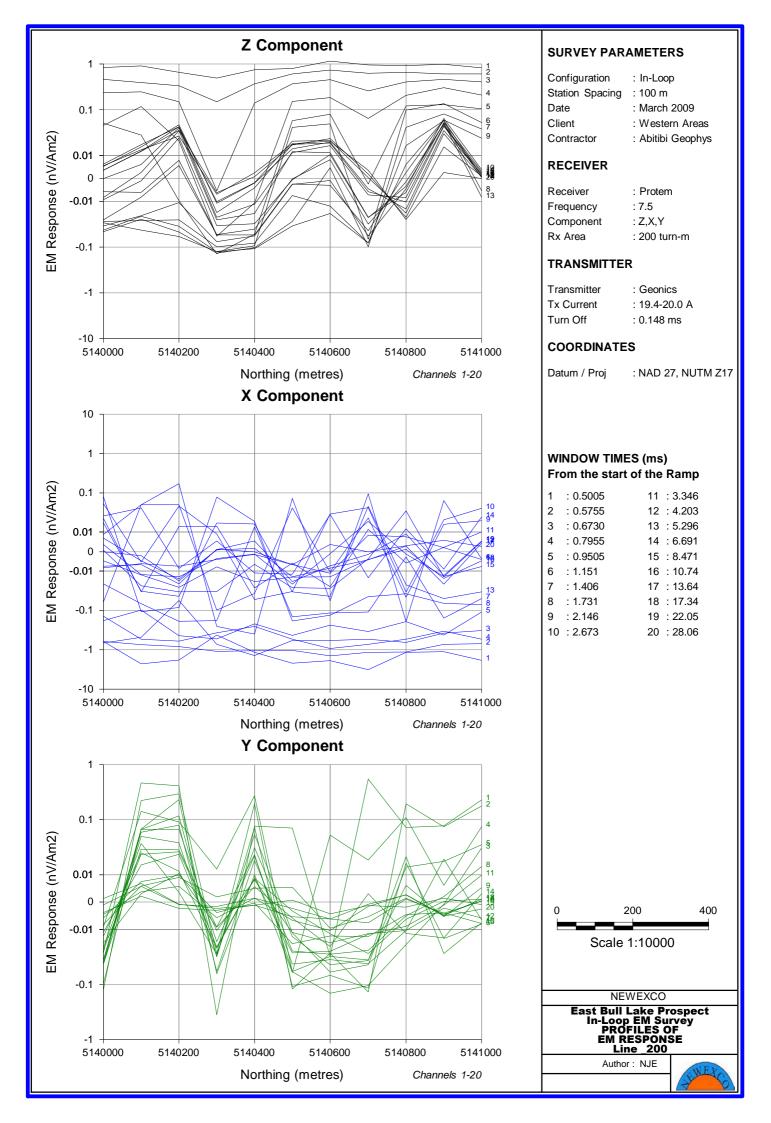


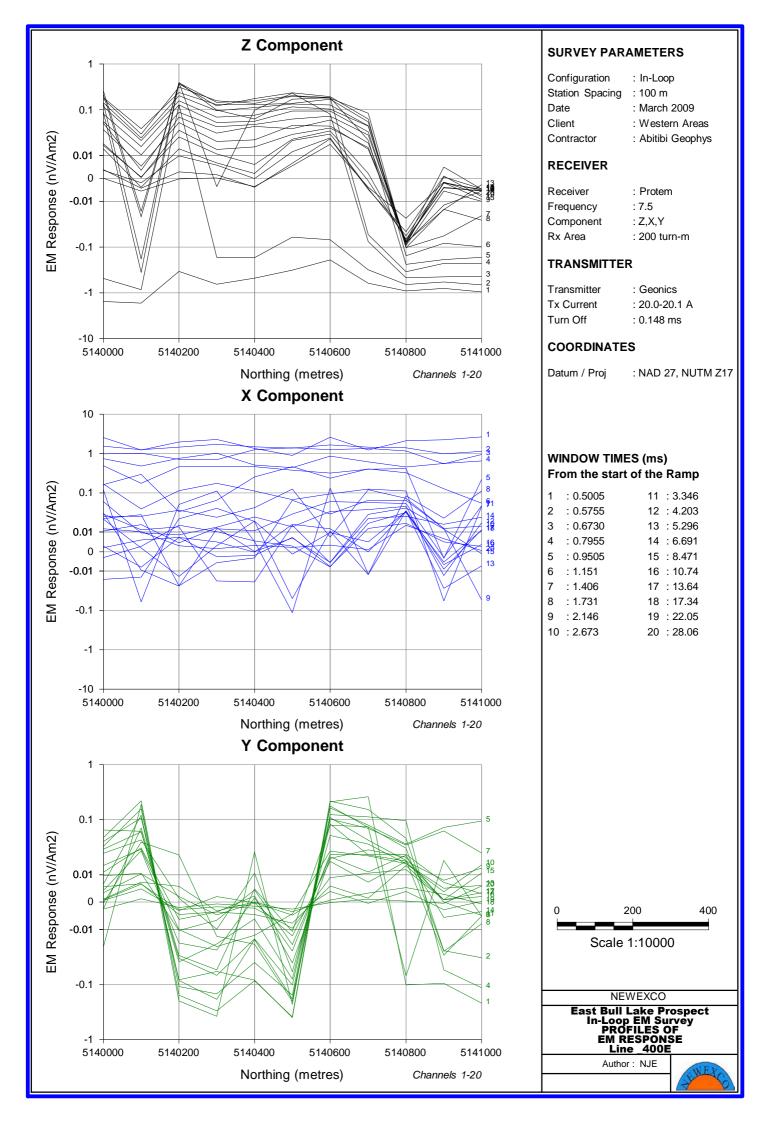


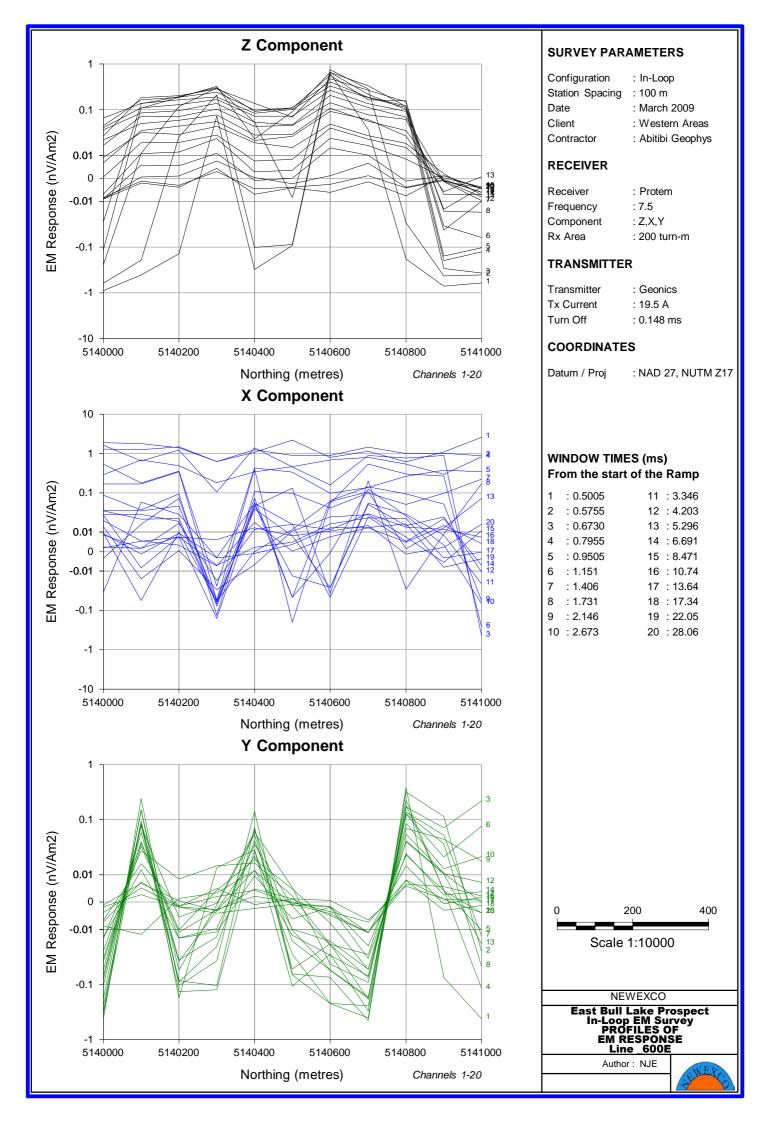


