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MEMORANDUM

TO	Costica Vieru - Thunderlarra Exploration Limited
FROM	Greg Maude / Russell Mortimer - Southern Geoscience Consultants
DATE	5/1/2014
REPORT NO.	SGC2895
RE	Allamber Project, NT - Borehole Magnetic Survey Documentation/Modelling

Down-hole magnetic data, including three component fluxgate readings and magnetic susceptibility logs, have been acquired at Thundelarra's Allamber Project in the Northern Territory. The data have been processed and modelled by SGC to locate off-hole magnetic bodies.

This memo discusses the results of the borehole logs / surveys, and documents that data processing and modelling efforts that have been completed.

1 DATA ACQUISITION

Downhole orientation surveys along with magnetic susceptibility and conductivity logging were completed by Direct Systems Australia at the Allamber Project. The drill-hole details are summarised in the table below;

Table 1. Drill-hole details for downhole surveys at the Allamber Project.

HOLE_ID	PROSPECT	MGA52east	MGA52north	RL(m)	EOH(m)	DIP°	AZI°
TAL090RC	NthBrumby	822870	8499870	121	59	-60	180
TAL091RC	NthTarpon	823455	8498363	150	191	-60	300
TAL102RC	Ox-Eyed	822880	8498040	143	82	-85	270
TAL116RC	Ox-Eyed	822830	8497995	139	109	-90	000
TAL117RC	Ox-Eyed	822780	8498003	142	100	-90	000
TAL126RC	Ox-Eyed	822914	8497926	134	156	-70	270
TAL136RC	Ox-Eyed	822774	8497937	130	282	-80	180

Three component fluxgate magnetometer and accelerometer readings from a magnetic orientation tool have been supplied for all drill holes at a station spacing of 0.5m.

Inductive conductivity, magnetic susceptibility and gamma radioactivity measurements are supplied for all holes at a station spacing of 0.1 m.

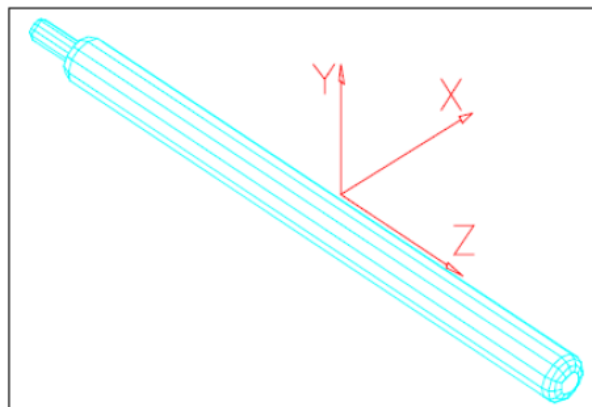
2 DATA PROCESSING

The Potent software used for down-hole magnetic modelling requires the three components of the magnetic field to be resolved for the geographical (East, North and Up) coordinates. Typically, downhole magnetic measurements are provided relative to the drill-hole direction, i.e. the Z, X and Y components as described in Figure 1. After some background checking, it was determined that the fluxgate tool used by Direct Systems (National Oilwell SR0027-R8) uses the same coordinate convention as described in Figure 1

The first processing step is to calculate the 3 geographic components of the magnetic field from the raw data, there are two important caveats that must be considered during this processing step;

1. The azimuth of the drill-hole is calculated from the magnetic readings, assuming that the east component of the magnetic field is zero (i.e. the magnetic field direction is north-south). This is only true in the absence of magnetic material in and around the-drill hole. The presence of magnetic materials will distort the local magnetic field, resulting in the incorrect calculation of the azimuth. Survey points affected by magnetic material near the drill hole either need to be removed from the calculation (often a subjective process), or control points can be added to the drill-hole path from other surveys (such as a gyro survey), if available.
2. For very steep drill holes, accurate rotation readings required to calculate the X and Y component directions cannot be recorded. This means that the East and North magnetic field components cannot be resolved; however, modelling can still be completed using the Total Magnetic Intensity (i.e. $(B_z^2 + B_x^2 + B_y^2)^{1/2}$). This issue specifically affects drill-holes TALRC102, 116 and 117.

The probe measures the magnetic field and acceleration in three different directions, that is, along three orthogonal axes. The probe has an index mark (a 'V') stamped on the lower part of the housing. This mark indicates the side of the probe from which the positive X axis extends. The Z axis is the longitudinal axis and points down. The Y axis is defined using a right hand coordinate system where the cross product of X and Y equal Z. The X and Y axis are in the horizontal plane when the probe is vertical.



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Figure 1. This diagram shows how the component directions are defined for the raw magnetic (Bx, By, Bz) and gravity (Gx, Gy, Gz) vectors.

Taking into account these factors, the data has been processed to resolve the geographical components of the magnetic field using the Raw2XYZ software. This programme is supplied with Potent software specifically for processing down-hole magnetic data.

An example of the processing is shown below (Figure 2). The raw magnetic and gravity components are processed to calculate the drill-hole azimuth and inclination, which are in turn used to resolve the three geographical components of the magnetic field. The EAST magnetic field is extracted by smoothing or straightening the azimuth by adding control points along the drill-hole path (i.e. where the azimuth is affected by local magnetic field variations).

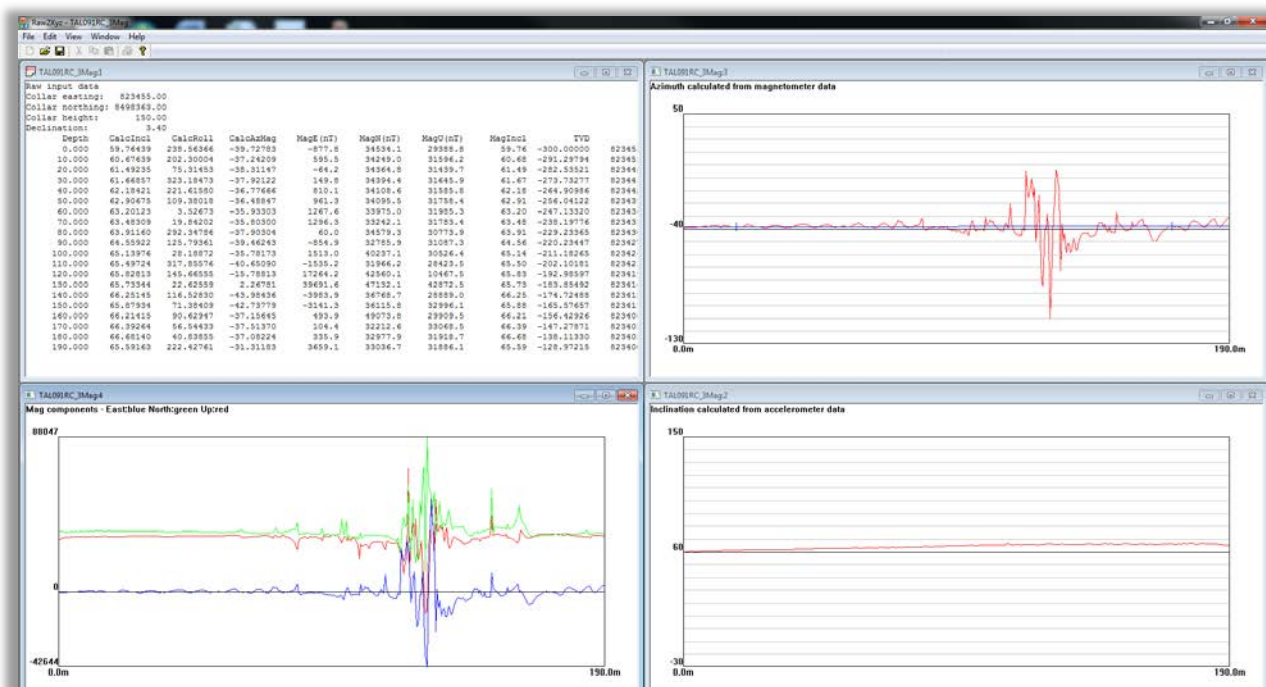


Figure 2. Processing down-hole magnetic data using the RAW2XYZ software. The calculated hole azimuth (RH top), hole inclination (RH bottom) and magnetic field traces (LH bottom – green is NORTH and red is UP and blue is east). In the calculated azimuth panel, control points have been added to straighten the azimuth (blue line in the azimuth panel) which then results in an EAST magnetic field trace that is not zero.

3 DOWN-HOLE MAGNETIC MODELLING

3.1 TAL090RC

The down-hole magnetic susceptibility log for TAL090RC is shown in Figure 3 and the TMI profile in Figure 4. The magnetic susceptibility values increase sharply where the hole intersects strongly magnetic mineralisation around 43m DH, the readings are still very high to the end of hole and it appears as though the drill hole has not exited the magnetic body.

The TMI profile shows a very broad, long wavelength anomaly from an off-hole source from surface to 44m DH where the hole intersects the magnetic mineralisation. From 44m to EOH the readings are erratic with a high gradient – which is indicative of an in-hole magnetic source.

