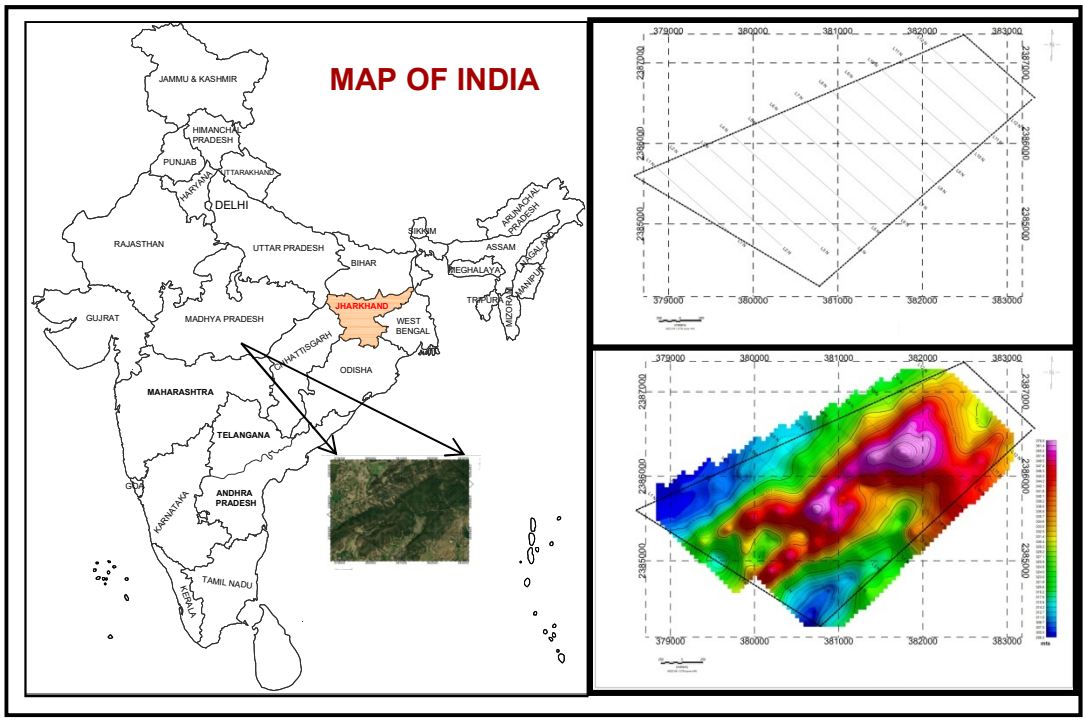
REPORT OF GROUND MAGNETIC SURVEY IN

KATORI-JHIRIYA BLOCK
BALAGHAT

MADHYAPRADESH



A MINI RATNA COMPANY

MINERAL EXPLORATION and CONSULTANCY LIMITED

(A Government of India Enterprise)

NAGPUR (Maharashtra), India

March - 2024

REPORT OF GROUND MAGNETIC SURVEY IN KATORI-JHIRIYA BLOCK, BALAGHAT, MADHYA PRADESH

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REPORT OF GROUND MAGNETIC SURVEY IN KATORI-JHIRIYA BLOCK, BALAGHAT, MADHYA PRADESH

1.0 INTRODUCTION

1.1 BACKGROUND

Mineral Exploration And Consultancy Limited (MECL) having its corporate office at Nagpur, Maharashtra is functioning under Ministry of Mines, Government of India with 100% holding for systematic exploration of minerals.

In view of the MMDR amendments act -2015, Minerals (Evidence of Mineral Contents) Rule 2015 and Mineral Auction Rule-2015, Ministry of Mines, GSI identified the block for exploration and MECL decided to take up the block for G-4 level of exploration under NMET funding. MECL requested Ministry of Mines, Government of India to allot this block for exploration to MECL.

The contrast in the physical properties of the mineralised zone and the host rock forms the basis of Geophysical Survey. The physical properties for different expected manganese and host rocks are shown in below Table-1.1.

Table -1.1 Physical Properties of different expected manganese & host rocks

Ore/ rock	Chemical composition	Mn content	Density (g/cc)	Magn.Suscep. 10^{-3}CGS
Pyrolusite	MnO_2	63%	4.70-5.00	Paramagnetic
Psilomelane	$MnOMn_2OH_2O$		3.70-4.70	
Braunite	$Mn_2O_3Mn_6O_2$	64.3%	4.75-4.82	
Rhodonite	$MnSiO_3$	41.8%	3.40-3.6	Paramagnetic
Rhodochrosite	$MnCO_3$	47.8%	3.40-3.60	100
Jacobsite	$MnFe_2O_4$		4.95	200-300
Quartz			2.6-2.8	.00063
Mica			2.15	
Phyllite			2.68 – 2.80	2

In the assigned area the Geophysical Survey was carried out for delineating mineralised zone along with depth, strike and extent of occurrence if any.

1.2 SCOPE OF WORK

The scope of work consisted of Acquisition, Processing and Interpretation of ground Magnetic survey data. The Geophysical Survey has to be carried out with 300m as profile interval and 20m as station interval in a grid pattern (20 x 300 mts) covering an area of 6.73 sqkm. The main objective of the Geophysical survey was to delineate Manganese ore zones and other associated minerals if any.

1.3 FIELD ACTIVITIES

A base camp for geophysical party was established at Tumsar. A Two member team (Table1.6) equipped with Proton – Precession Magnetometer (PPM), DGPS, Total Station and GPS was engaged for the work. Magnetic Base was established near the block and its coordinates are given in Table 2.3. The field activities consisted of the following:

- Fixing of survey points in 20m x 300m grid.
- Acquisition of Magnetic data.
- Field QC of acquired data on day to day basis.

Total area surveyed and stations recorded in the block are given below.

BLOCK	PARAMETER	GRID	STATION/COVERAGE
Katori-Jhiriya	MAGNETIC	20 X 300	1200 Stations

The Layout map of Geophysical stations in Katori –Jariya block is shown in Fig 1.3.1

1.4 DURATION OF WORK

The Geophysical survey was planned to complete within month duration i.e. from 01/09/23 to 30/09/23.

1.5 BACK OFFICE WORK

- QA/QC of acquired data on day to day basis.
- Preliminary processing of data to check for errors/jumps.
- Monitoring of station and coverage

1.6 LIST OF PERSONNEL

Following personnel were involved in the project as given below

Table 1.6 List of key Personnel's

Sl.No.	Name and Designation	Responsibility
1	G.S.Dhami GM (Geological Services)	Heading the entire project, Planning, Monitoring, Liasoning, Data Processing, Interpretation and Report writing
2	A.B.S.S.Rama Krishna Manager	Field Management, data acquisition, on site QC, Data Processing, Interpretation and Report writing
3	Ripan Paul, STA (S&M)	Surveying

2.0 EXPLORATION PARAMETERS

2.1 PROJECT AREA LOCATION

The survey area, Katori Jariya block is located 45 Km away from Bhalaghat, Madhya Pradesh. The location of the block is shown in Figure 2.1.1. The corner points of the block demarcated for Geophysical Survey are as follows:

Table 2.1: Block boundary Coordinates

Corner Points	Easting	Northing
A	378556.35	2385571.97
B	382480.57	2387401.45
C	383272.83	2386547.62
D	380823.76	2384205.66

2.2 INSTRUMENT DETAILS

2.2.1 MAGNETOMETER

Type	Proton Precision magnetometer (PPM)
Make	Scintrex (ENVI Pro MAG)
Sensitivity	0.1 nT
Accuracy	+/- 1nT
Range	23000 to 100,000 nT

2.2.2 SURVEY EQUIPMENTS

- DGPS
- Total Station-Sokia
- GPS-Garmin handheld

2.3 FIELD DATA ACQUISITION

The Block boundary demarcations and survey stations were fixed in the grid pattern with spacing of 20m as station interval and 300m as profile interval with bearing N132.5°E using DGPS and Total Station. Pegs with marked station number were placed at every point. The Reduced level (RL) of every station was determined with Total Stations with an accuracy of ±2cm.

The Magnetic data was recorded at every station with respect to a fixed base station on routine basis with Proton Pression Magnetometer respectively. The coordinates of the base for Magnetic is given in Table 2.3. A total of 1200 stations were recorded for Magnetic covering 6.73 sq. km area. The digital elevation map (RL) of study area is shown in Figure 2.3.1 in which the Centre portion and Eastern portion is elevated where as South and Western part is low lying area.

Table 2.3: Location of Base

Base Station	EASTING	NORTHING
Magnetic	381583.0	2382739.0

DATA REDUCTION AND PROCESSING MAGNETIC SURVEY

2.3.1 Magnetic Survey

Recorded magnetic data was corrected for diurnal variation of the geomagnetic field with respect to the base where data was recorded at the start and end of every day field work. The Magnetic Anomaly (MA) was calculated with respect to base. The data was processed using Geosoft Oasis Montaj software and the below listed figures were generated.

- Magnetic anomaly Fig (2.3.1.1)
- Upward continuation of MA at 50mts Fig (2.3.1.2)
- Residual Map of MA upto 50 mts Fig (2.3.1.3)
- Upward continuation of MA at 100mts Fig (2.3.1.4)
- Residual Map of MA upto 100 mts Fig (2.3.1.5)
- Upward continuation of MA at 150mts Fig (2.3.1.6)
- Residual Map of MA upto 150 mts Fig (2.3.1.7)
- Upward continuation of MA at 200mts Fig (2.3.1.8)
- Residual Map of MA upto 200 mts Fig (2.3.1.9)
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- Residual Map of MA upto 300 mts Fig (2.3.1.11)
- Horizontal Derivative Hx map Fig (2.3.1.12)
- Horizontal Derivative Hy map Fig (2.3.1.13)
- Vertical Derivative map Fig (2.3.1.14)
- Analytical Signal Analysis of MA Fig (2.3.1.15)
- The Source parameter image (SPI) map of MA Fig (2.3.1.16)
- The Radially Averaged Power Spectrum of MA Fig (2.3.1.17)
- Expected Anomaly zones on Magnetic Anomaly Map Fig (2.3.1.18)

3.0 RESULTS OF GEOPHYSICAL SURVEY

3.1 MAGNETIC SURVEY

The total variation in TMI of 413.20 nT with the highest value of 45713.20 nT and 45300.07 nT as lowest is observed whereas total variation in MA of 413.19 nT with 213.19 nT as highest and -200.00nT as lowest was observed.

The total magnetic intensity (TMI) as well as magnetic anomaly (MA) has indicated characteristics magnetic response over different litho units with significant NE-SW. From the magnetic anomaly map geologically the area appears to be geologically controlled in NE-SW direction.

The detected anomalies on the residual magnetic map of MA with 50m, 100m, 150m, 200m and 300m upward continuation reflects the geological features / structures. The horizontal derivatives, the first vertical derivative maps of TMI has been generated for enhancing local anomalies. Derivative tends to sharpen the edges of anomalies and to enhance shallow features. Thus the smaller anomalies are more readily apparent in areas of strong regional disturbances. The vertical derivative map is much more responsive to local influences than to broad or regional effects and therefore tends to give sharper picture than the map of the total magnetic field intensity. The first vertical derivative of MA has clearly demarcated the anomalous zone in NE-SW direction.

An attempt also has been made to determine the depth of anomalous zones / body in the area by Source parameter imaging. In addition to the depth estimation of the bodies by Source parameter imaging it also locate the edges of the bodies. The source parameter imaging works well on 3D bodies and the map of the tilt angle was obtained from potential data, the minimum of which is placed on the boundaries of the causative bodies.

From Source parameter imaging the depth of mineralized zones at proposed boreholes are found ranging from 20 mts to 80 mts.

The average depth of mineralized zone from Radially averaged power spectrum of MA was found upto a maximum depth of 80 mts.

4.0 Conclusion and Recommendations :

The Ground Magentic survey conducted has demonstrated the capability to detect mineralized zones area. Spatial filtering like first vertical derivative, Horizontal derivatives and analytical signal analysis etc were applied to enhance the outcomes. For obtaining source depth information, source parameter imaging, Radially averaged power spectrum etc., were applied and depth of the anomalous zones found ranging from 20mt to 80 mts.

The large magnitude short spatial anomalies in the residual Magnetic map are primarily due to relatively shallow high magnetic intensity / Susceptibility geological features / Mineralized zones. From the study carried out, it appears that mineralisation in the form of irregularly shaped lensoidal bodies has taken place in the central portion in the North side where as towards the south it was distributed in East and West of the study area. On the basis of study made three zones (Zone-1, Zone-2 and Zone-3) were marked / identified as interesting / probable mineralisation and further investigations has to be done like trenching /pitting in the probable mineralized zones and shown in figure 4.1 to 4.3 on the Magnetic Anomaly Map and the mineralized zones found.