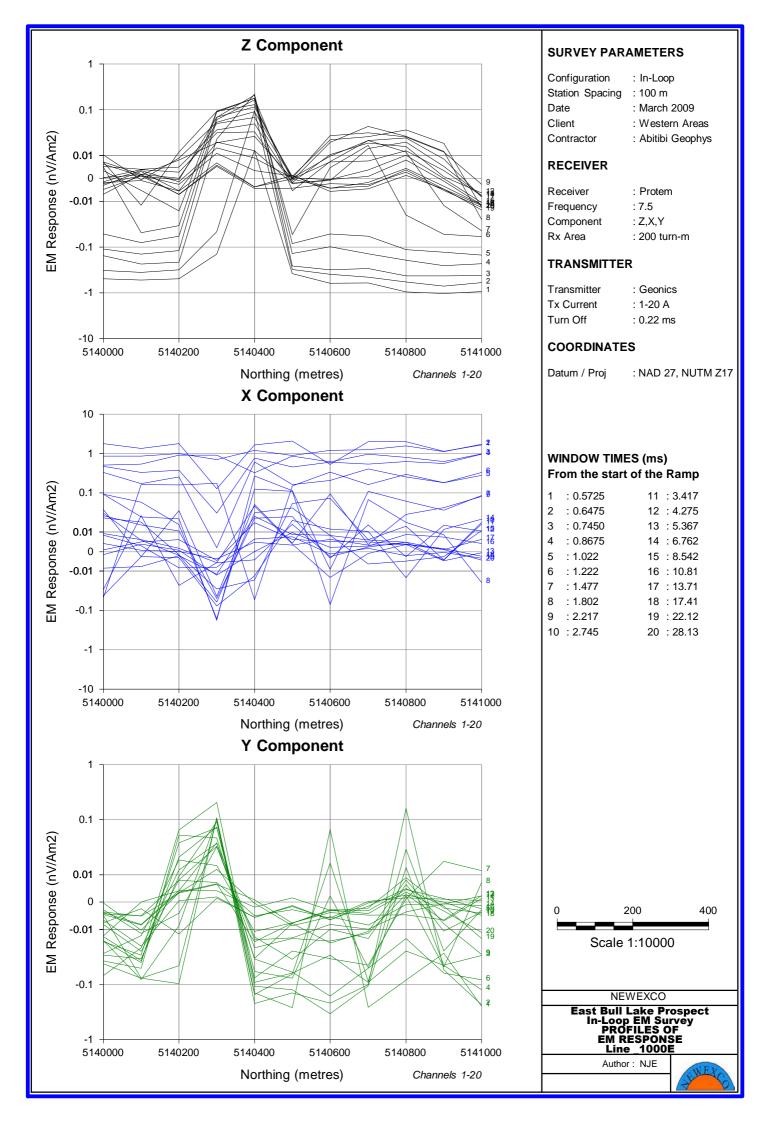


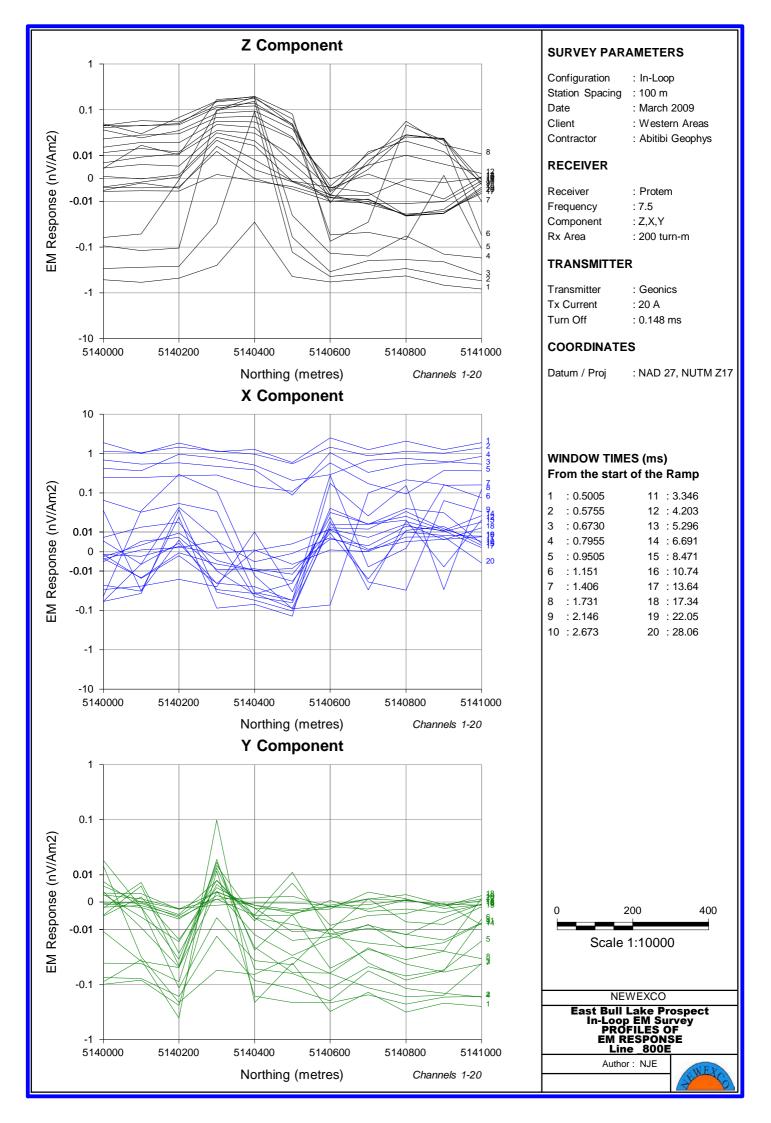












APPENDIX 3

MapInfo *.tab FILES AND 3D *.dxf of PLATES

(Also available on CD included on back page of this Report)



MapInfo Tab Files



Modelled Plates in DXF Format

