

# REPORT ON INTERPOLATION OF A TERRESTRIAL MAGNETIC & VLF SURVEY

Northwest Territories, Canada

by



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October, 2016

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## Introduction

This report describes the process of interpolation and filtering of the walkmag data acquired by Skypilot Exploration in September 2016.

Upon receiving raw data acquired with GEM Systems proton Precession magnetometers, it went clear that interpolation is not possible without filtering the noisy data. Since the signal quality (sq) factor of the acquired data for many data points was below the required values, we tried to give those points less weight in interpolation and in some cases even completely remove them.

The dataset consists of two separate datasets covering east and western side of the area. The interpolated results are also named as EAST and WEST.

For the west grid, the total line kilometers taken was 28.5 km consist of 1420 points over 19 parallel lines. All survey lines were oriented NE-SW.

For the east grid, the total line kilometers taken was 10.35 km consist of 649 points over 23 semi-parallel lines. All survey lines were oriented NE-SW as well.

The survey described in this report took place on August 28th, 29th and 31st, 2016 and on September 5th, 7th, 12th, 13th and 14th, 2016.

The data were examined for bedrock magnetic anomalies representing deep ultramafic or ultrapotassic intrusions. The report includes data processing and basic interpretation.

## Data Processing and Presentation

All post-field data processing was carried out using Geosoft Montaj and Microsoft Excell. Presentation of flight lines and final maps used Oasis/Geosoft Montaj. Results were gridded using minimum curvature and a grid cell size of 30 - 42 meters.

### Base Map

The geophysical images accompanying this report are positioned using the WGS 1984 datum. The survey geodetic GPS positions have been map projected using the Universal Transverse Mercator (UTM) projection in Zone 10N. A summary of the map datum and projection specifications are as follows:

- Datum: WGS 1984 UTM Zone 10N
- Scale Factor: 10000
- Latitude of Origin: 0.0
- Linear Unit: Meter (1)

### Magnetic Data

The Magnetic Data was first quality checked and any points lacking sufficient georeferenced data or excessive noise were removed. The filtered magnetic data were then corrected for diurnal variations using the magnetic base station data and with use of GEM Systems GEMLink 5.3. No correction for the regional reference field (IGRF) were applied and the Total Magnetic Intensity (TMI) values are the sensed ones. All data then were interpolated using minimum curvature method with grid cell size of 32 meters. This value was set based on the lines spacing of the acquired data for both west and east grid. After finishing interpolation, initial processing subjected the data to several filters:

1. A low pass filter to get rid of the high frequency features. This filter makes sharp noises and high frequency features smoother and amplifies the signal strength associated with deeper

structures. For petrology and geological targets such high frequency anomalies are not usual interests.

2. A FFT filter and a reverse FT to derive the analytical signal which is a measure of the total derivative field.
3. Vertical derivative filter.
4. Total horizontal filter.

## Very Low Frequency Electro-Magnetic (VLF-EM) Data

In the presence of a conductor, the total VLF field is elliptically polarized. The VLF-EM survey method aims to detect and measure the tilt angle ( $\theta$ ) of the major axis of the polarization ellipse, and its ellipticity  $e$ : the ratio of the major to minor axis. In most modern commercial instruments, one obtains a direct digital readout of the in-phase (real) and quadrature (imaginary) components of the vertical secondary magnetic field expressed as a percentage of the primary horizontal field. For reasonably small values, the real component is related to the tilt angle of the polarization ellipse by the following equation:

$$R = 100\theta \quad (\theta \text{ in radians})$$

Where R is the ratio of the response in percent and  $\theta$  is the tilt angle.