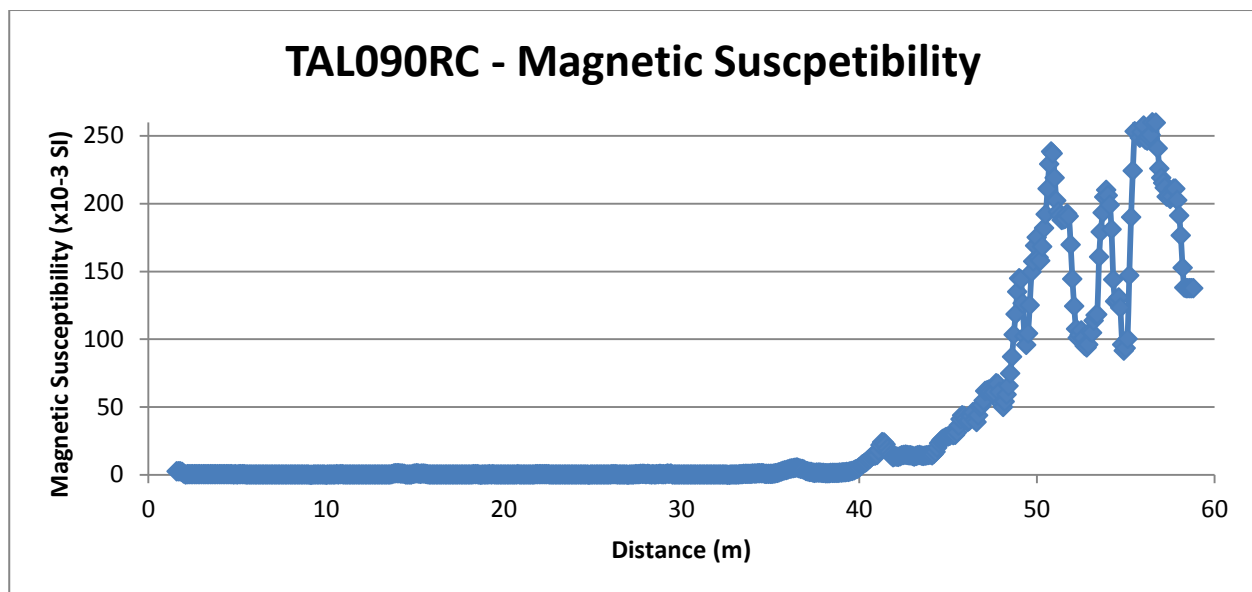


Figure 3. TAL090RC, magnetic susceptibility log.

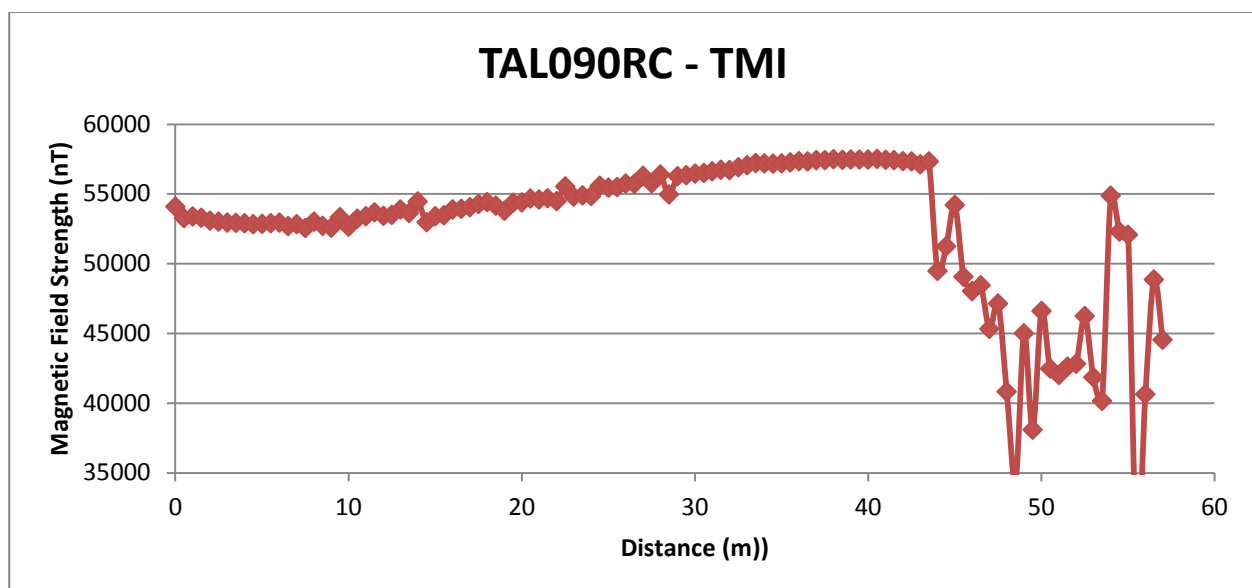


Figure 4. TAL090RC, TMI log.

Modelling has been completed on the four magnetic profiles (East, North, Vertical and TMI) as shown in Figure 5. The off-hole response indicates that the centre of the magnetic body is located above the hole and slightly to the south of the intersection.

The modelled susceptibilities are much higher than those recorded in from the logs (the model has a susceptibility over 1 SI), however, there is little constraint on the size or volume of the off-hole magnetic source. It is possible that the target is more magnetic off-hole, or has a larger volume than the model with a lower susceptibility.

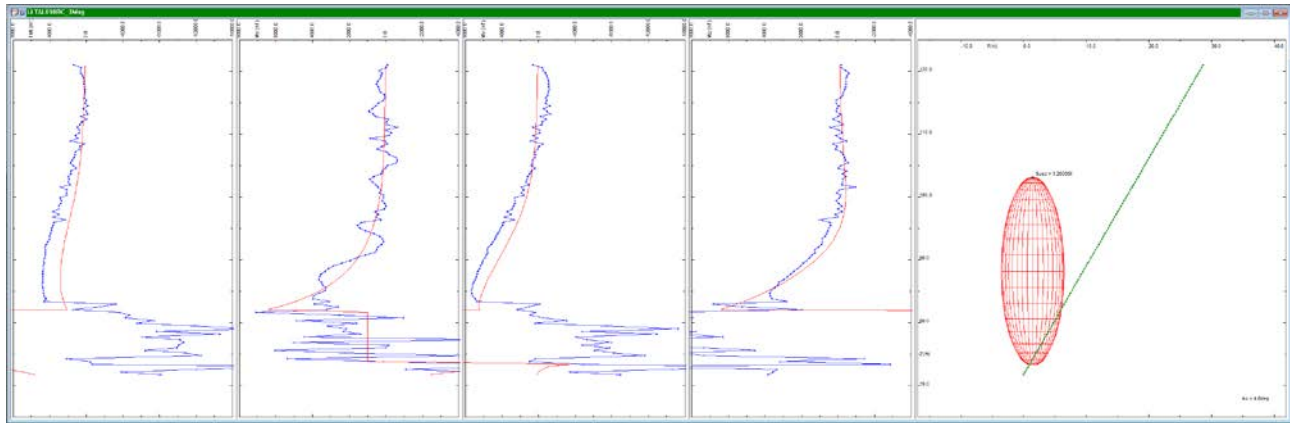


Figure 5. TAL090RC, downhole magnetic modelling. The four profiles on the left show the TMI, Mag-East, Mag-North and Mag-up components (blue is observed data and red is modelled data). The RH panel shows the drill-hole position (green trace) and the magnetic model body (red).

3.2 REVIEW OF TAL090RC AMAG DATA AND MODELLING

The location of the drill-hole with respect to the airborne TMI data and modelling is shown below in Figure 6. The drill-hole is inclined to the south towards the source of a strong TMI anomaly (~4000 nT).

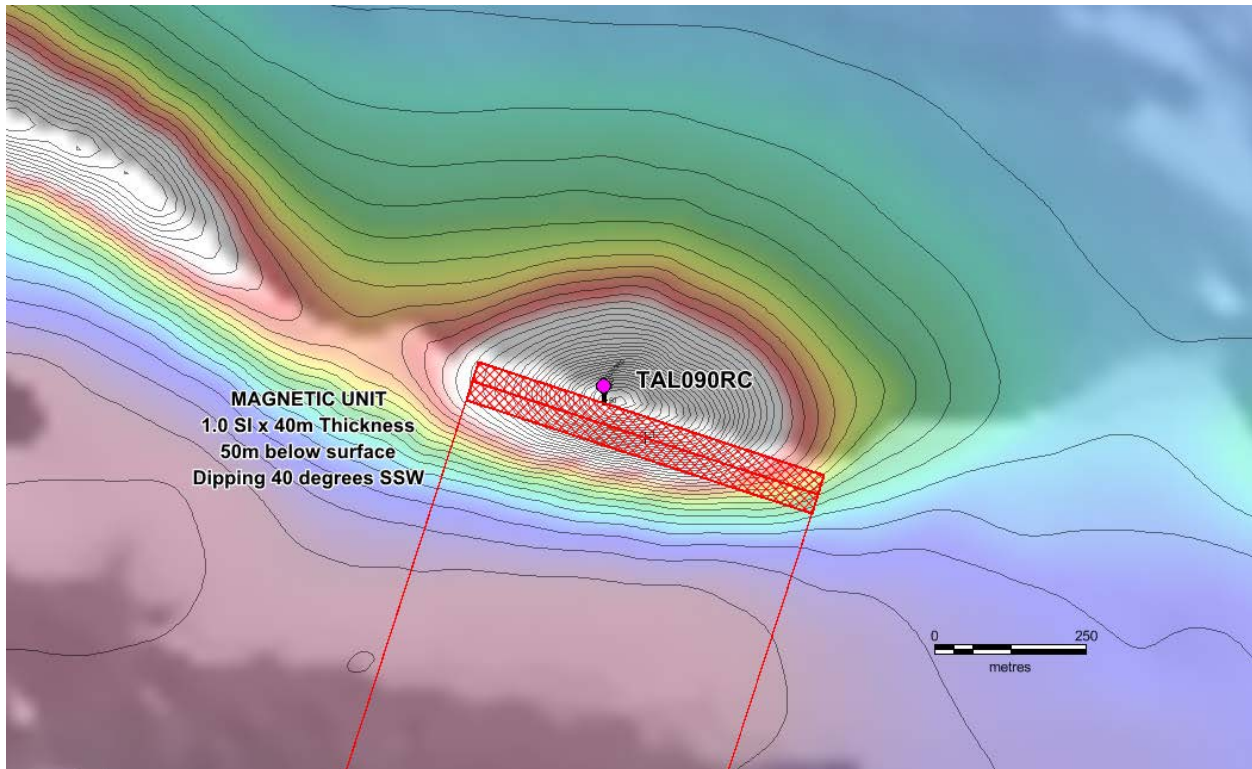


Figure 6. Airborne magnetic data showing the TMI anomaly near TAL090RC. The drill collar is shown in magenta and the AMAG model is the red prism.