5.0 LIST OF FIGURES

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2.3.1.3	Residual Map of MA upto 50 mts
2.3.1.4	Upward Continuation MA at 100mts
2.3.1.5	Residual Map of MA upto 100 mts
2.3.1.6	Upward Continuation MA at 150mts
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2.3.1.8	Upward Continuation MA at 200mts
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2.3.1.15	Analytical Signal Analysis of MA
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2.3.1.17	Radially Averaged Power Spectrum of MA
2.3.1.18	Expected Anomaly zones on Magnetic Anomaly Map
4.1	Expected Anomaly zones on Magnetic Anomaly Map
4.2	Expected Anomaly zones with Profile plot on MA Map
4.3	Expected Anomaly zones Marked with exposed ore body

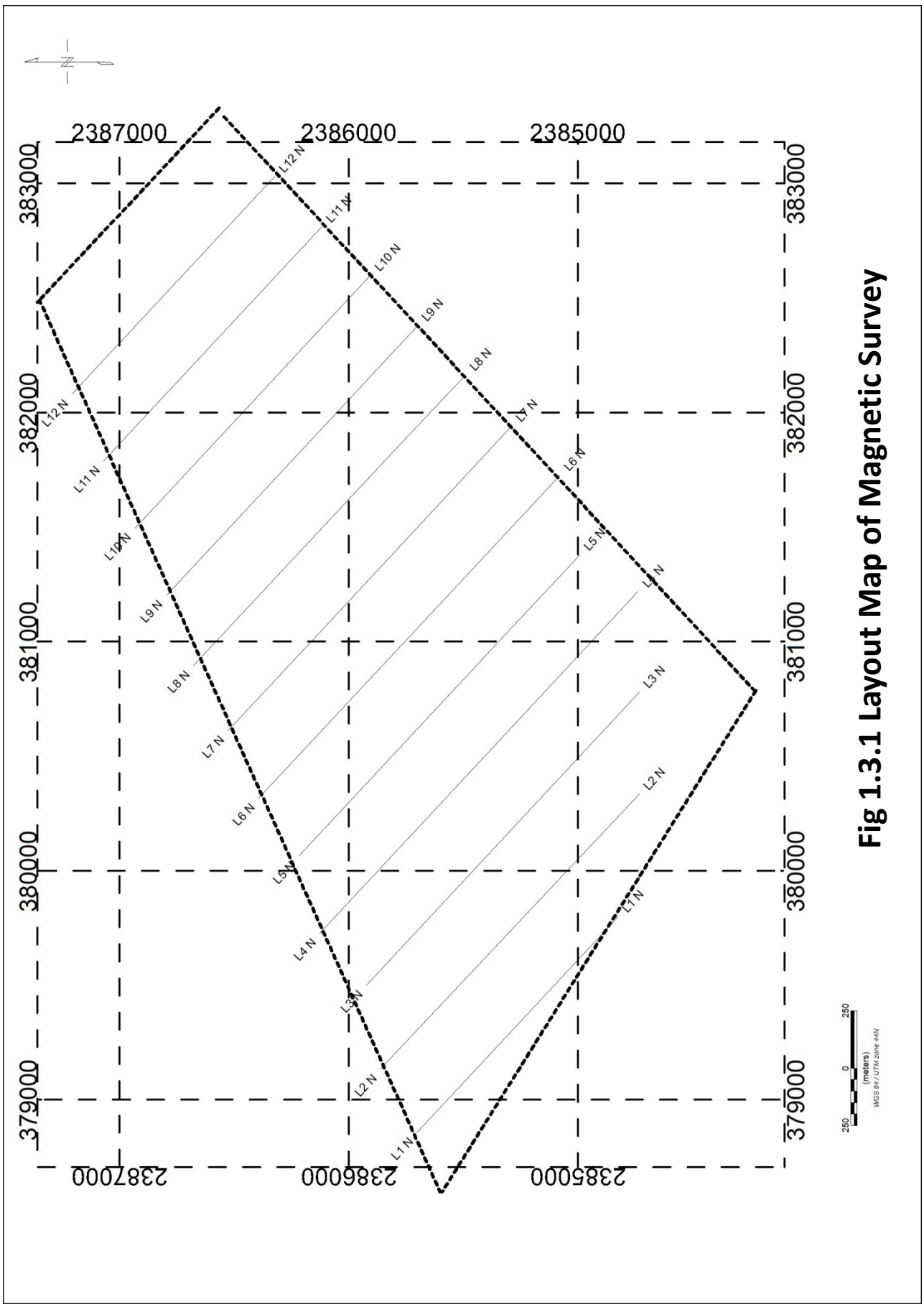

Fig 1.3.1 Layout Map of Magnetic Survey

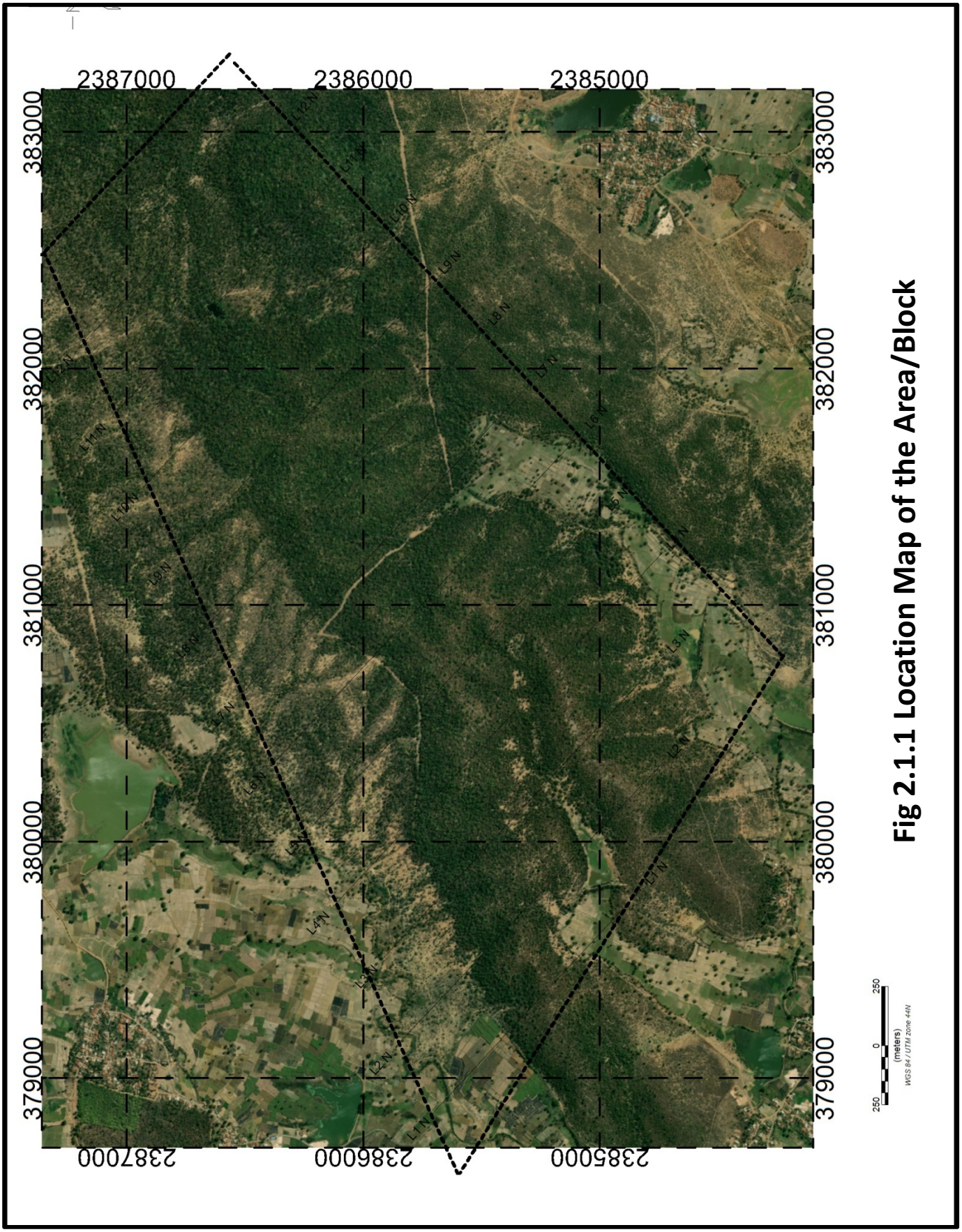