Model profiles of the AMAG anomaly are shown below in Figure 7. The modelling results show a strongly magnetic unit (1.0 SI @ 40m thick) dipping moderately (~40°) to the SSW. The depth of the model is consistent with the intersected depth of the magnetic material in TAL090RC.

The model results show that TAL090RC has been drilled down-dip of the magnetic unit, scraping the bottom edge of the magnetic body in the end of the hole. If the magnetic body intersected in this hole is considered to be of significance, it would be recommended to drill a second hole towards the NNE to test the full width of the magnetic unit.

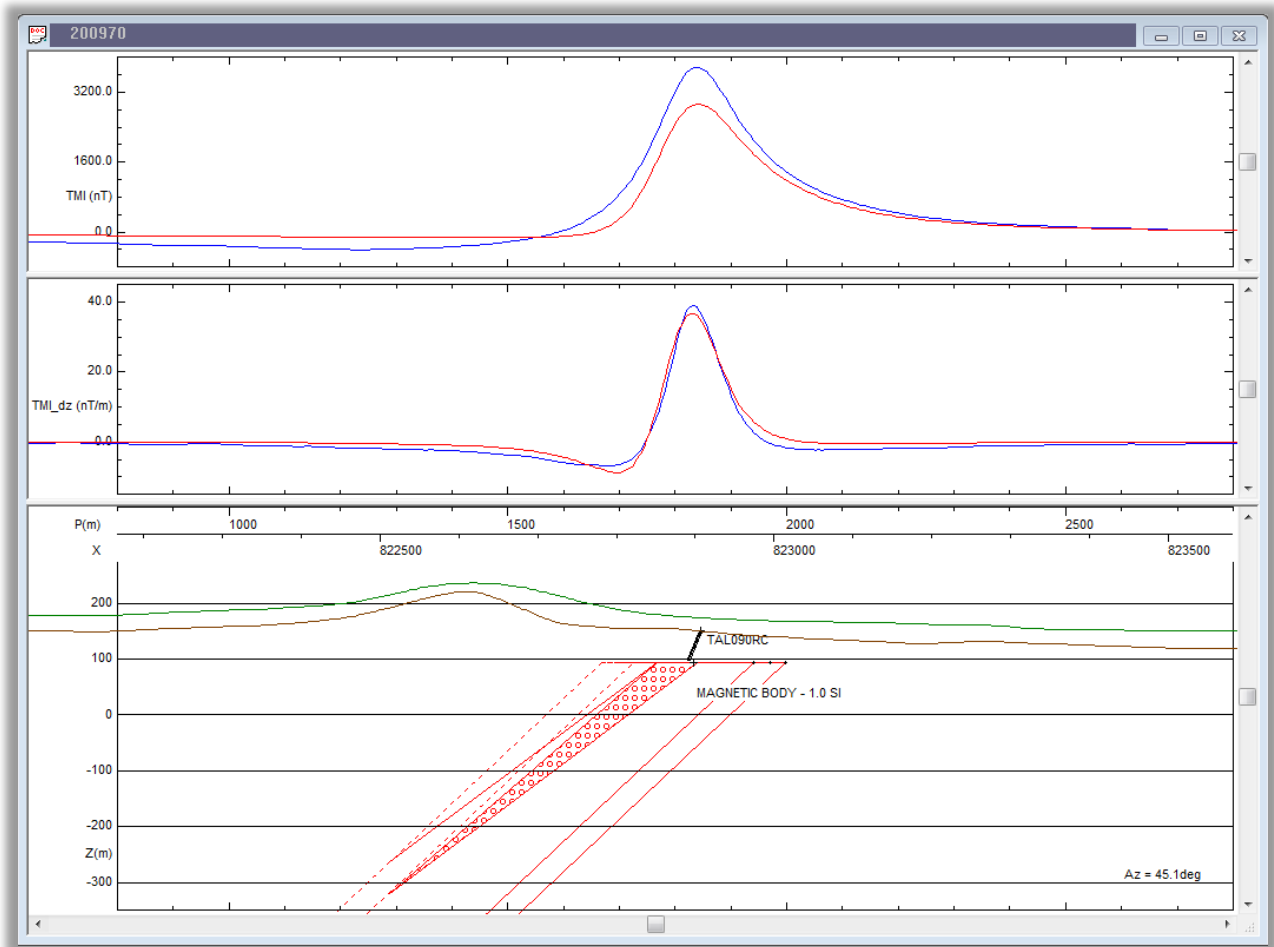


Figure 7. AMAG model profile (line 200970) over TAL090RC. The top and middle panels show the TMI and TMI_FVD traces (blue is observed data and red is modelled data). The lower panel shows the model cross-section with the drill hole trace projected onto the section (in black). The terrain surface is brown and the survey flight-path is green.

3.3 TAL091RC

The down-hole magnetic susceptibility log for TAL091RC is shown in Figure 6 and the TMI profile in Figure 7. The magnetic susceptibility values increase sharply from 120 to 130m DH where the hole intersects strong magnetic mineralisation. The TMI profile shows a strong in-hole anomaly associated with this intersection. A second smaller anomaly located around 150 to 170m does not correlate with any significant magnetic mineralisation and is likely caused by a small, off-hole, magnetic body. No satisfactory models have been produced due to the very high gradients seen in the magnetic profiles

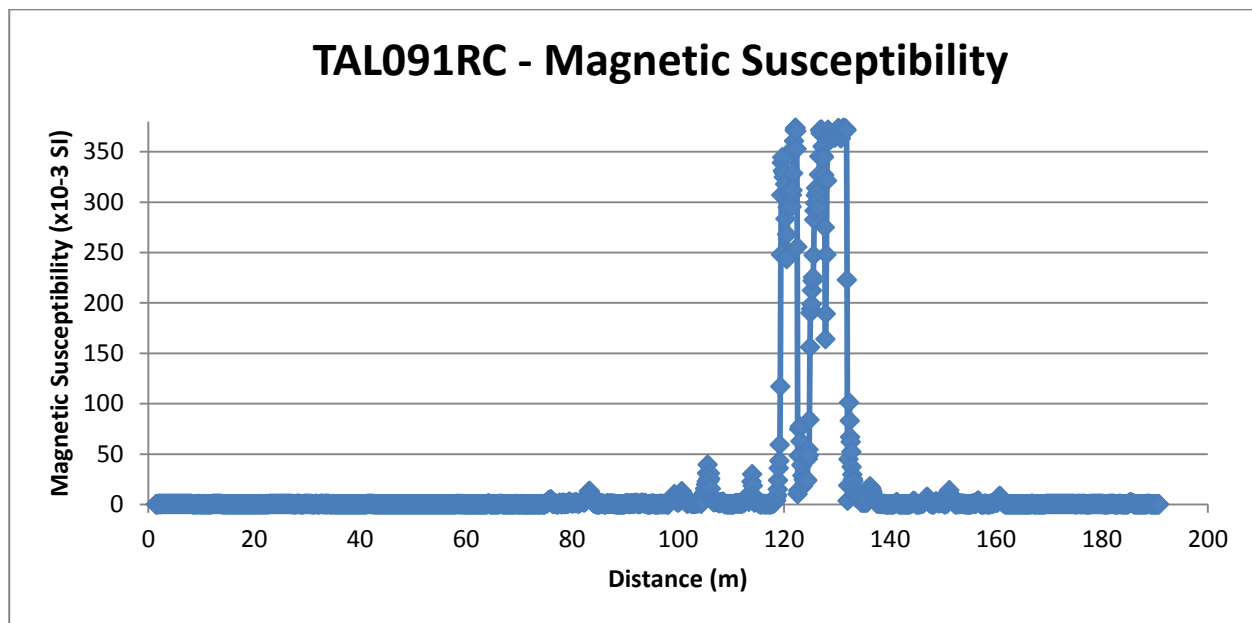


Figure 8. TAL091RC, magnetic susceptibility log.

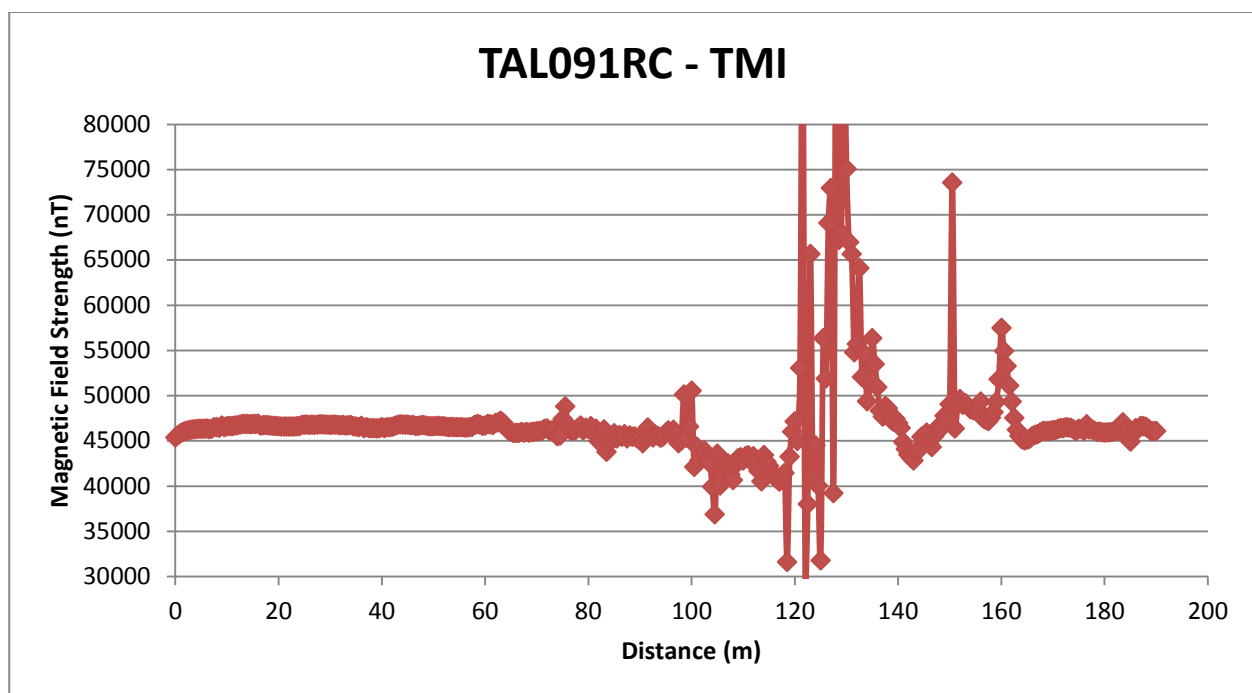


Figure 9. TAL091RC, TMI log.

3.4 REVIEW OF TAL091RC AMAG DATA AND MODELLING

The location of the drill-hole with respect to the airborne magnetic data and modelling is shown below in Figure 10, the model profile is shown in Figure 11.

TAL090RC has been drilled into the flank of a magnetic anomaly, which the modelling indicates is caused by at least two, thin and moderately SSW dipping magnetic bodies. TAL091RC intersects the northern-most unit, which is consistent with the response observed in the borehole logs.

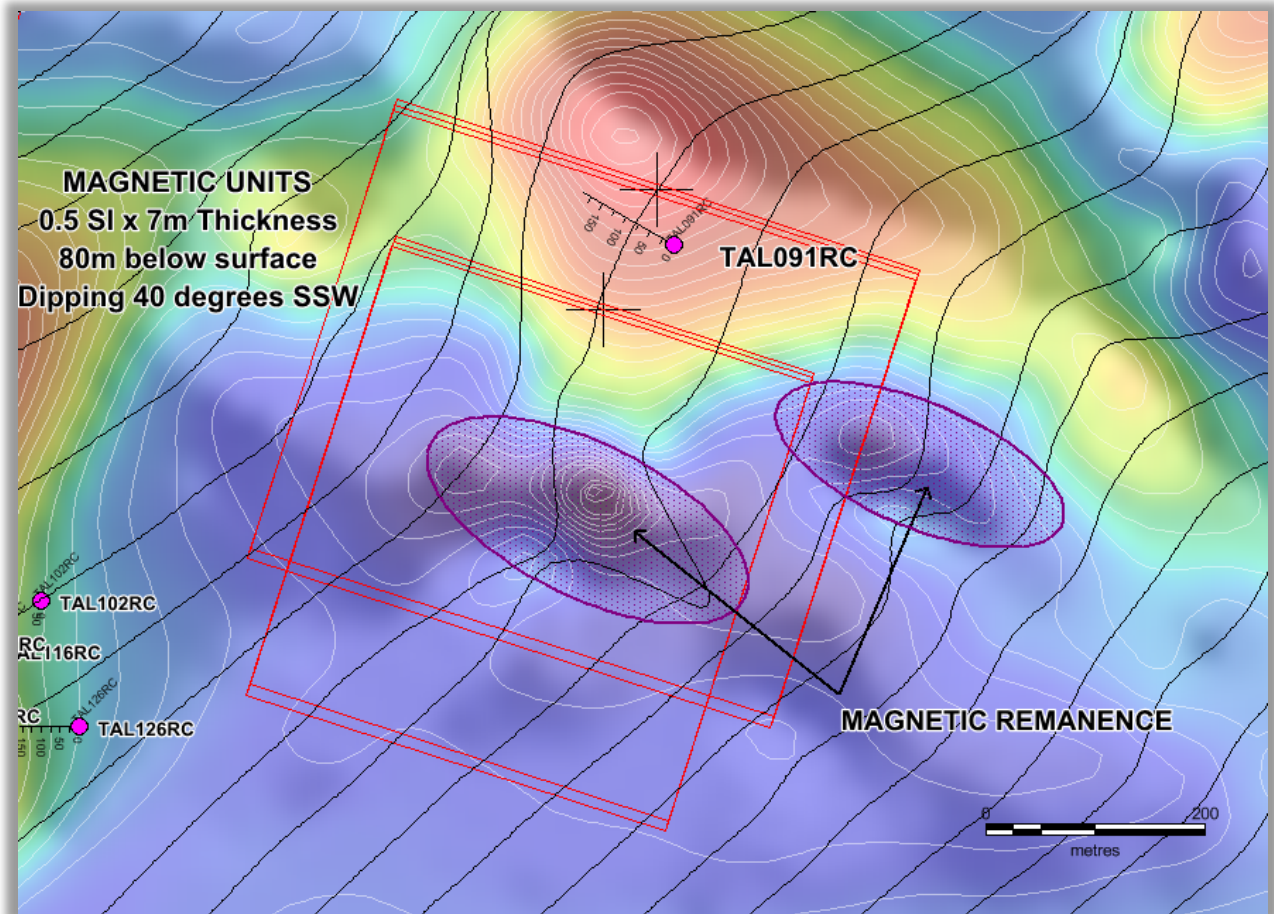


Figure 10. TAL091RC on background image of airborne TMI, with 10nT contours (white) and stacked TMI profiles (black). The magnetic models (red polygons) are shown and the location of the magnetic remanence is indicated.

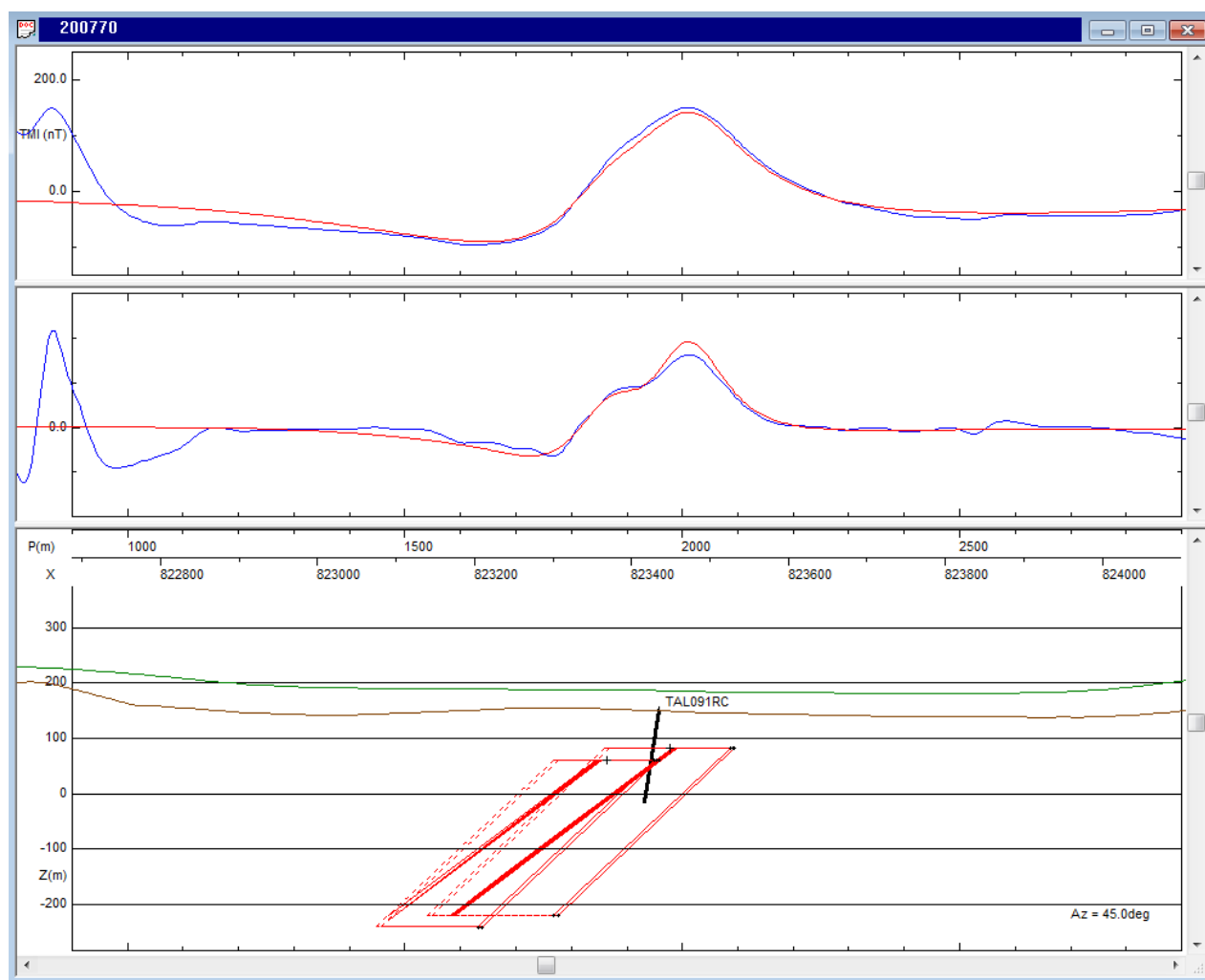


Figure 11. . AMAG model profile (line 200770) over TAL091RC. The top and middle panels show the TMI and TMFVD traces (blue is observed data and red is modelled data). The lower panel shows the model cross-section with the drill-hole trace projected onto the section in black.

There is a discrete zone of magnetic remanence to the south of this magnetic anomaly (as indicated in Figure 10); it is possible that the remanence is associated with alteration? The Analytic Signal of the TMI (Figure 12) defines the strong and shallow anomaly located 200m directly south of TAL091RC. The location of the anomaly just north of drill-hole does not vary significantly between TMI and analytic signal; this anomaly is probably not be affected by remanence and may have been tested adequately by the drill hole.