Fig 2.1.1 Location Map of the Area/Block

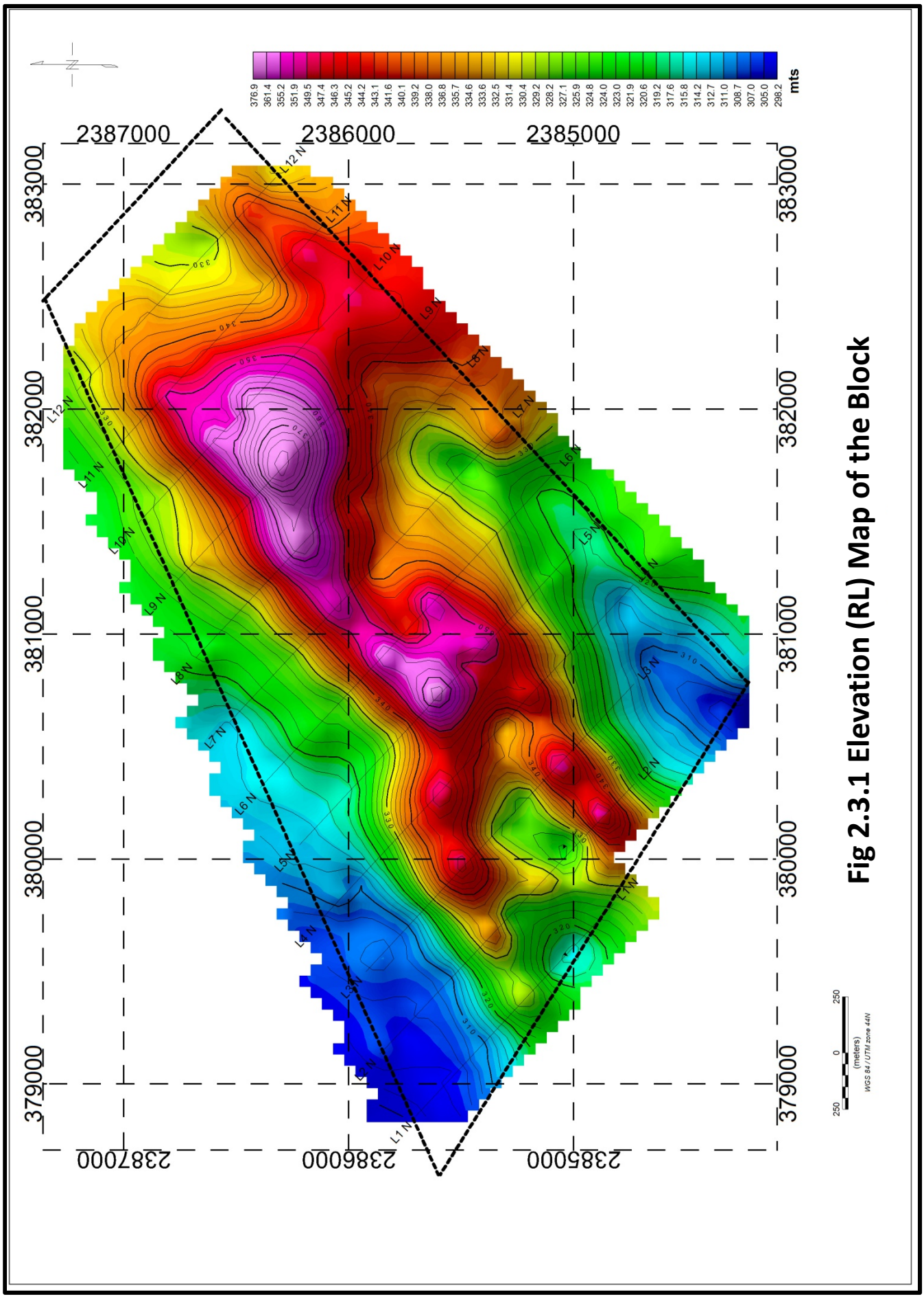

Fig 2.3.1 Elevation (RL) Map of the Block

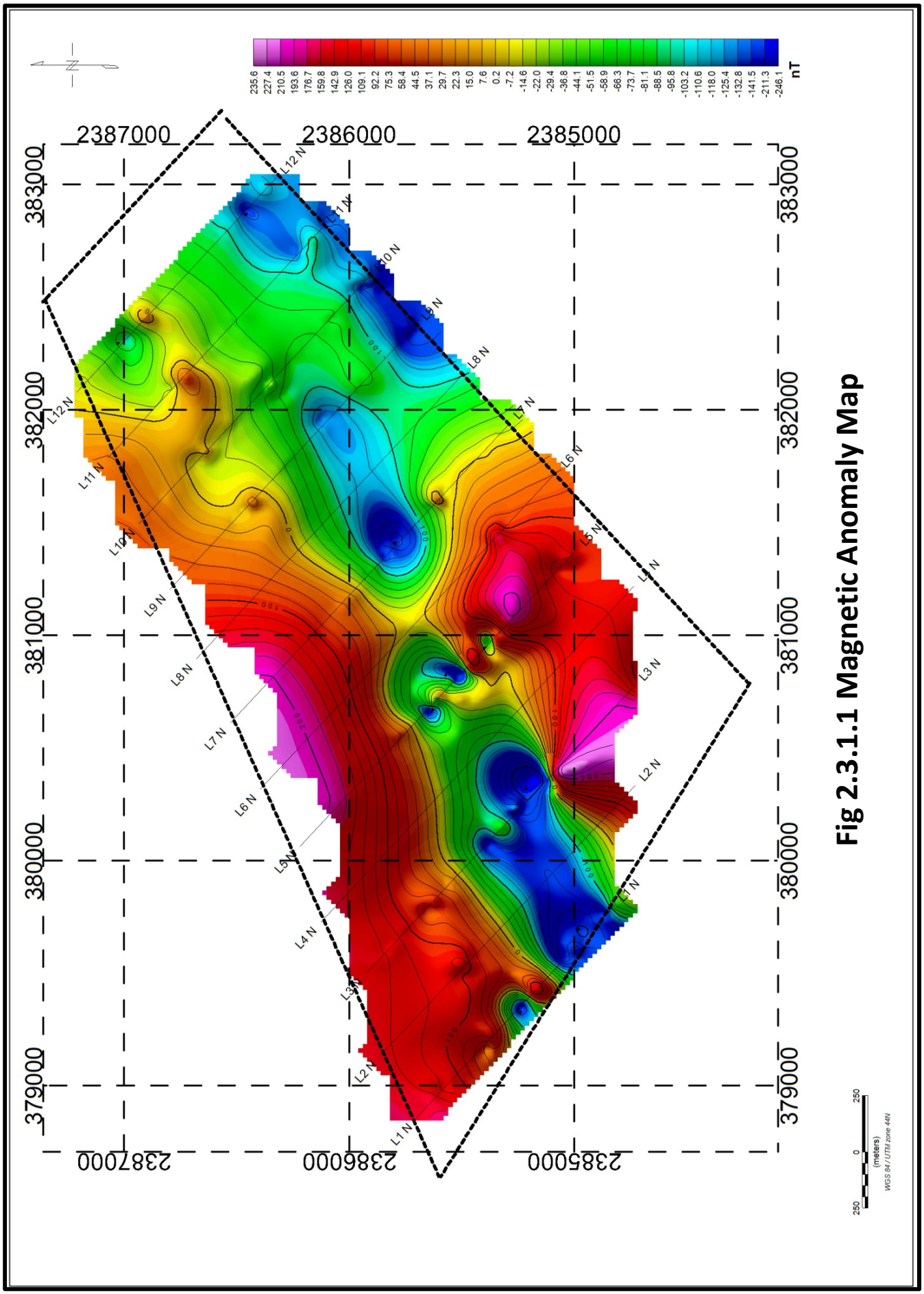

Fig 2.3.1.1 Magnetic Anomaly Map

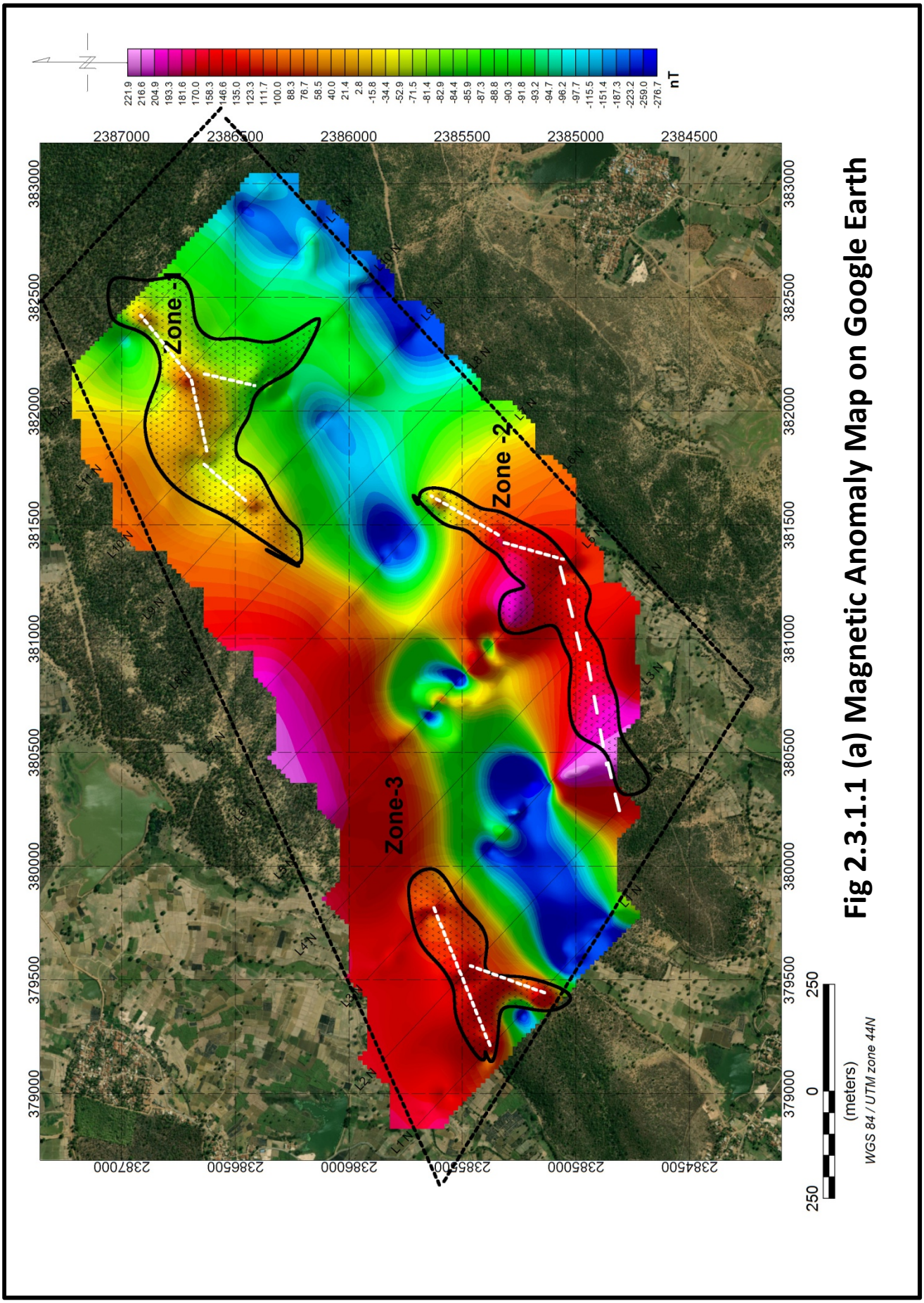

Fig 2.3.1.1 (a) Magnetic Anomaly Map on Google Earth

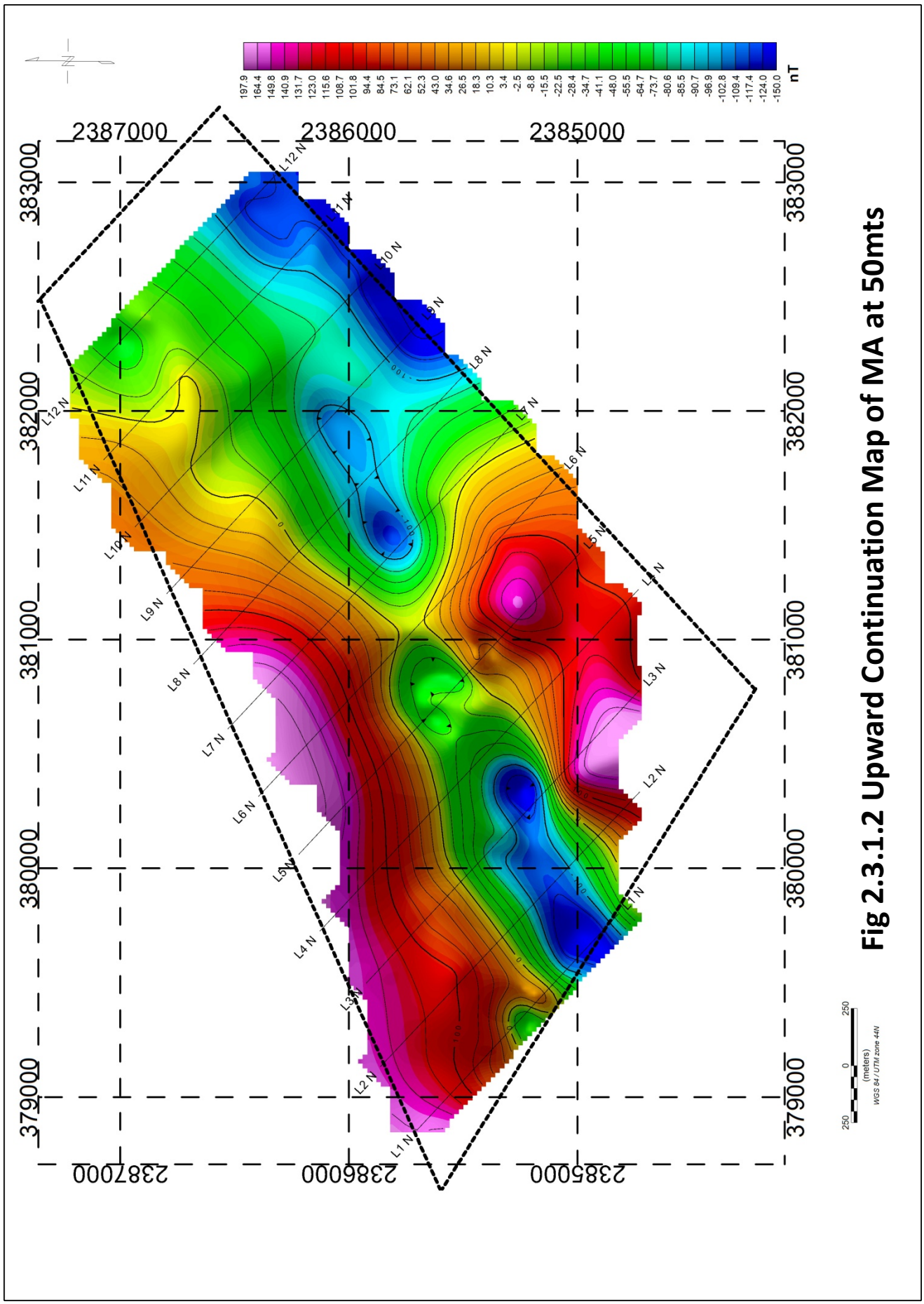

Fig 2.3.1.2 Upward Continuation Map of MA at 50mts

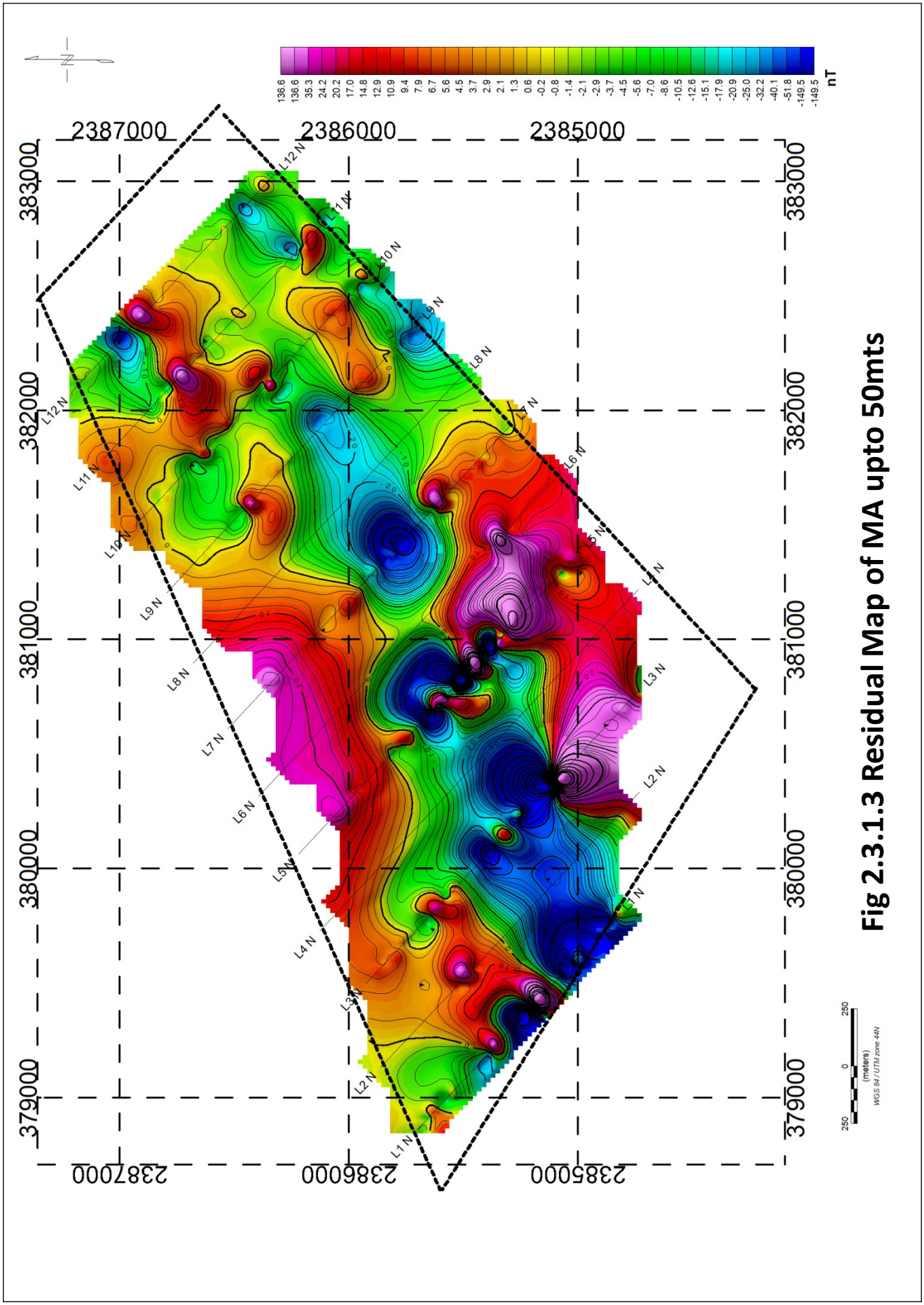