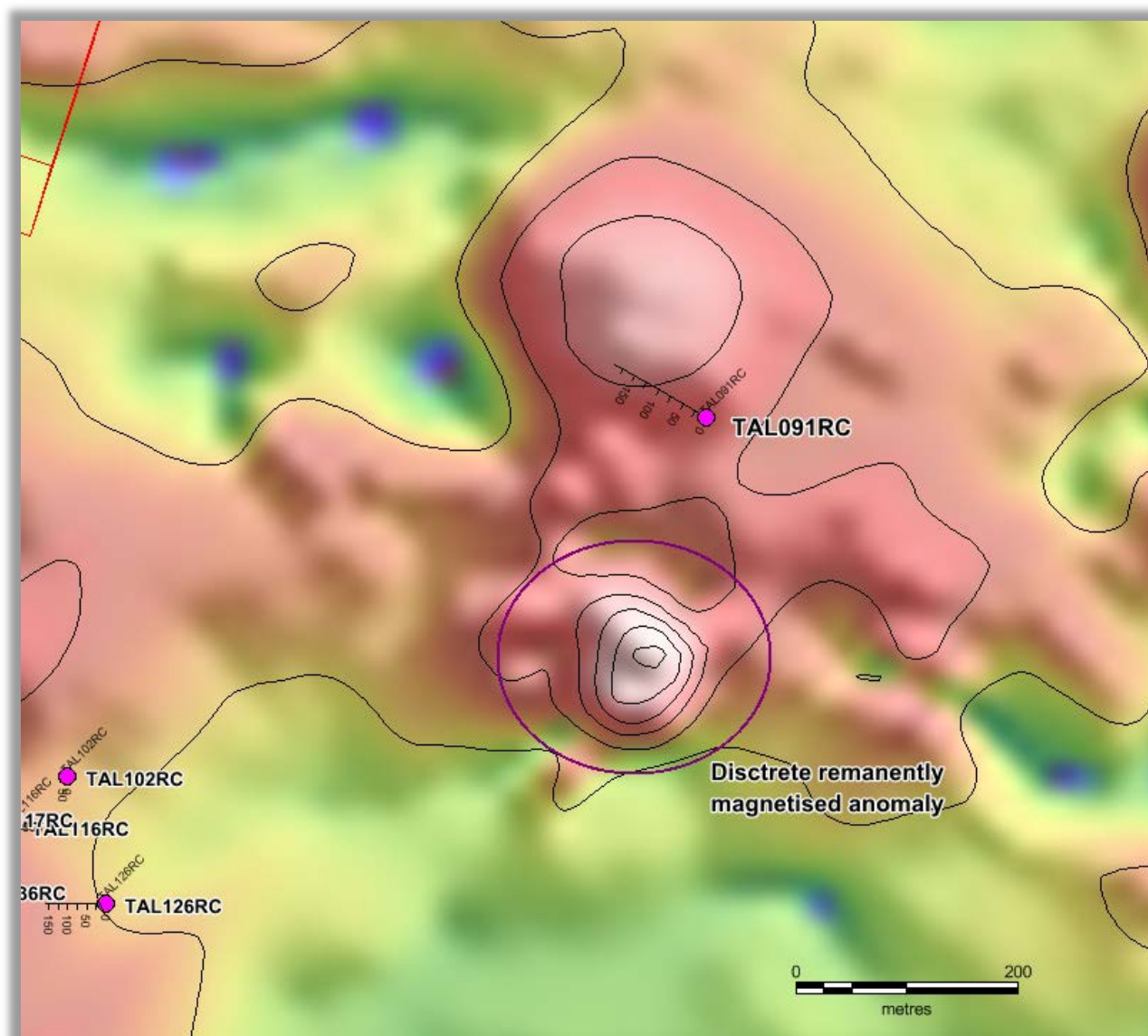


Figure 12. Background image of analytic signal with the TAL091RC drill-hole. A str

3.5 TAL102RC

The down-hole magnetic susceptibility log for TAL102RC is shown in Figure 13 and the magnetic profiles in Figure 14. The drill-hole inclination of $\sim 85^\circ$ is too deep to accurately resolve the East and North components of the magnetic field, thus only the total field is shown.

The magnetic susceptibilities are very low; the material intersected in the drill hole is only weakly magnetic. The magnetic field profile shows little variation, there are no strong or coherent responses observed from near-hole magnetic sources. The strongest response observed in the profile is in the top 10m, possibly associated with a cultural source or magnetic material in the cover. Modelling has not been completed for this hole.

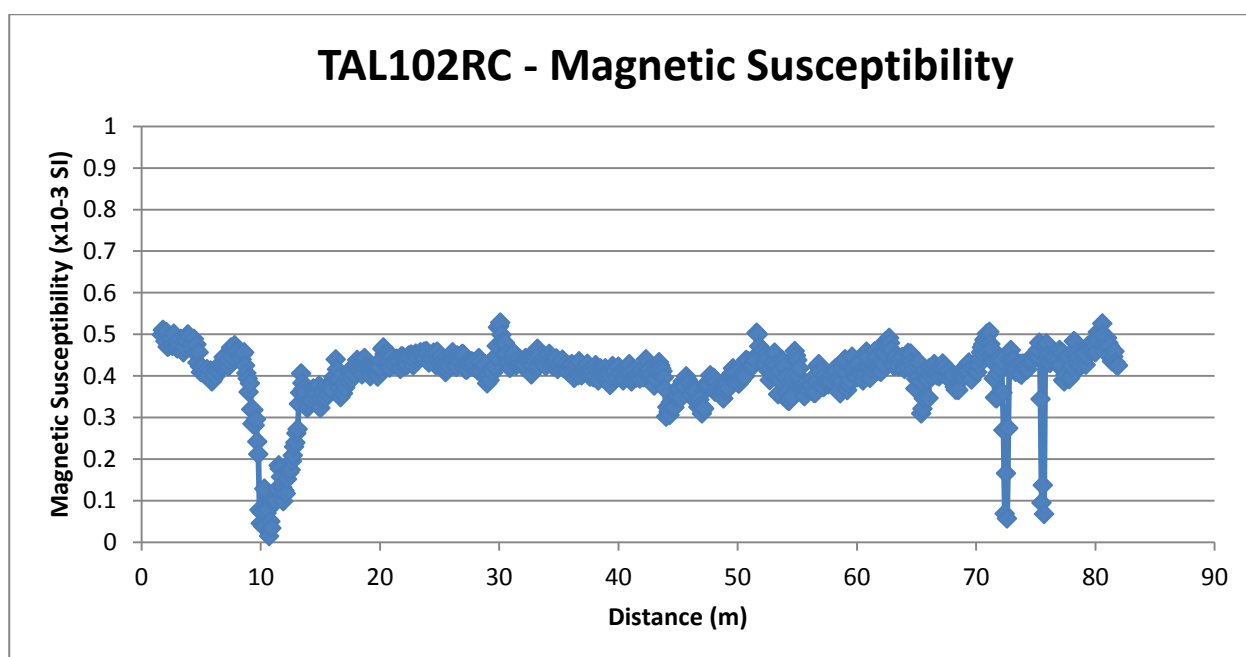


Figure 13. TAL102RC, magnetic susceptibility log.

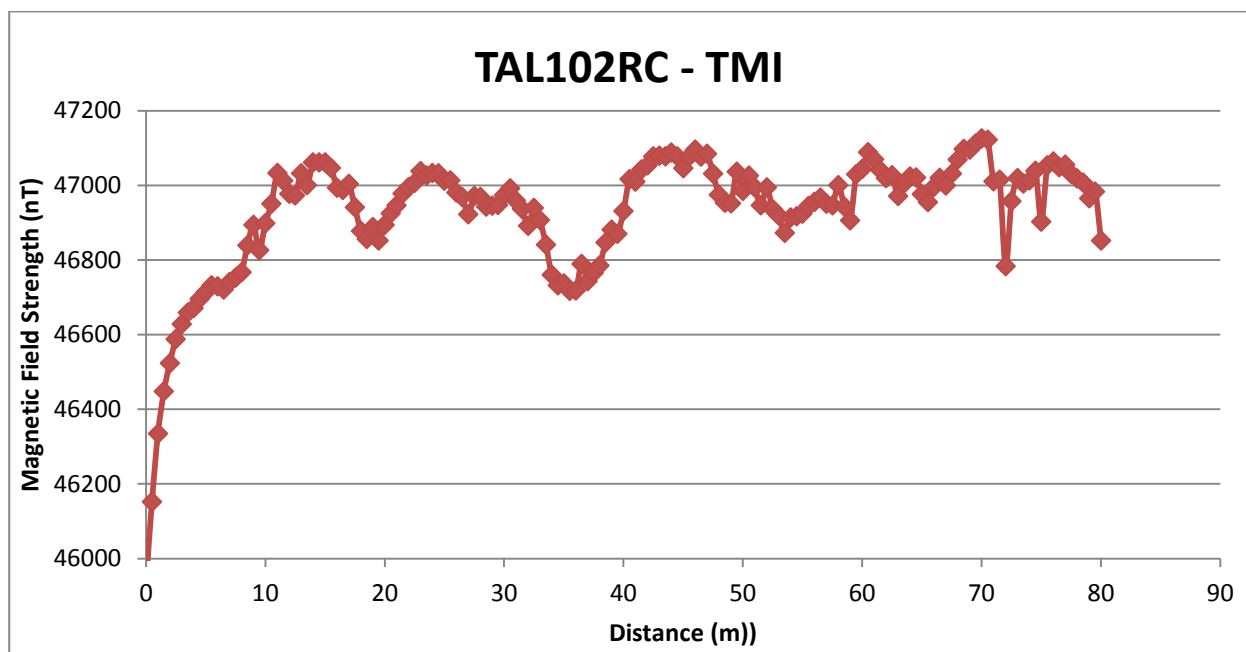


Figure 14. TAL102RC, TMI log.

3.6 TAL116RC

The down-hole magnetic susceptibility log for TAL116RC is shown in Figure 15 and the magnetic profiles in Figure 16. TAL116RC is a near-vertical hole so the east and north components of the magnetic field could not be resolved.

The magnetic susceptibility profile shows that the material in the drill hole is very weakly to non-magnetic, the highest response recorded is approximately 1×10^{-3} SI. There are no strong and coherent anomalies observed in the TMI trace. Modelling has not been completed for this hole.

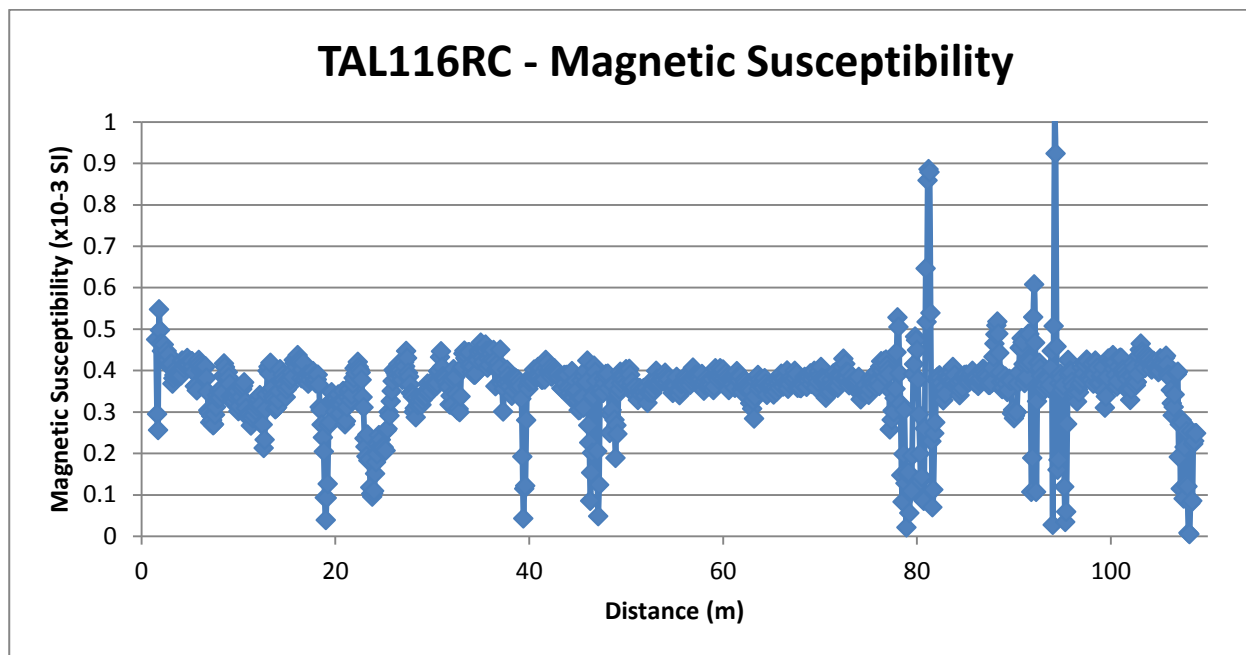


Figure 15. TAL116RC, magnetic susceptibility log.

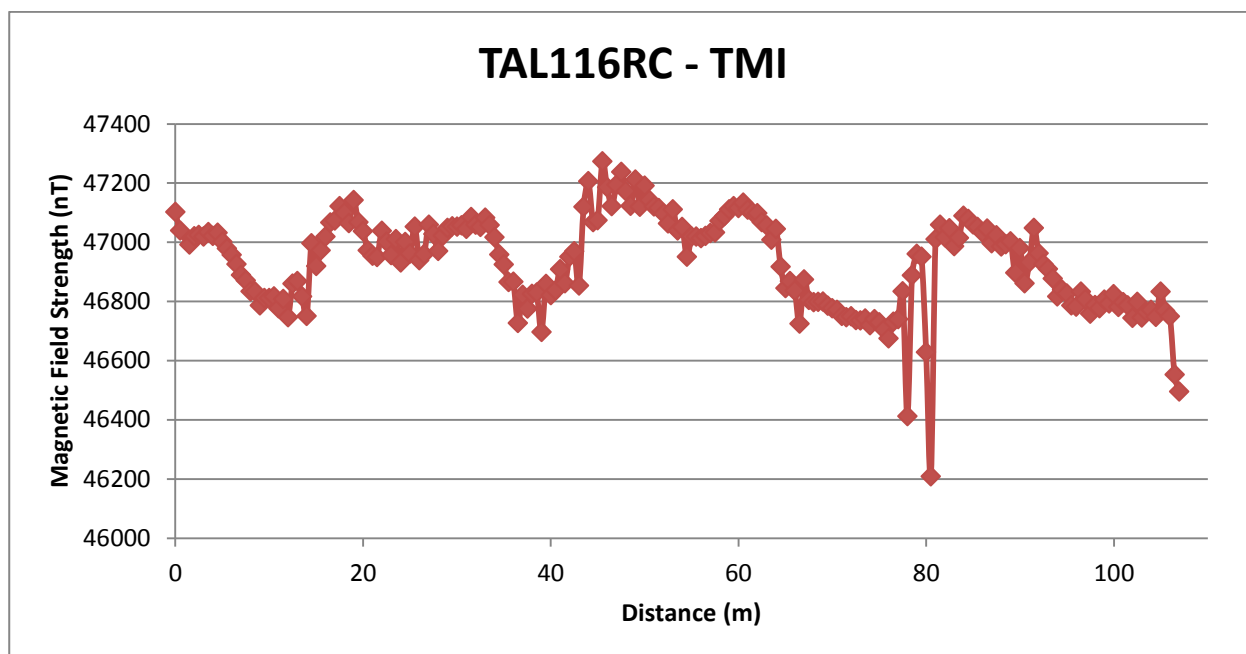


Figure 16. TAL116RC, TMI log.

3.7 TAL117RC

The down-hole magnetic susceptibility log for TAL117RC is shown in Figure 17 and the magnetic profile in Figure 18. TAL116RC is a near-vertical hole so the east and north components of the magnetic field could not be resolved.

The magnetic susceptibility log shows that no strongly magnetic material was intersected in the hole; the values are very low. The TMI trace does not show any strong or coherent anomalies from off-hole sources. There is a relatively strong decrease in the TMI between 75m and EOH, which may indicate that there is a magnetic source below the drill-hole. An attempt was made to model such a target, however, without the off-hole components it is very difficult to resolve the position of such a body.

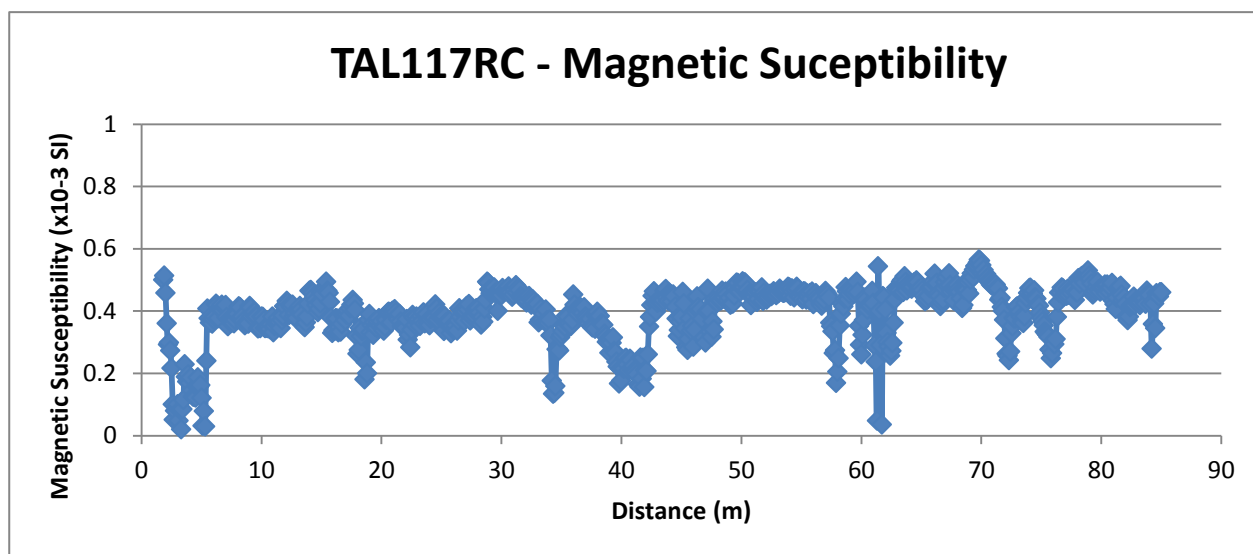


Figure 17. TAL117RC, magnetic susceptibility log.

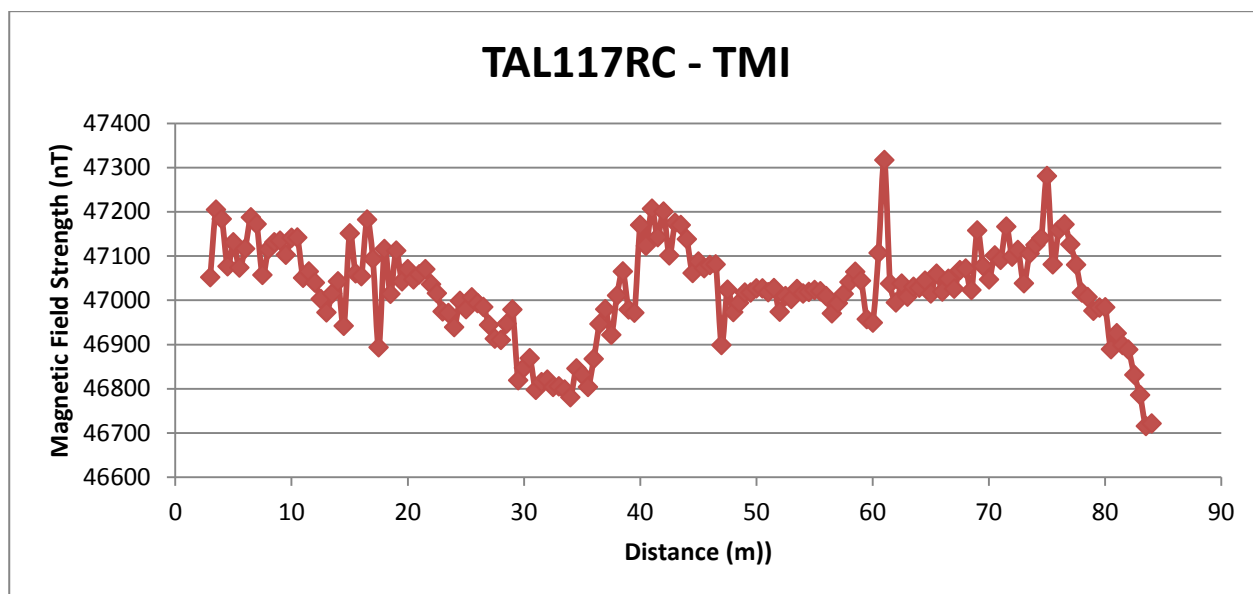


Figure 18. TAL117RC, TMI log.