Fig 2.3.1.3 Residual Map of MA upto 50mts

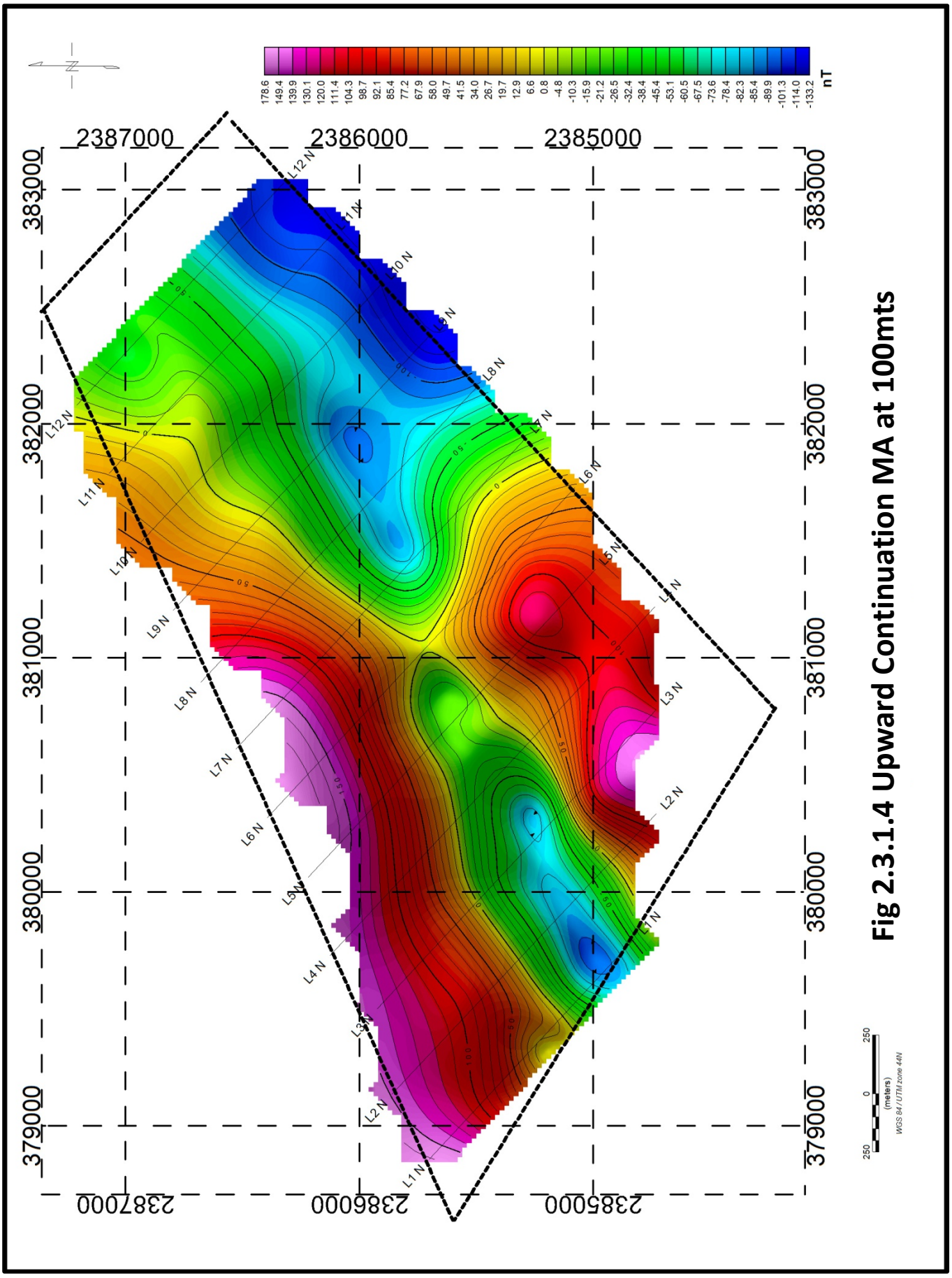

Fig 2.3.1.4 Upward Continuation MA at 100mts

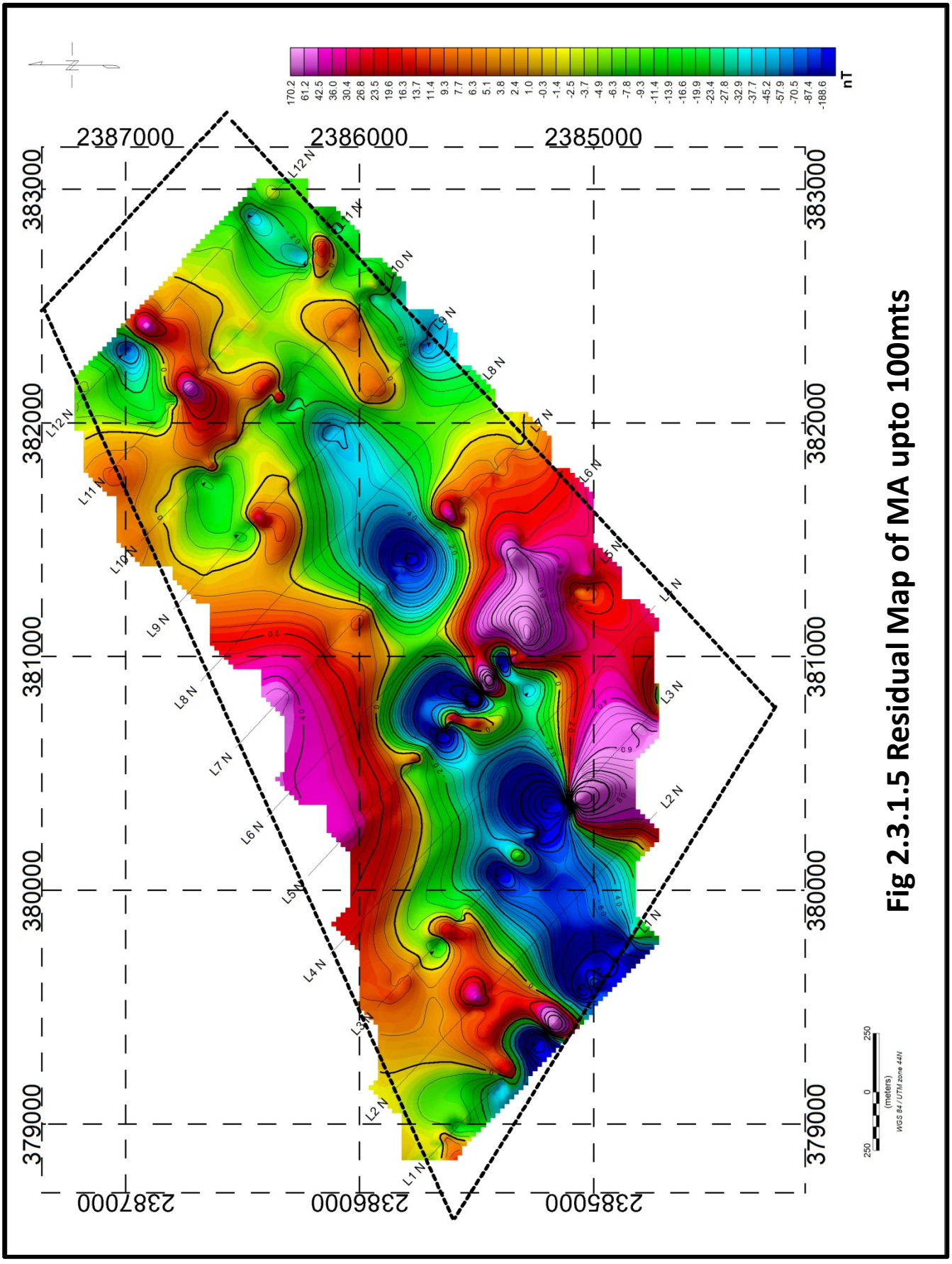

Fig 2.3.1.5 Residual Map of MA upto 100mts

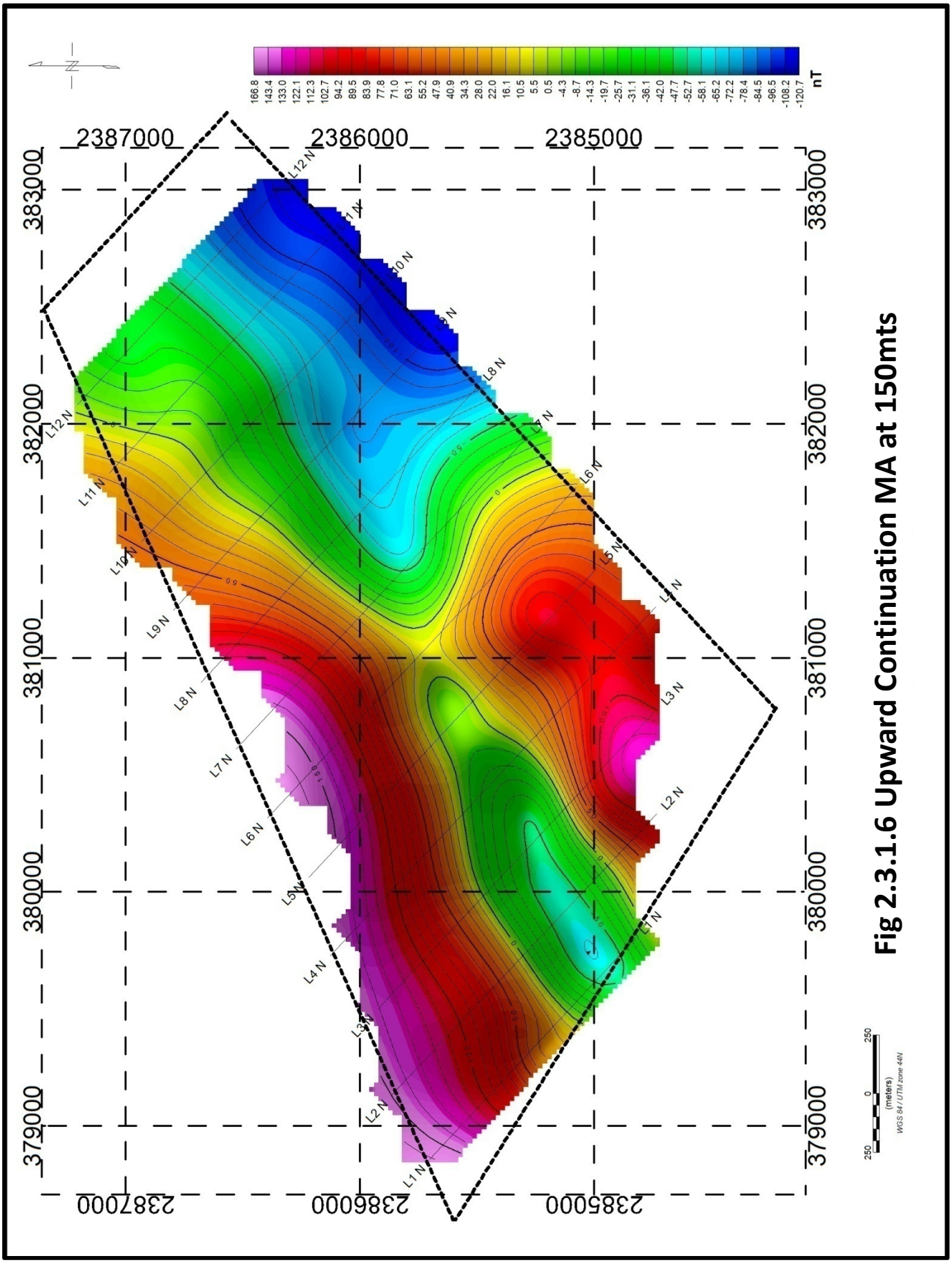

Fig 2.3.1.6 Upward Continuation MA at 150mts

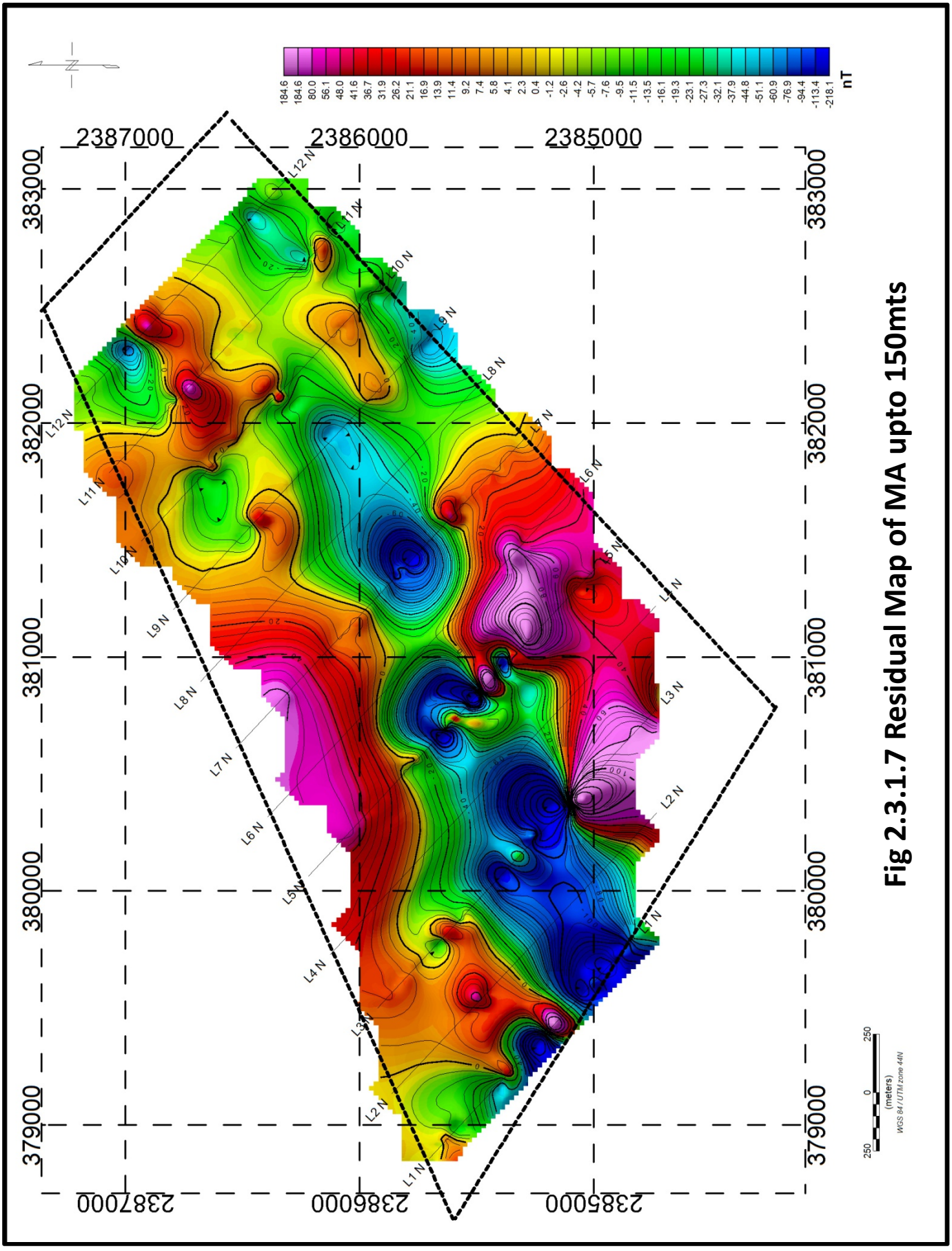

Fig 2.3.1.7 Residual Map of MA upto 150mts