3.8 TAL126RC

The down-hole magnetic susceptibility log for TAL126RC is shown in Figure 19 and the magnetic profile in Figure 20.

TAL126RC has intersected a zone of strongly magnetic mineralisation from 144 to 147m DH with magnetic susceptibilities values of up to 0.35 SI. The TMI trace shows a strong, in-hole anomaly that correlates with the position of the magnetic mineralisation.

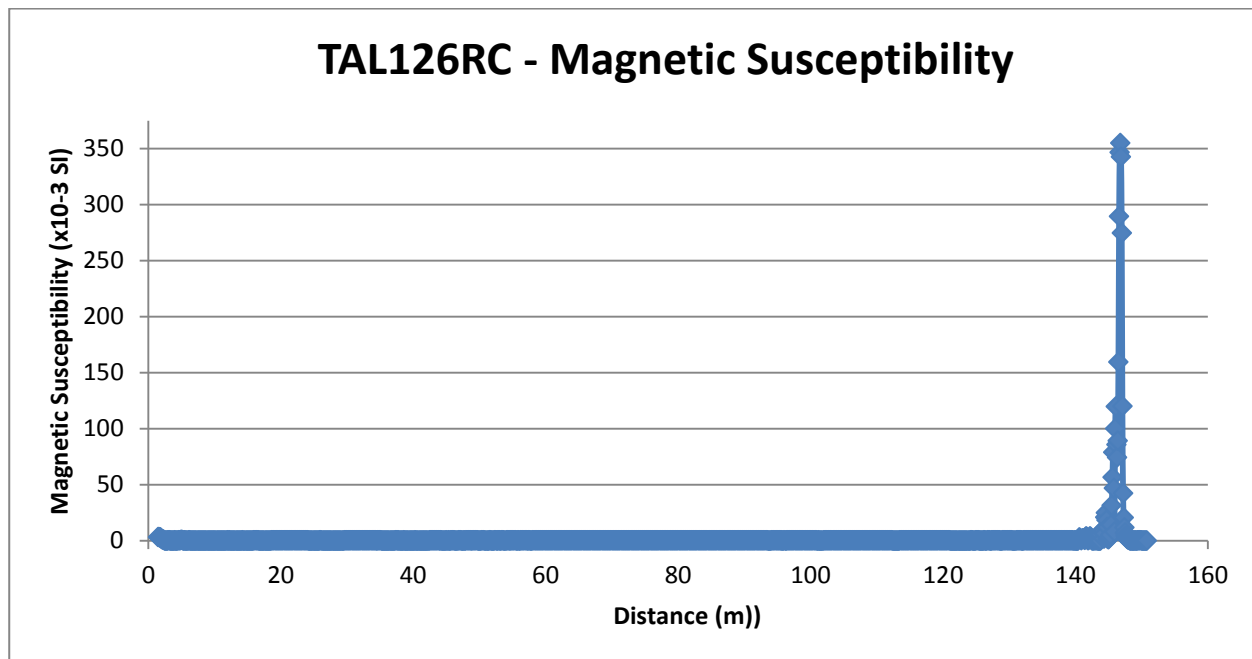


Figure 19. TAL126RC, magnetic susceptibility log.

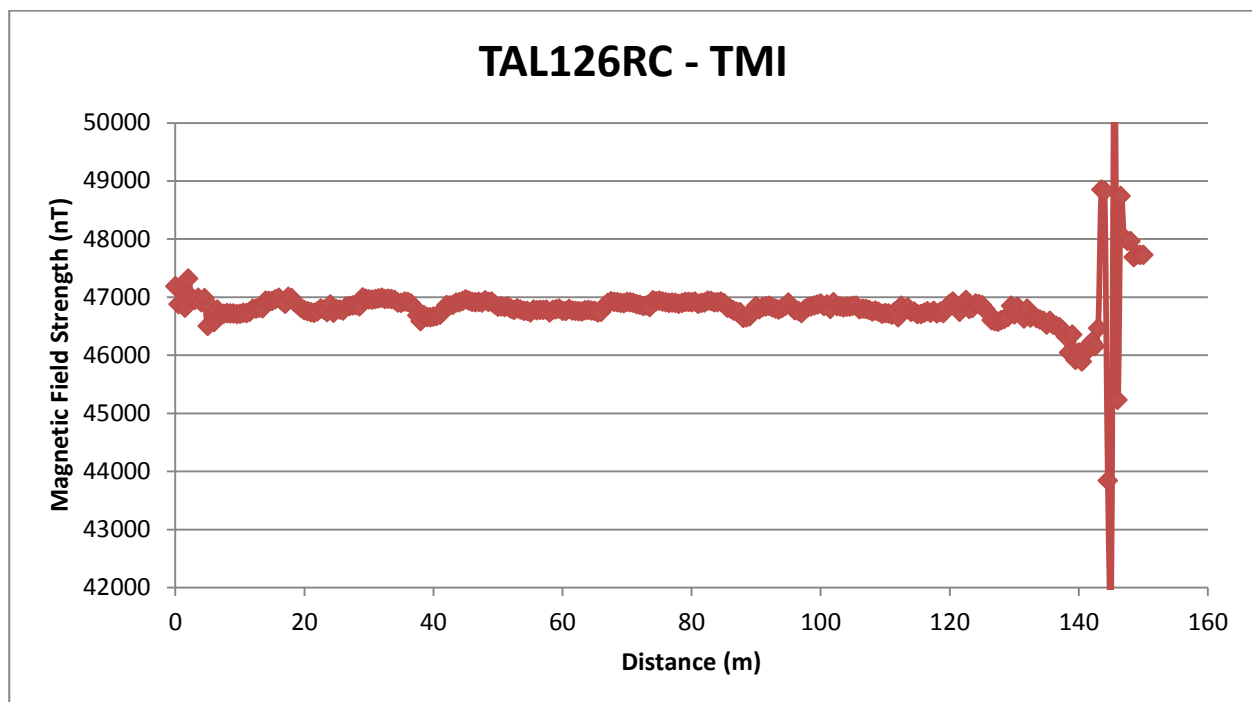


Figure 20. TAL126RC, TMI log.

TMI modelling of the in-hole anomaly is shown in Figure 21. The response observed in TAL126RC is very high amplitude with a very high gradient and very short wavelength. The response is indicative of a thin intersection of magnetic material. Modelling indicates that the magnetic source continues below the drill hole, although it is very difficult to say how far it continues with any confidence. The magnetic susceptibility of this model is 0.5 SI, which is slightly higher than the measured susceptibility.

The response is dominated by the in-hole magnetic material and there is no indication of off-hole responses that can be modelled with any confidence.

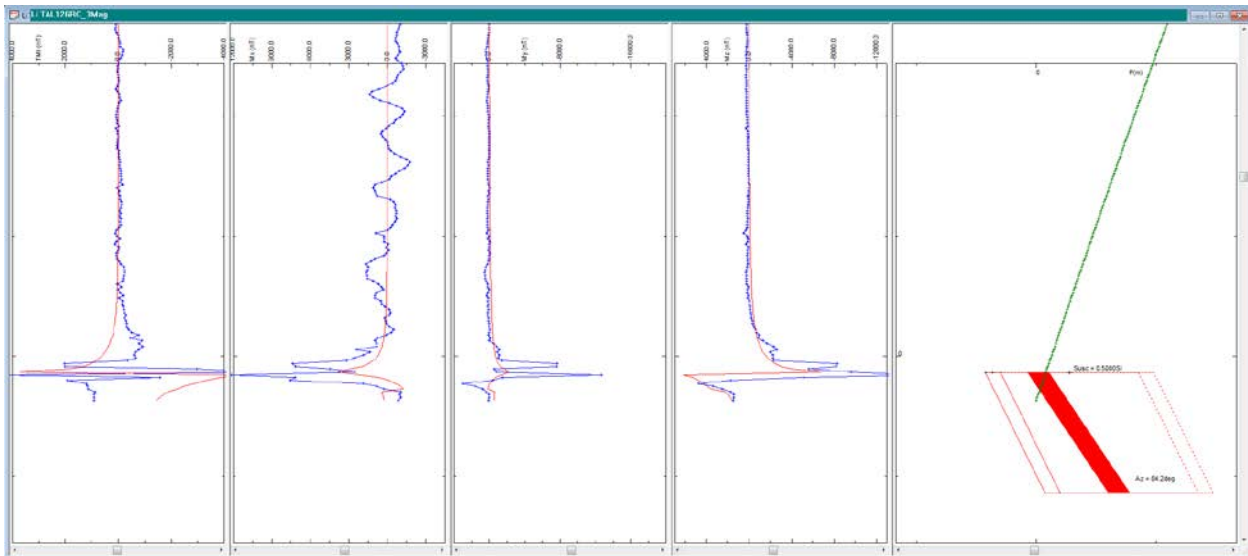


Figure 21. TAL126RC, downhole magnetic modelling. The four profiles on the left show the TMI, Mag-East, Mag-North and Mag-up components (blue is observed data and red is modelled data). The RH panel shows the drill-hole position (green trace) and the magnetic model body (red).