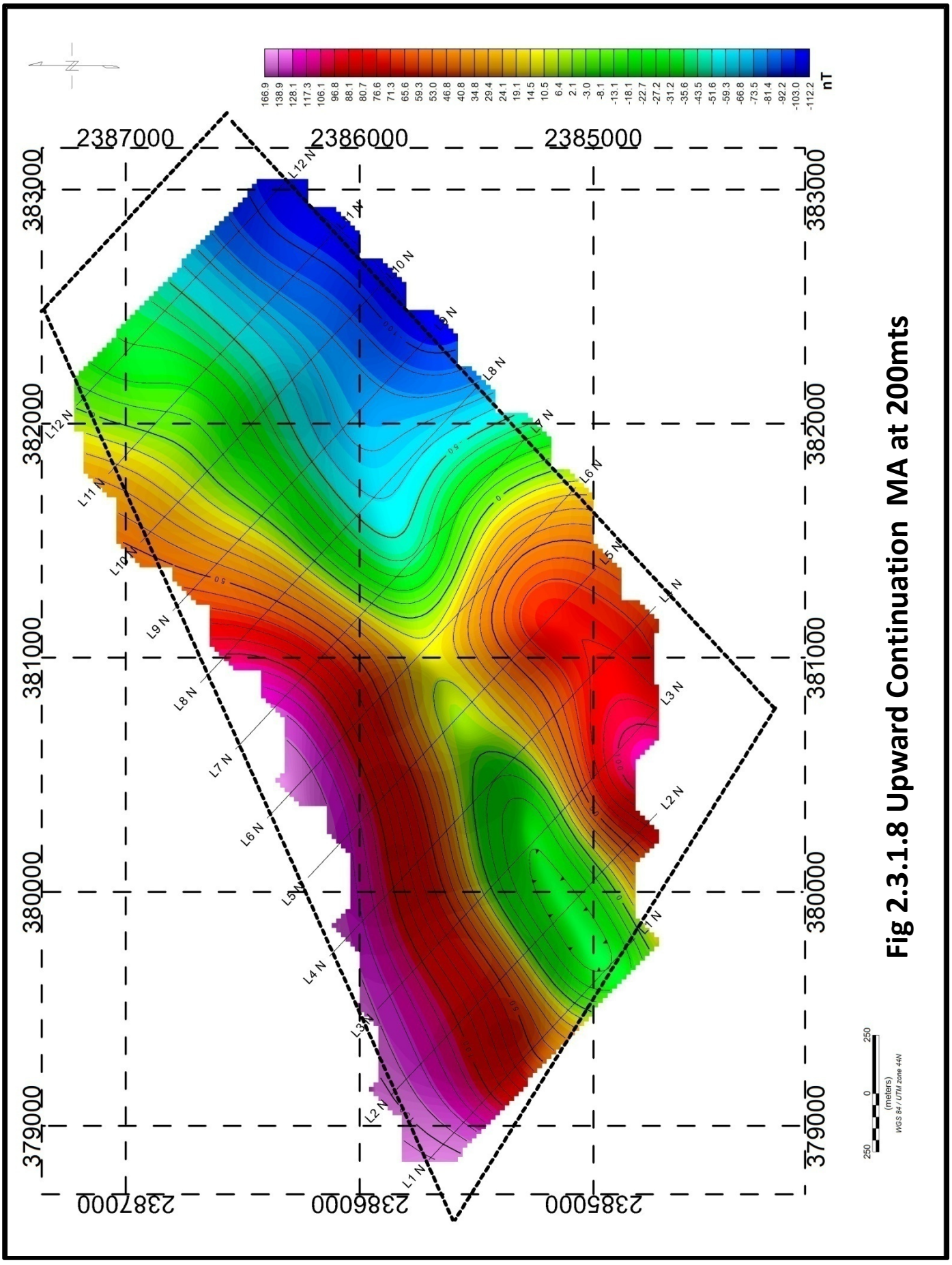

Fig 2.3.1.8 Upward Continuation MA at 200mts

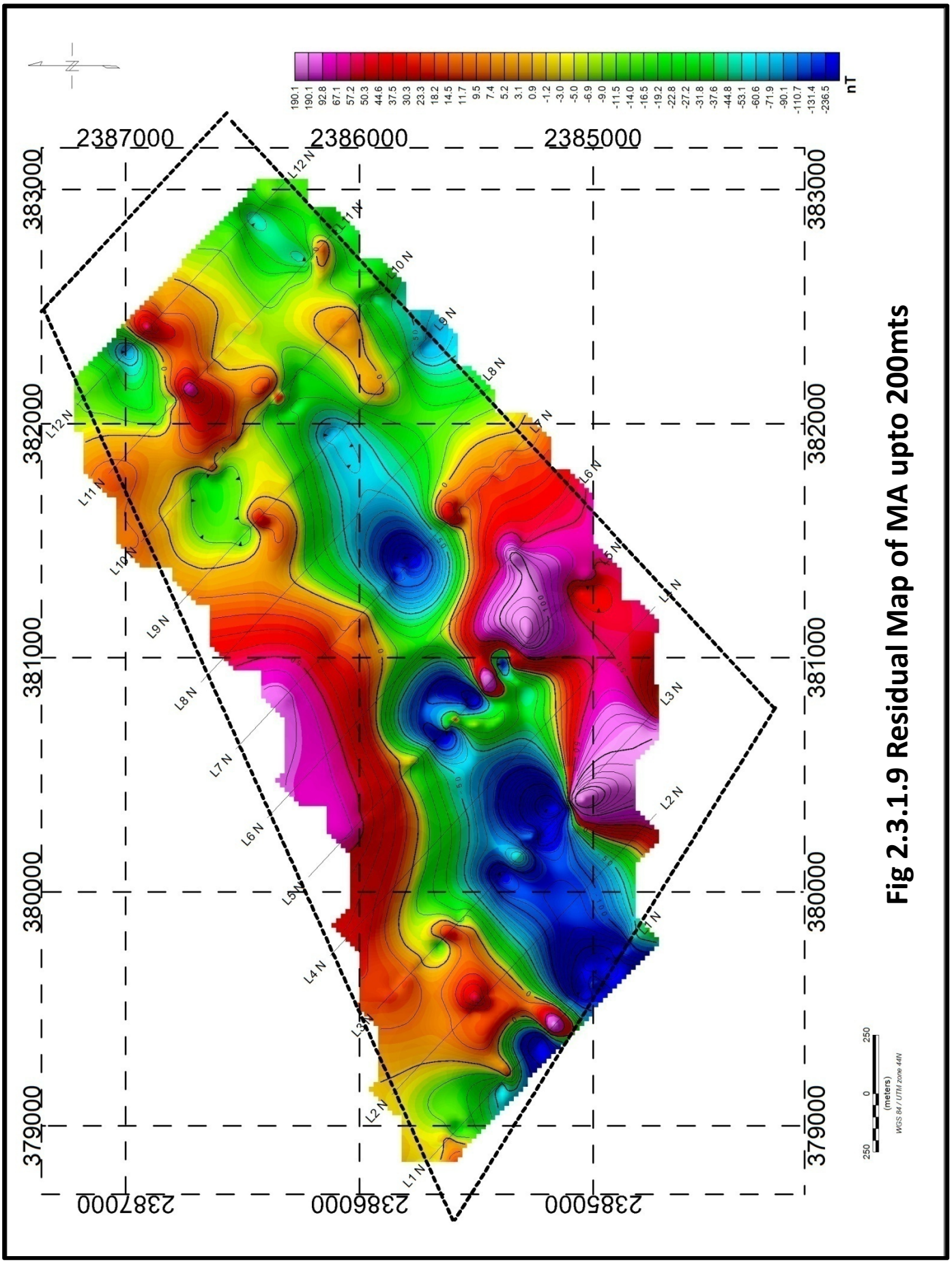

Fig 2.3.1.9 Residual Map of MA upto 200mts

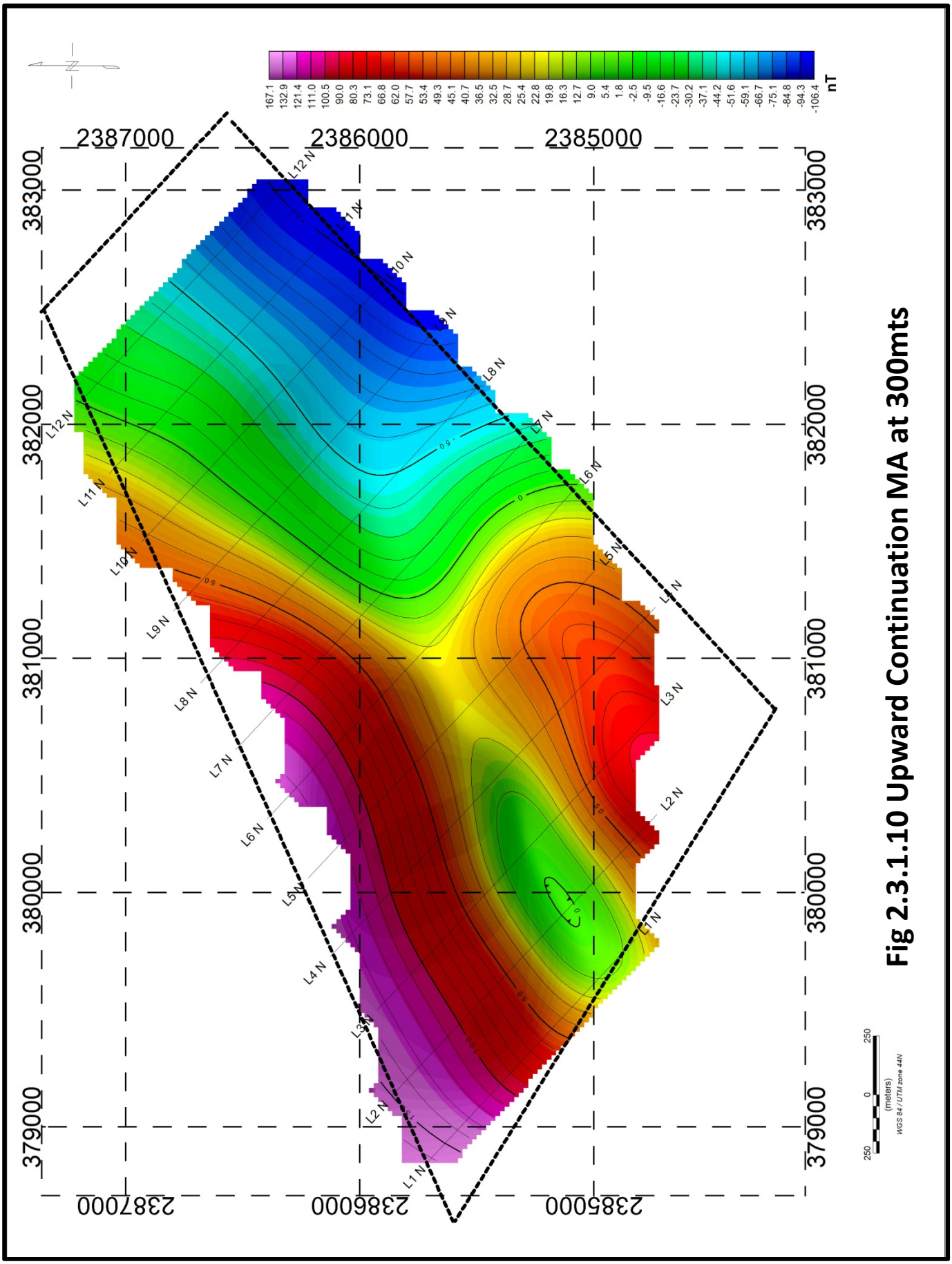

Fig 2.3.1.10 Upward Continuation MA at 300mts

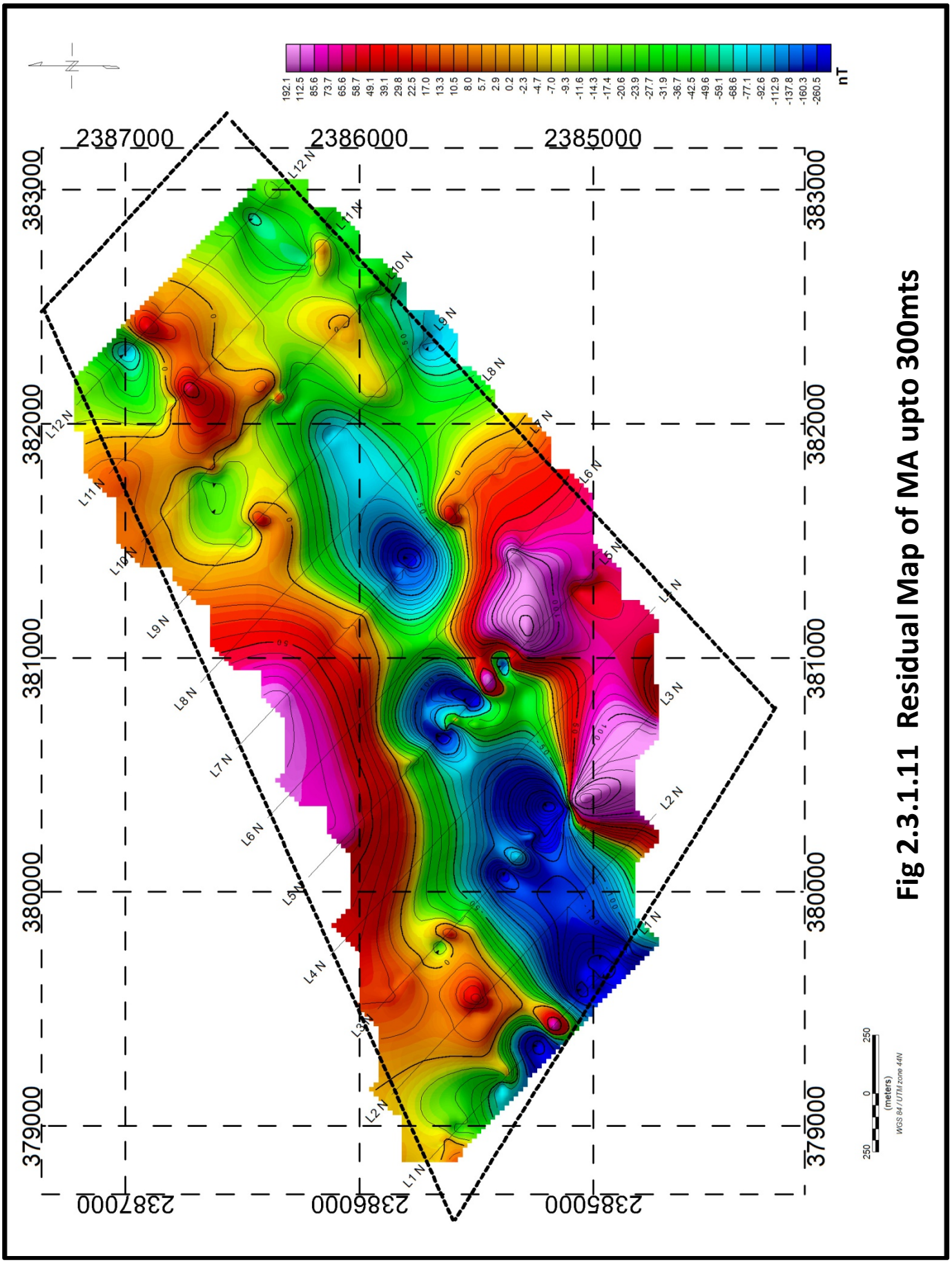

Fig 2.3.1.11 Residual Map of MA upto 300mts

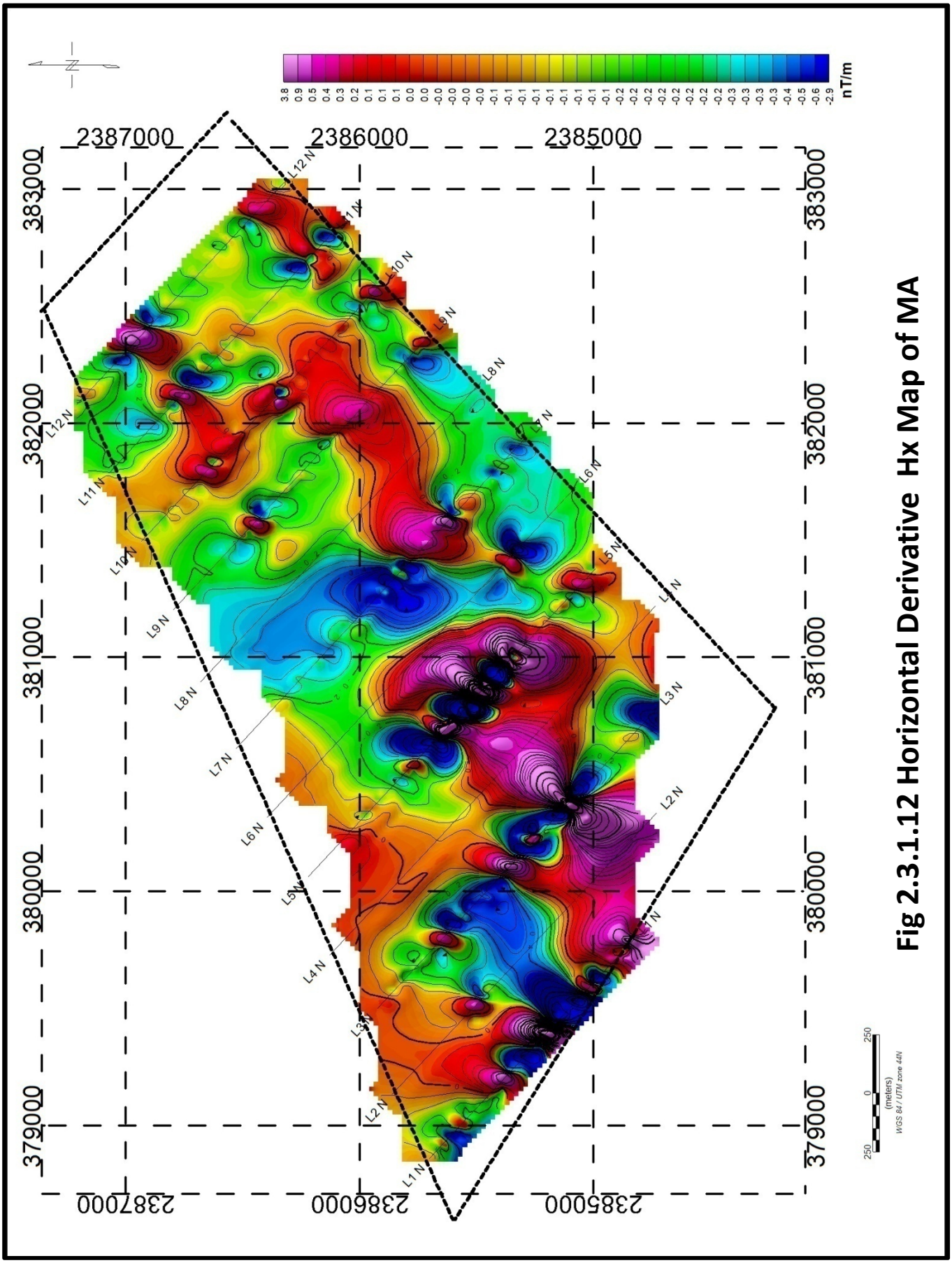

Fig 2.3.1.12 Horizontal Derivative Hx Map of MA