3.9 TAL136RC

The down-hole magnetic susceptibility log for TAL136RC is shown in Figure 22 and the magnetic profile in Figure 23.

Strongly magnetic mineralisation was intersected from 115 to 117 m DH with susceptibility values up to 0.35 SI. This intersection correlates with a strong TMI anomaly between 100 and 150m DH; the anomaly includes some high gradient readings at the intersection, and a broader anomaly from an off-hole source.

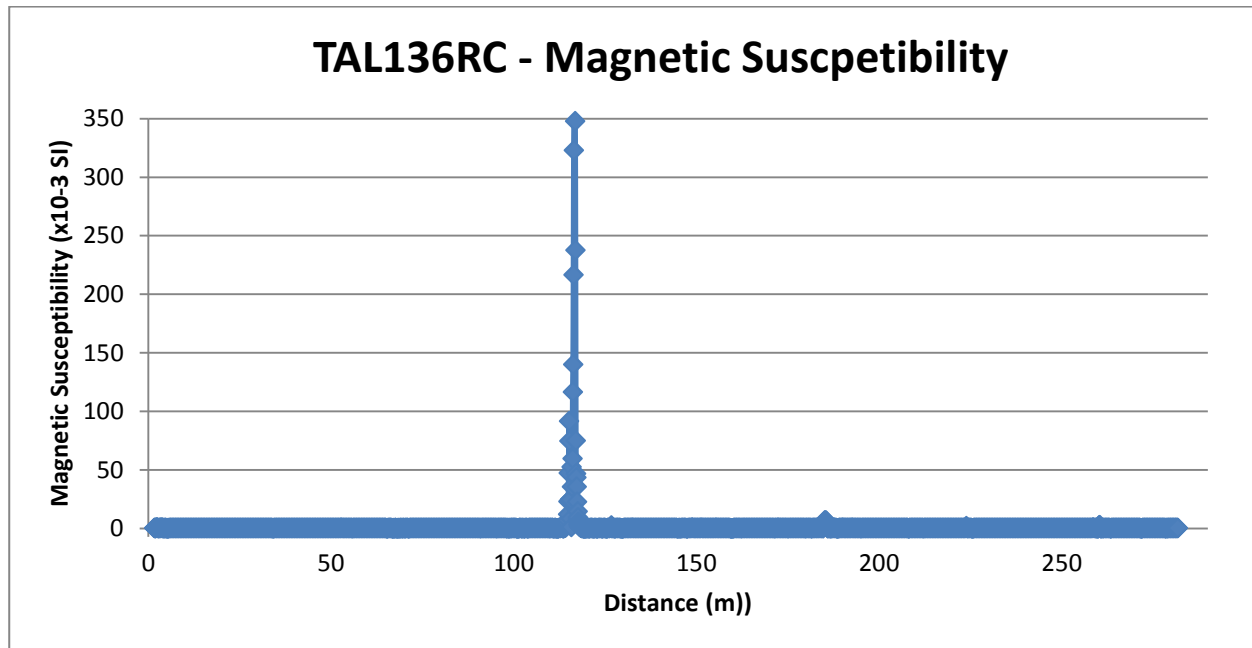


Figure 22. TAL136RC, magnetic susceptibility log.

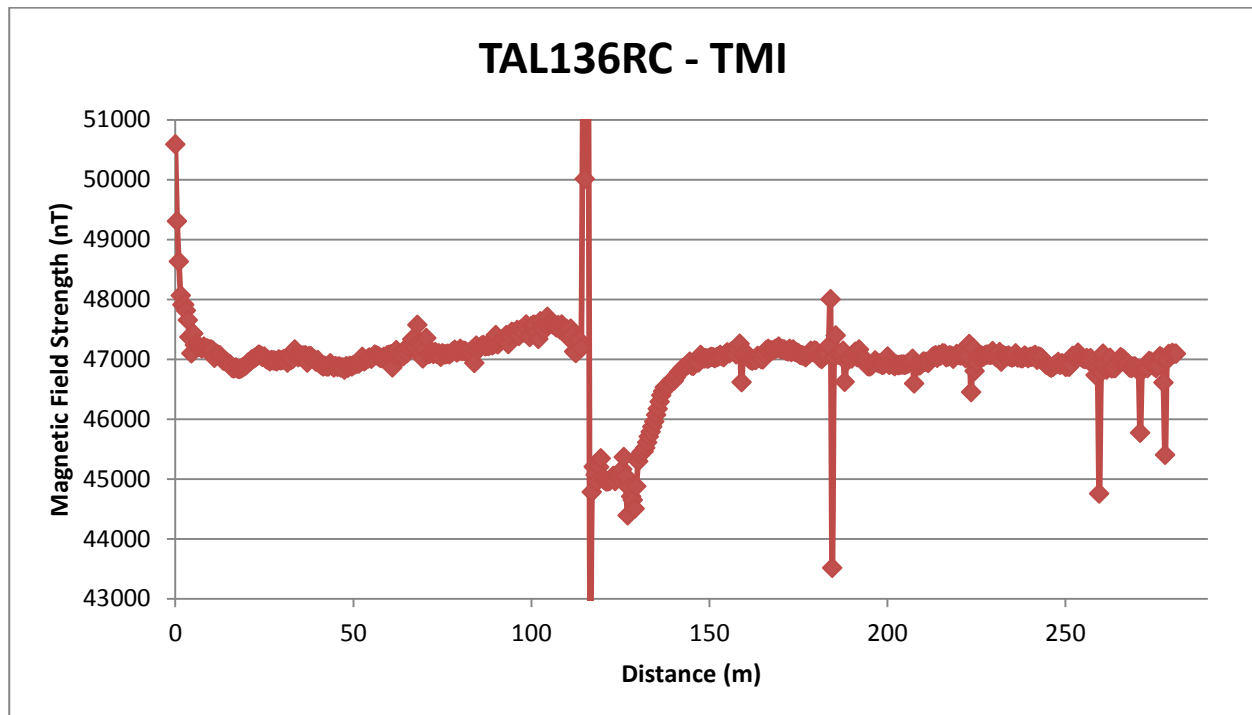


Figure 23. TAL136RC, TMI log.

The off-hole anomaly has been modelled; the Potent model profiles are shown below in Figure 24.

The source of the anomaly appears to be located above and to the south of the hole, plunging north towards the hole. The magnetic susceptibility of the elliptical model shown below is 0.3 SI using dimensions of 20m x 30m x 60m.

Based on the modelling results, it appears as though TAL136RC has possibly just scraped the bottom edge of the magnetic body, the modelling indicates that the magnetic body is thicker to the south of the existing drill-hole.

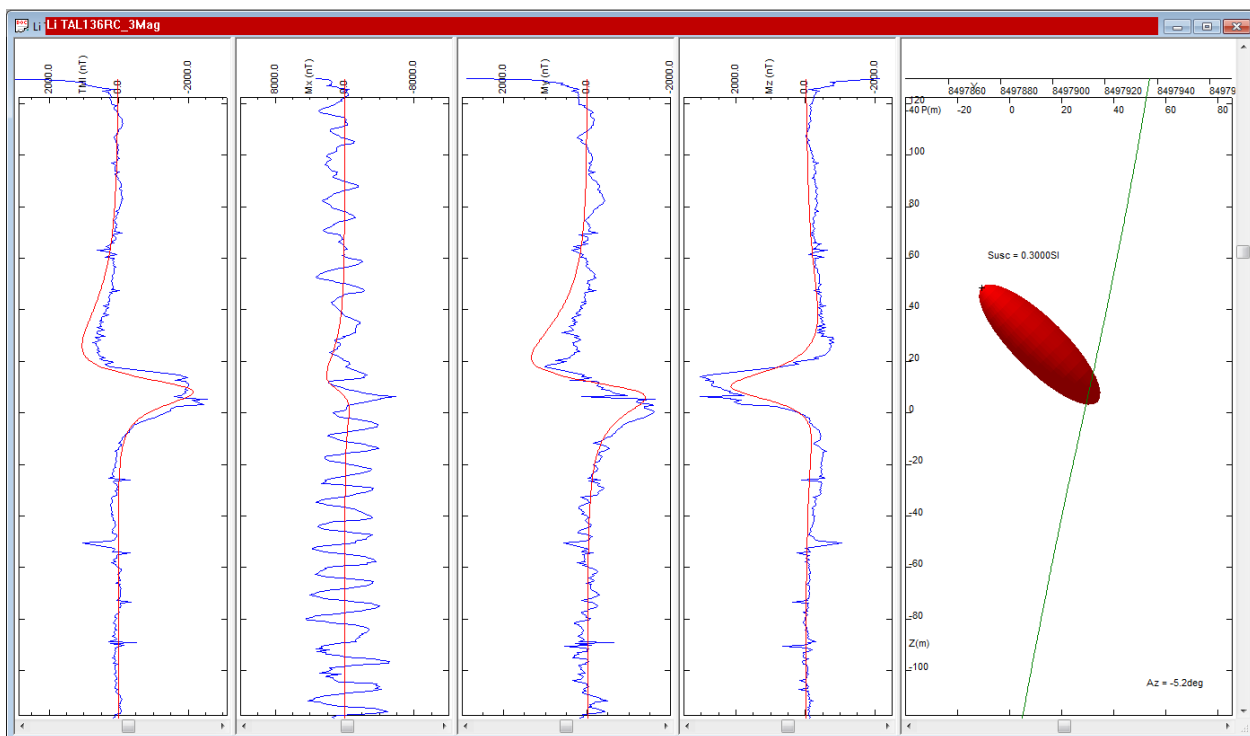


Figure 24. TAL136RC, downhole magnetic modelling. The four profiles on the left show the TMI, Mag-East, Mag-North and Mag-up components (blue is observed data and red is modelled data). The RH panel shows the drill-hole position (green trace) and the magnetic model body (red).