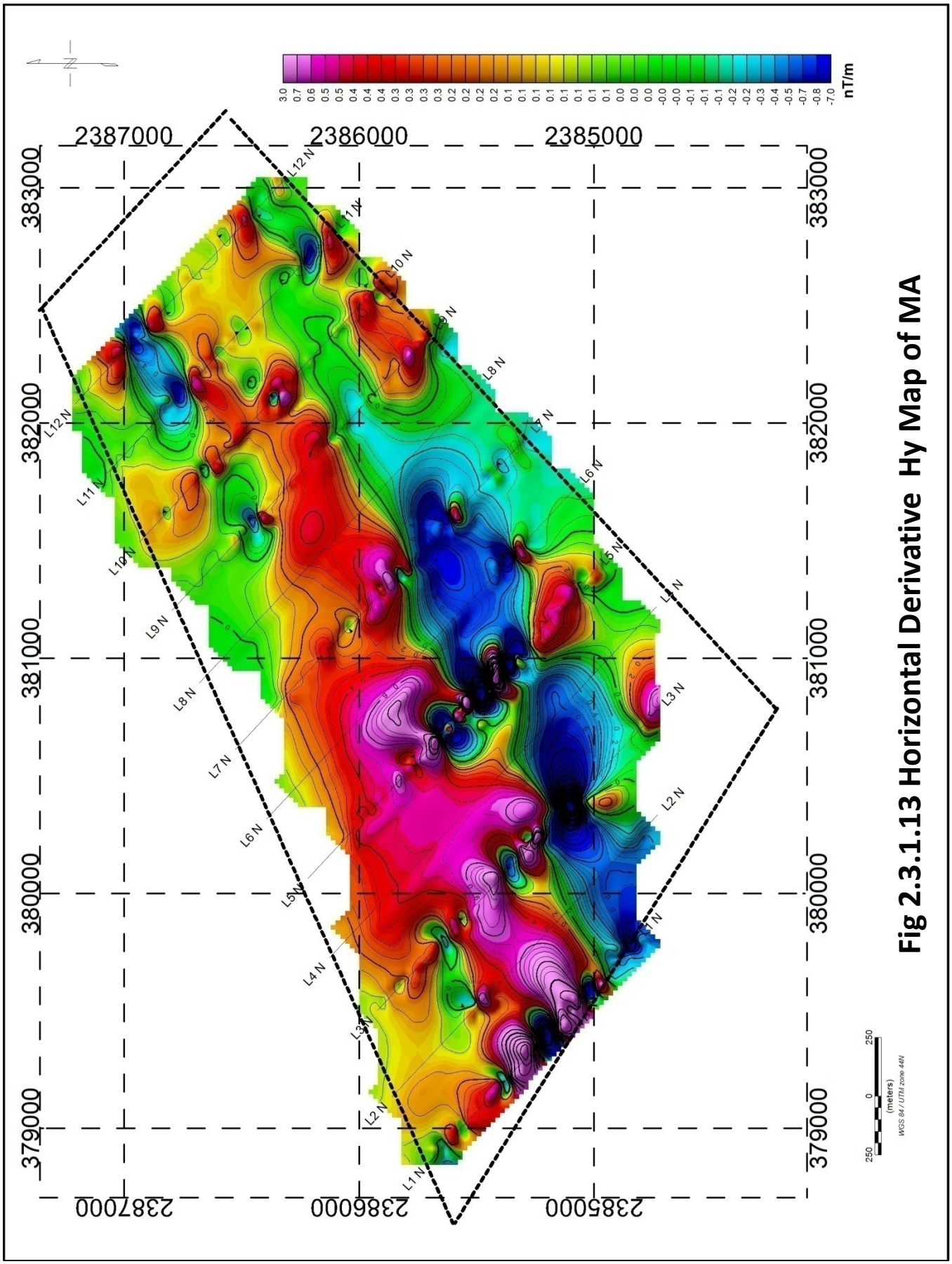

Fig 2.3.1.13 Horizontal Derivative Hy Map of MA

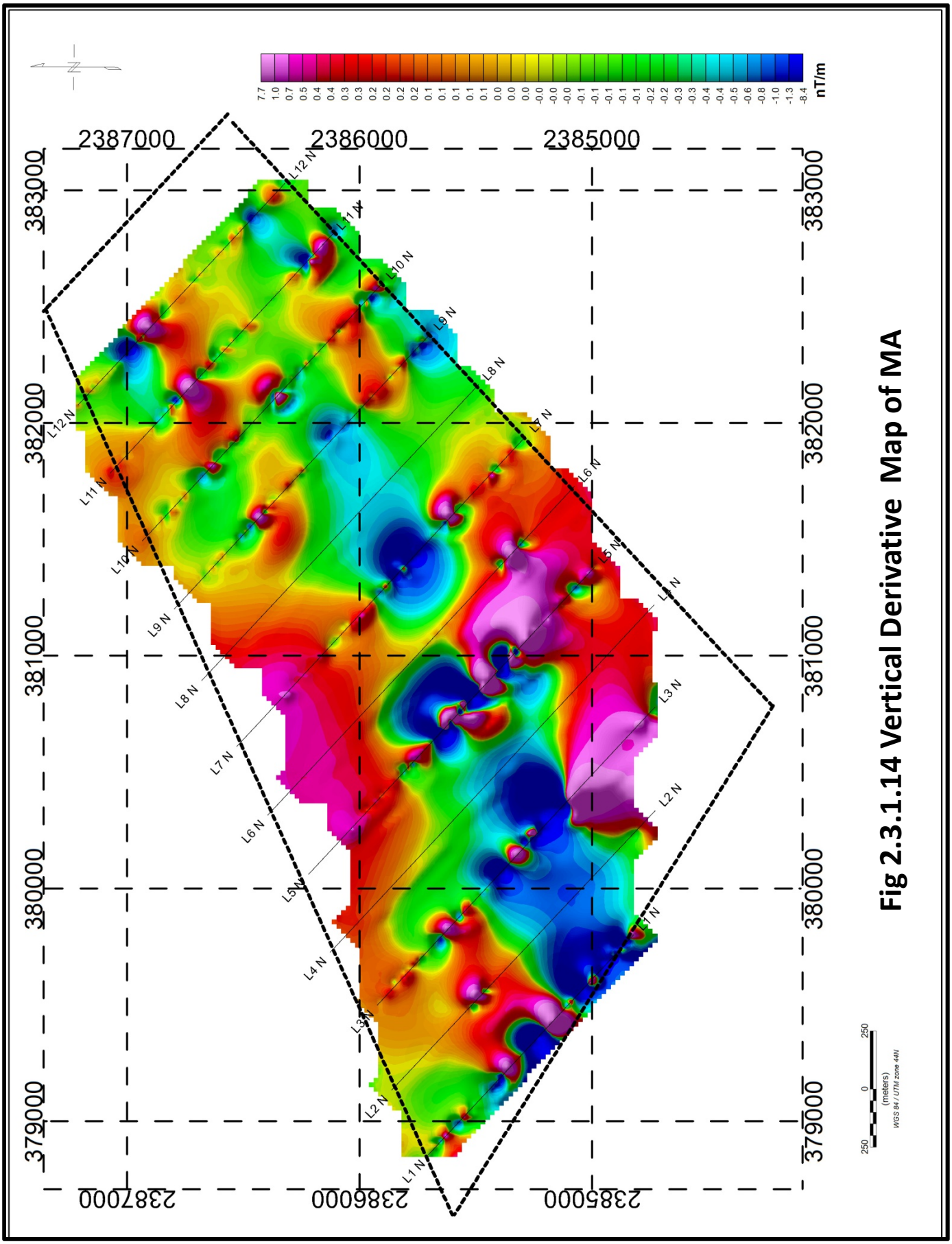

Fig 2.3.1.14 Vertical Derivative Map of MA

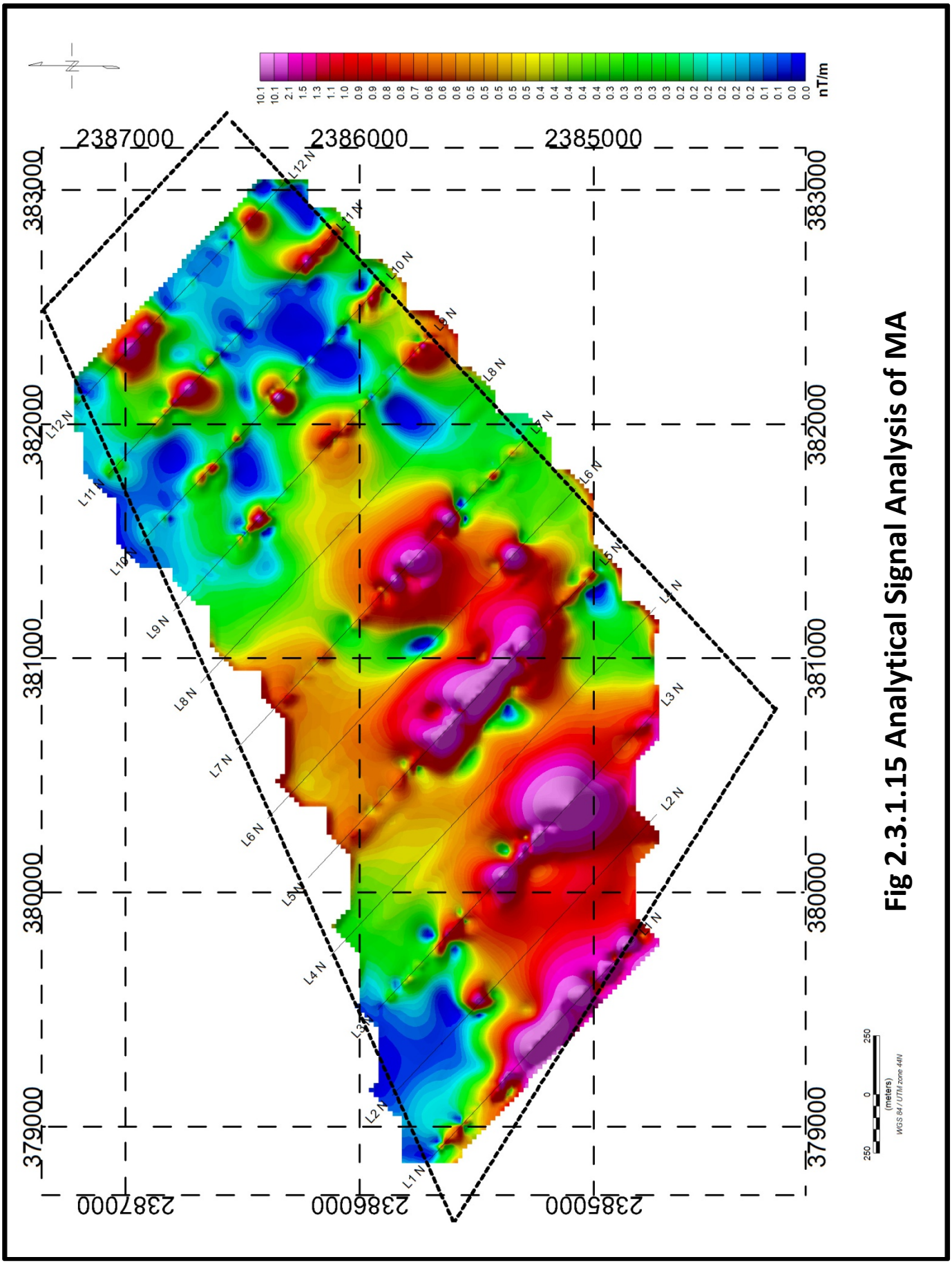

Fig 2.3.1.15 Analytical Signal Analysis of MA

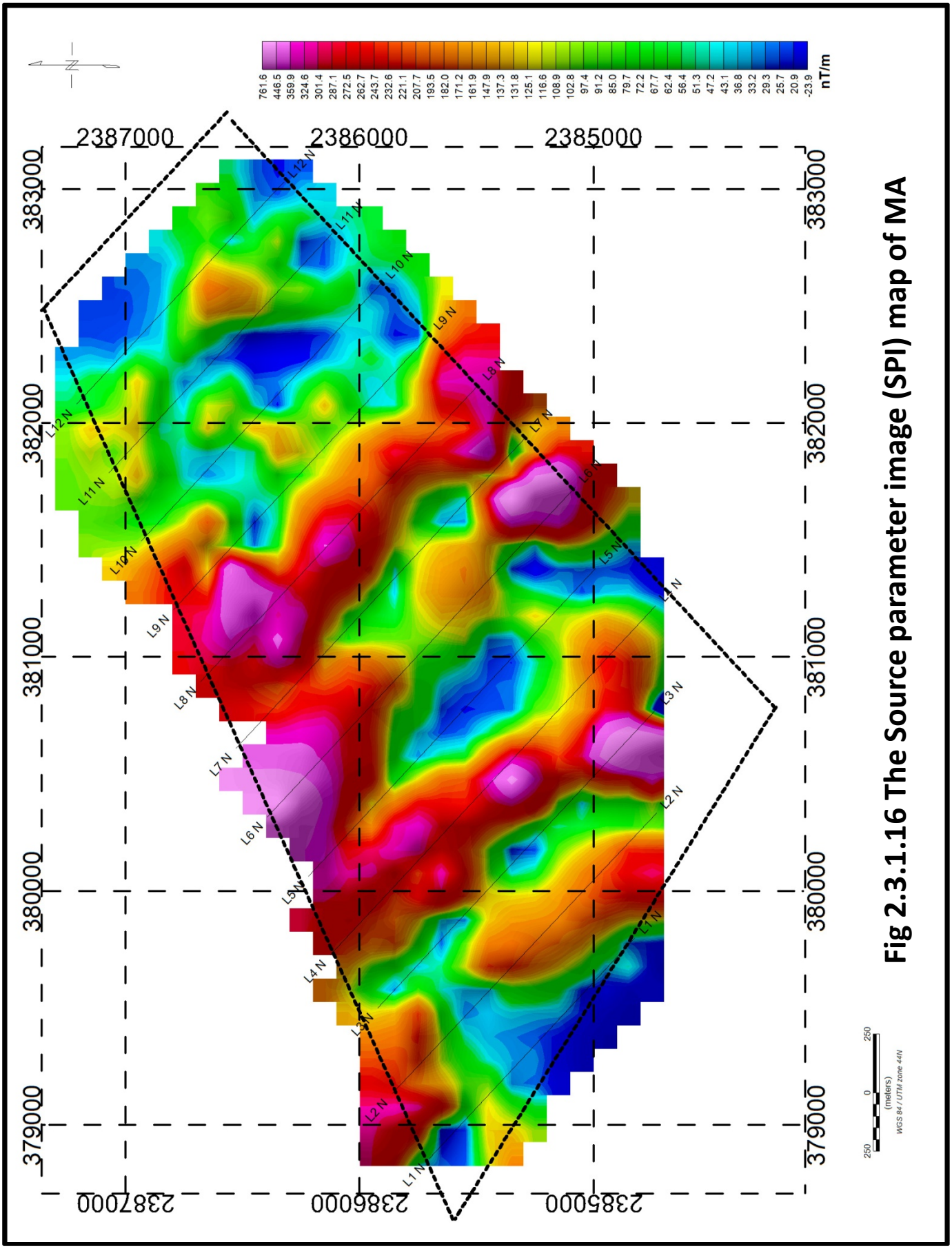

Fig 2.3.1.16 The Source parameter image (SPI) map of MA

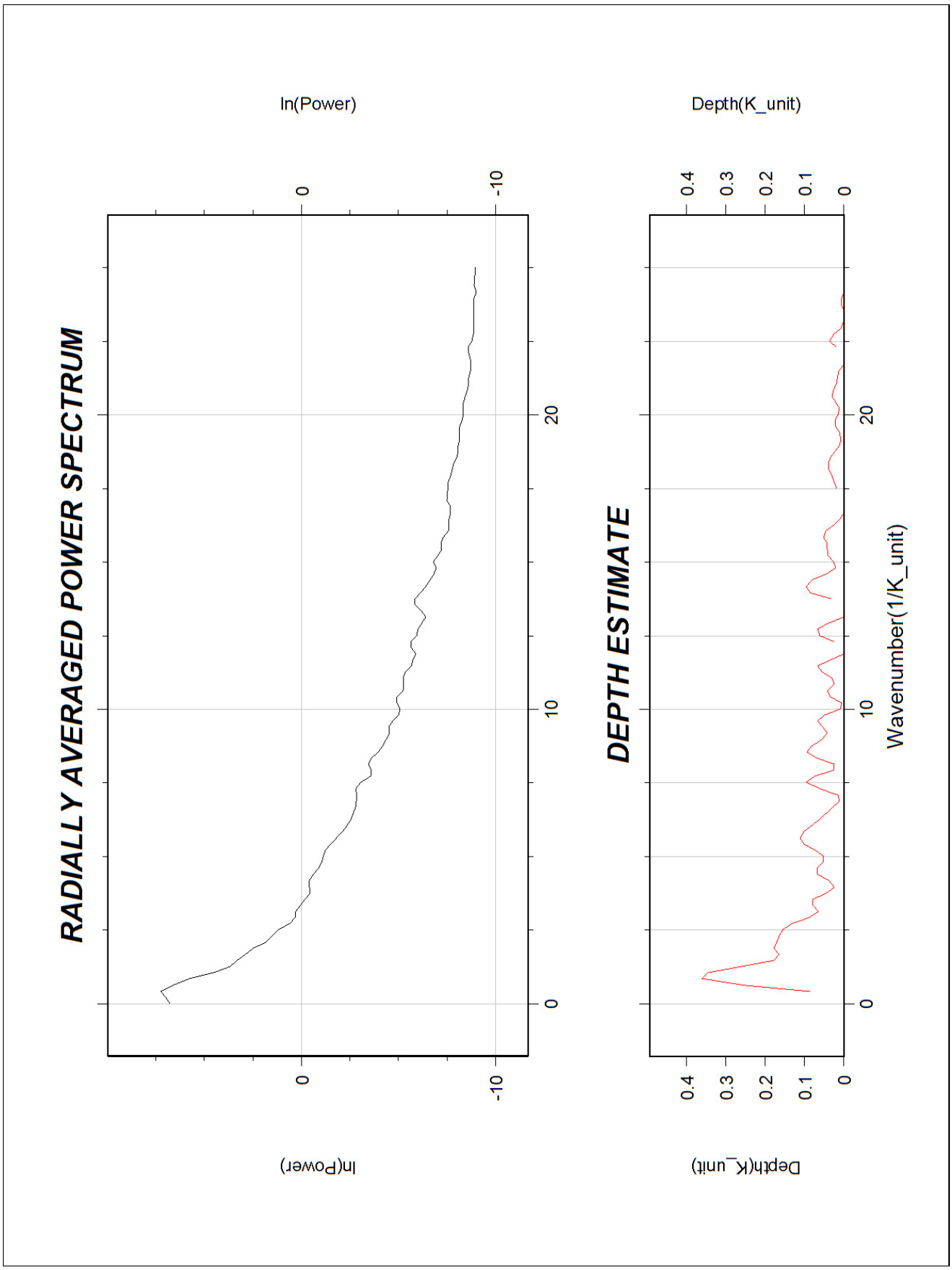

Fig 2.3.1.17 :Radially Averaged Power Spectrum of MA

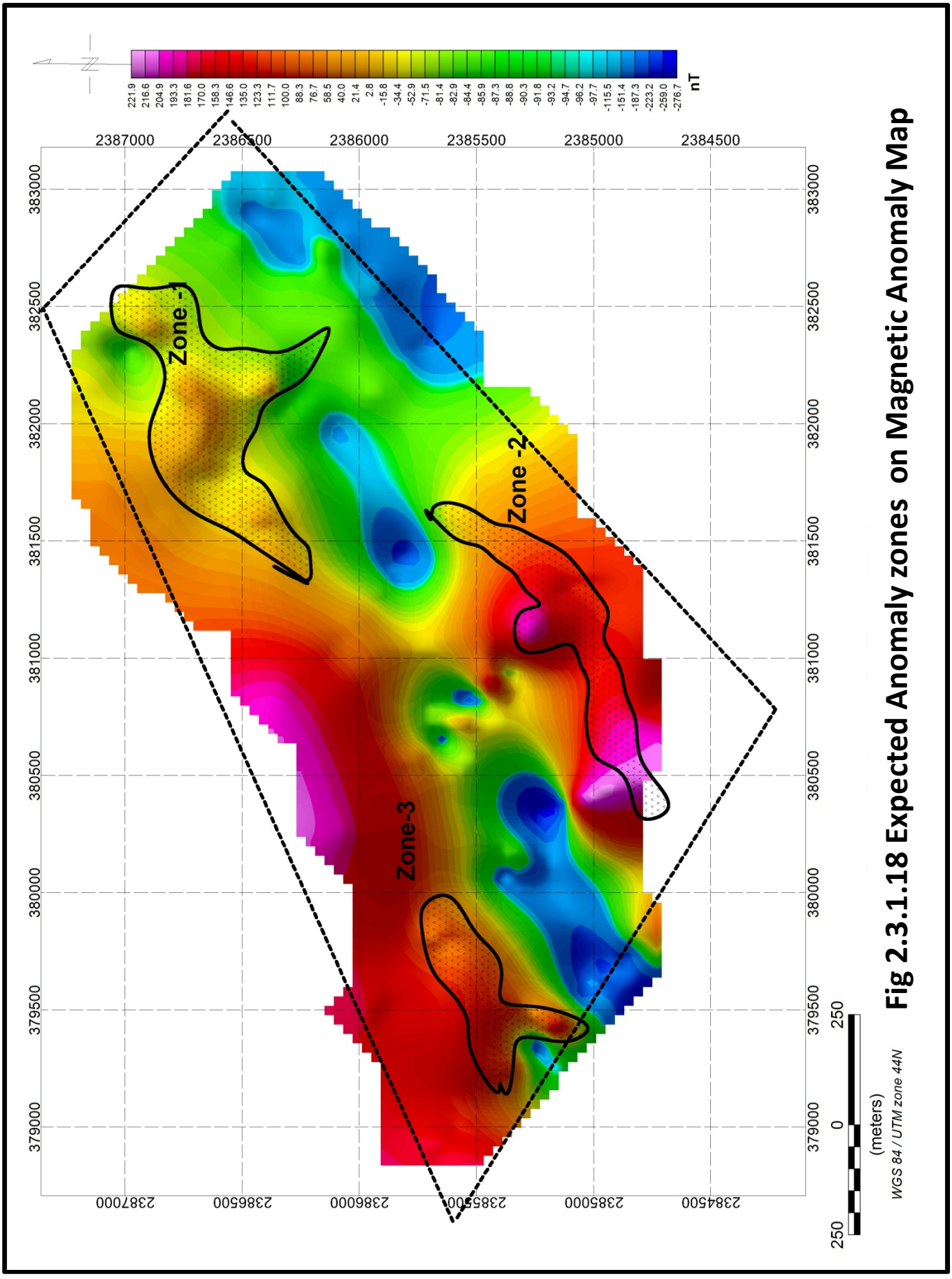

Fig 2.3.1.18 Expected Anomaly zones on Magnetic Anomaly Map

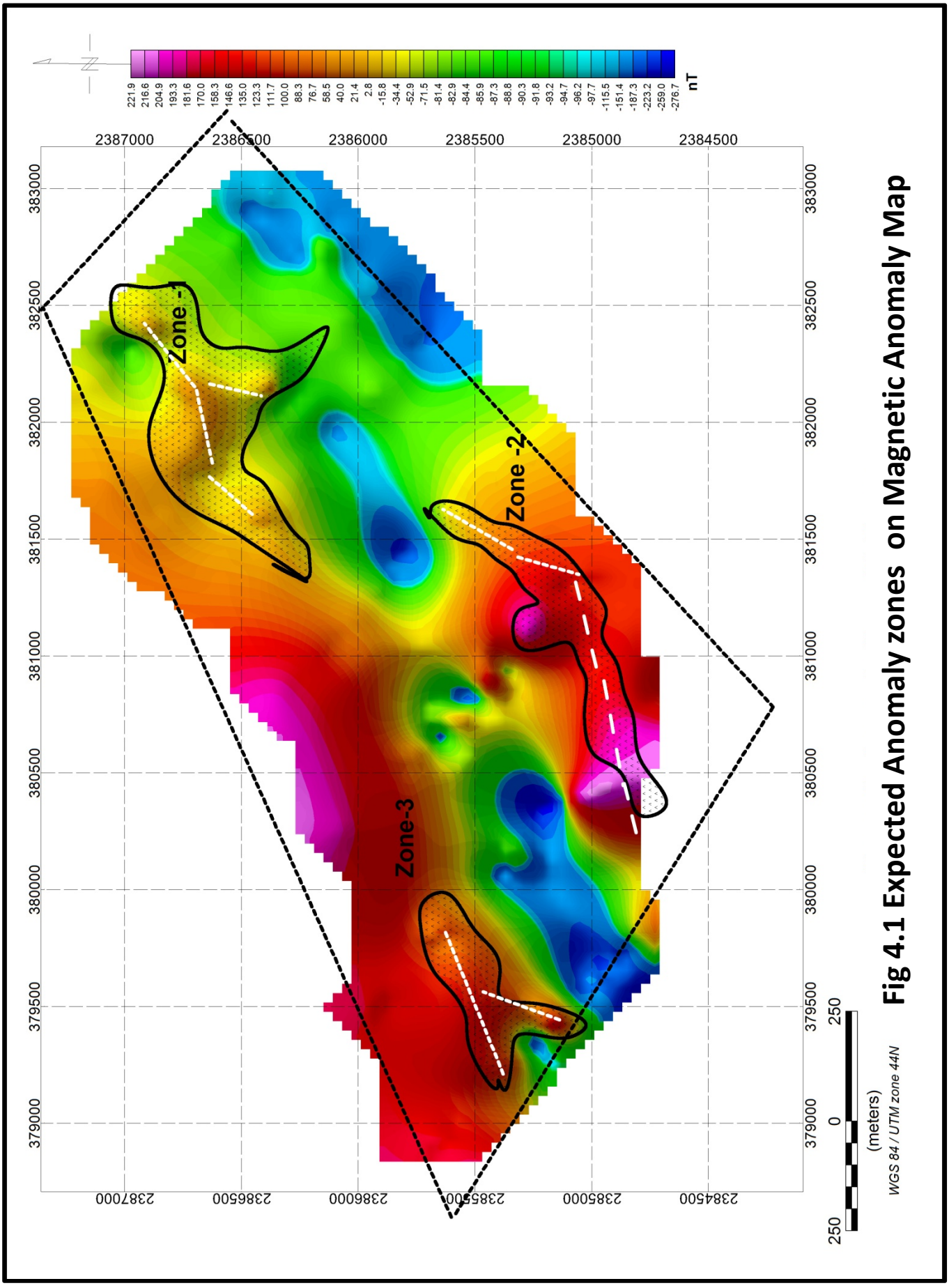

Fig 4.1 Expected Anomaly zones on Magnetic Anomaly Map

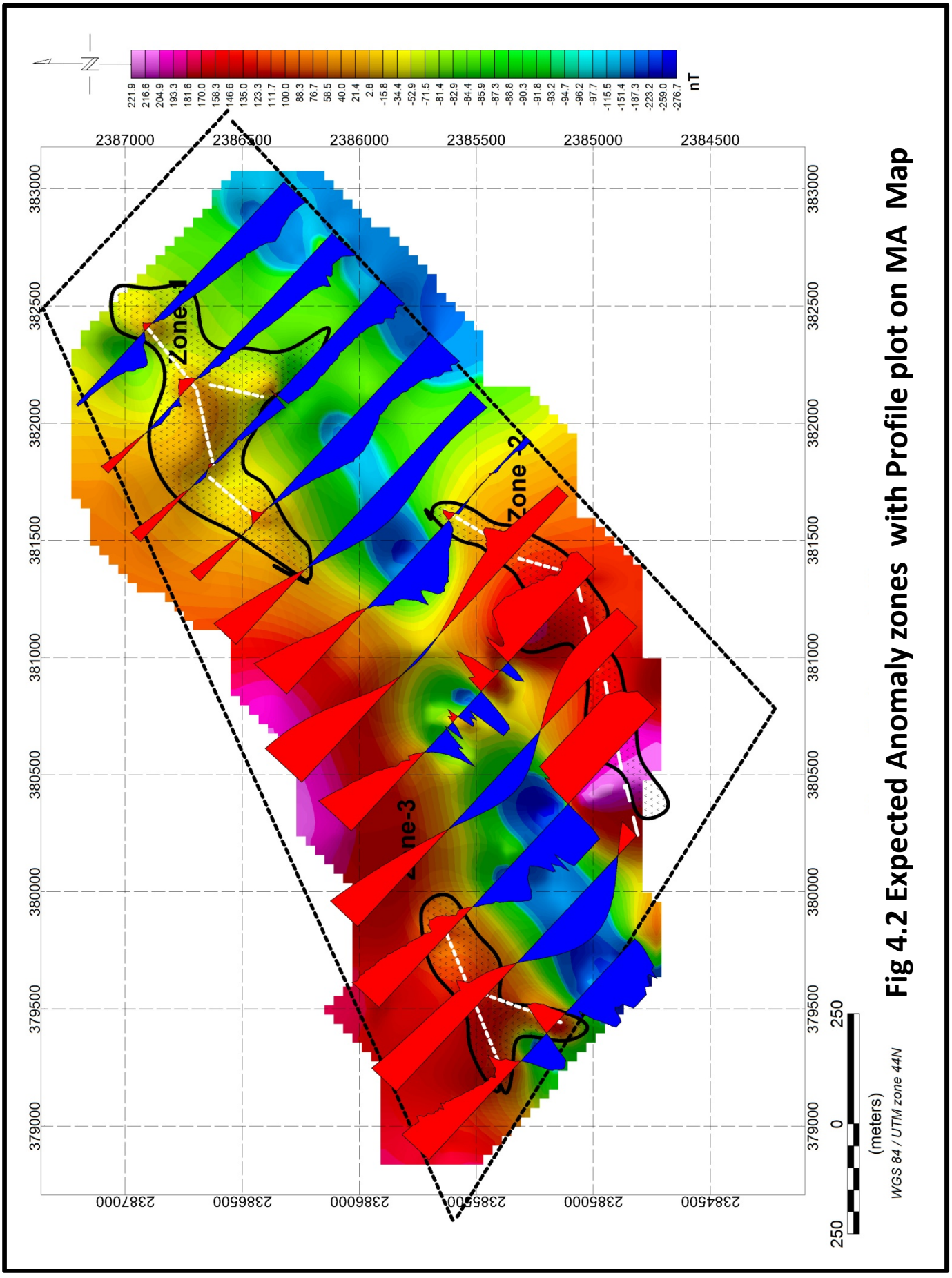

Fig 4.2 Expected Anomaly zones with Profile plot on MA Map

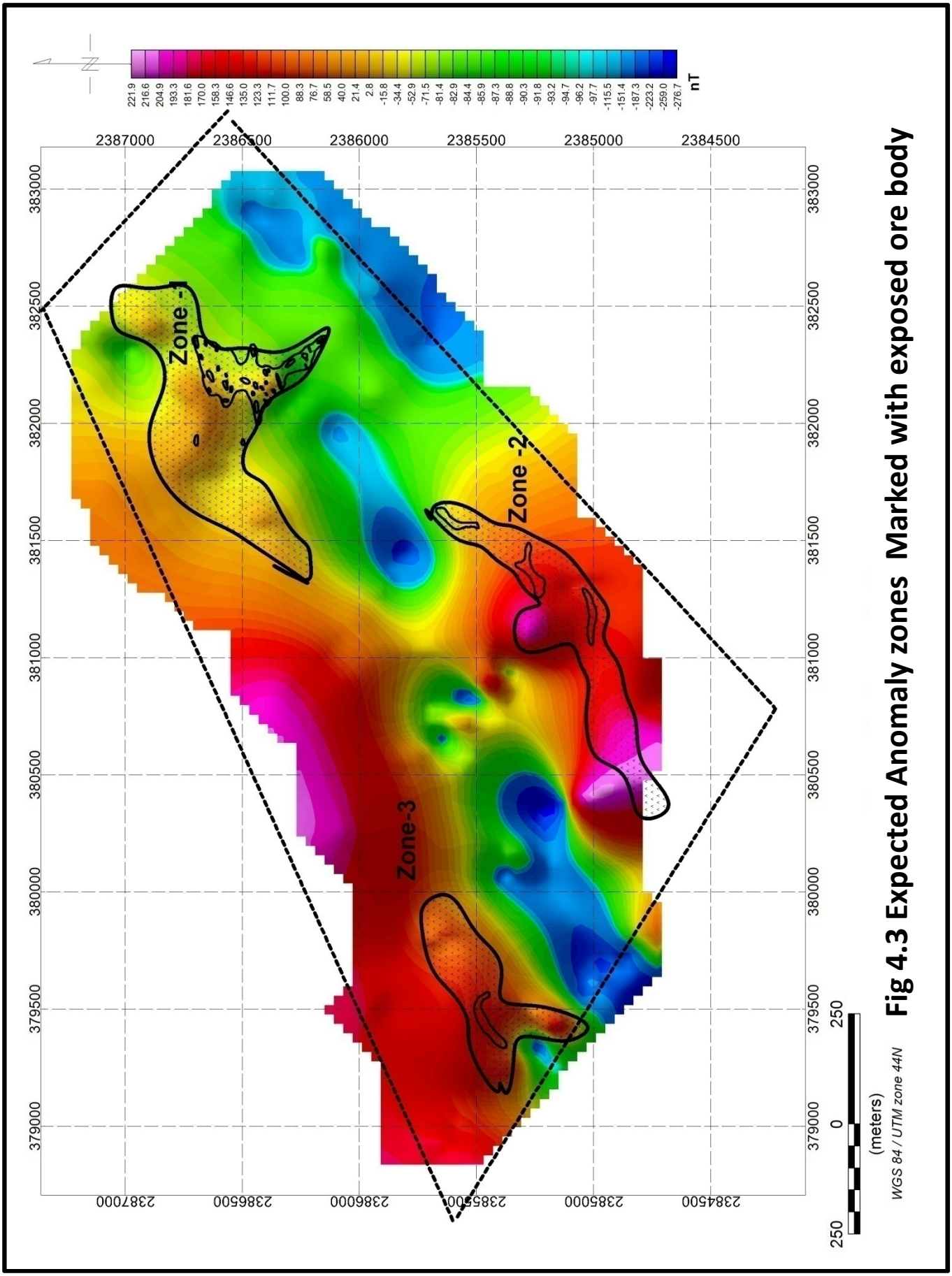

Fig 4.3 Expected Anomaly zones Marked with exposed ore body