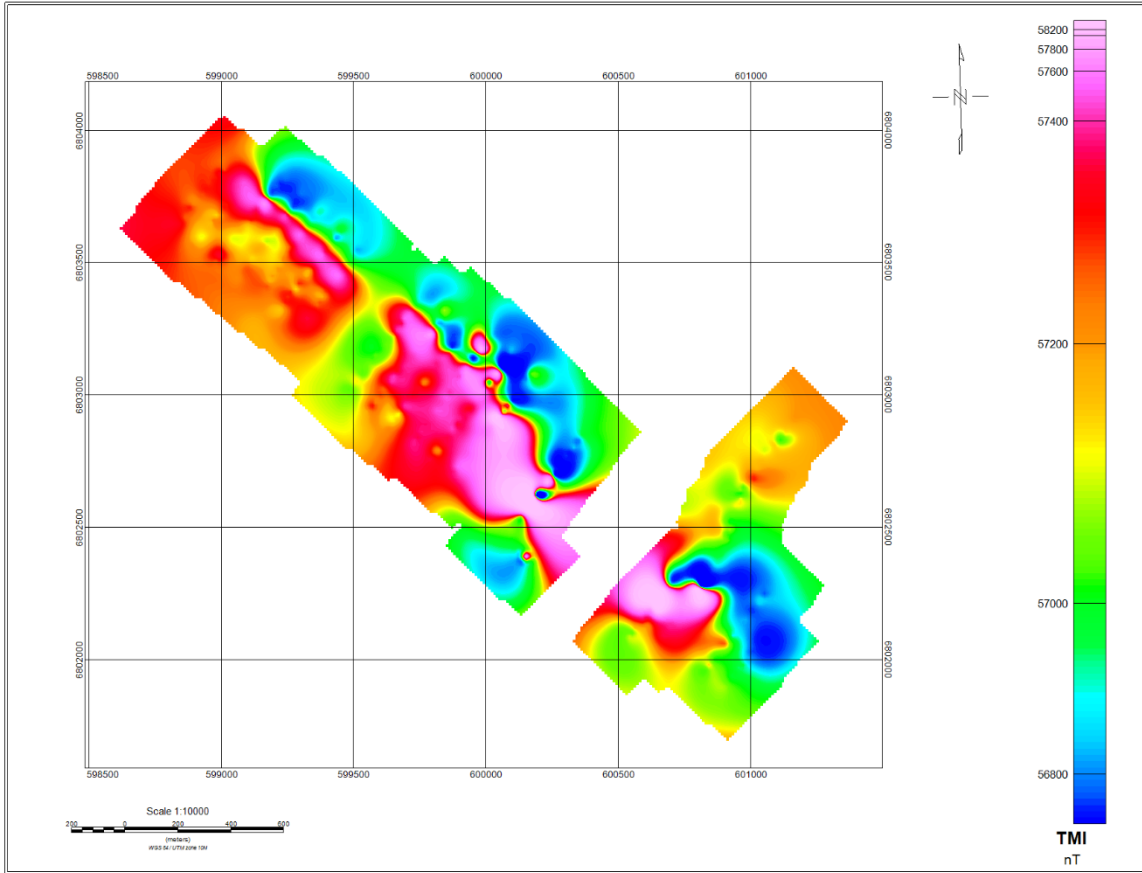
Applying the following equation to the data acquired from the field observations results in the real component of the response field. These values can then be interpolated using minimum curvature method with grid cell size of 30 metres. This cell size is based on the line spacing associated with the data (which is 100m).

The same process was applied to the Quadrature values to calculate and interpolate the imaginary component of the data. The processed datasets as well as combined maps are included in the Appendices.

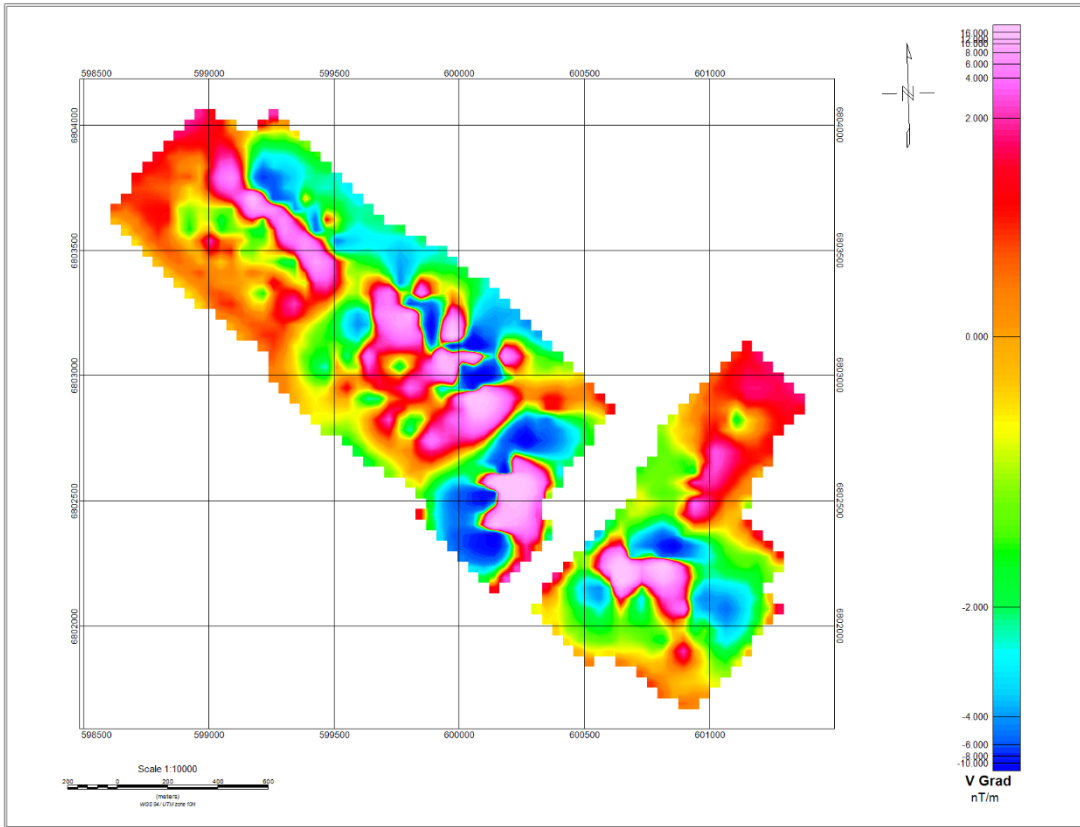
## Survey Results

# East Grid Maps

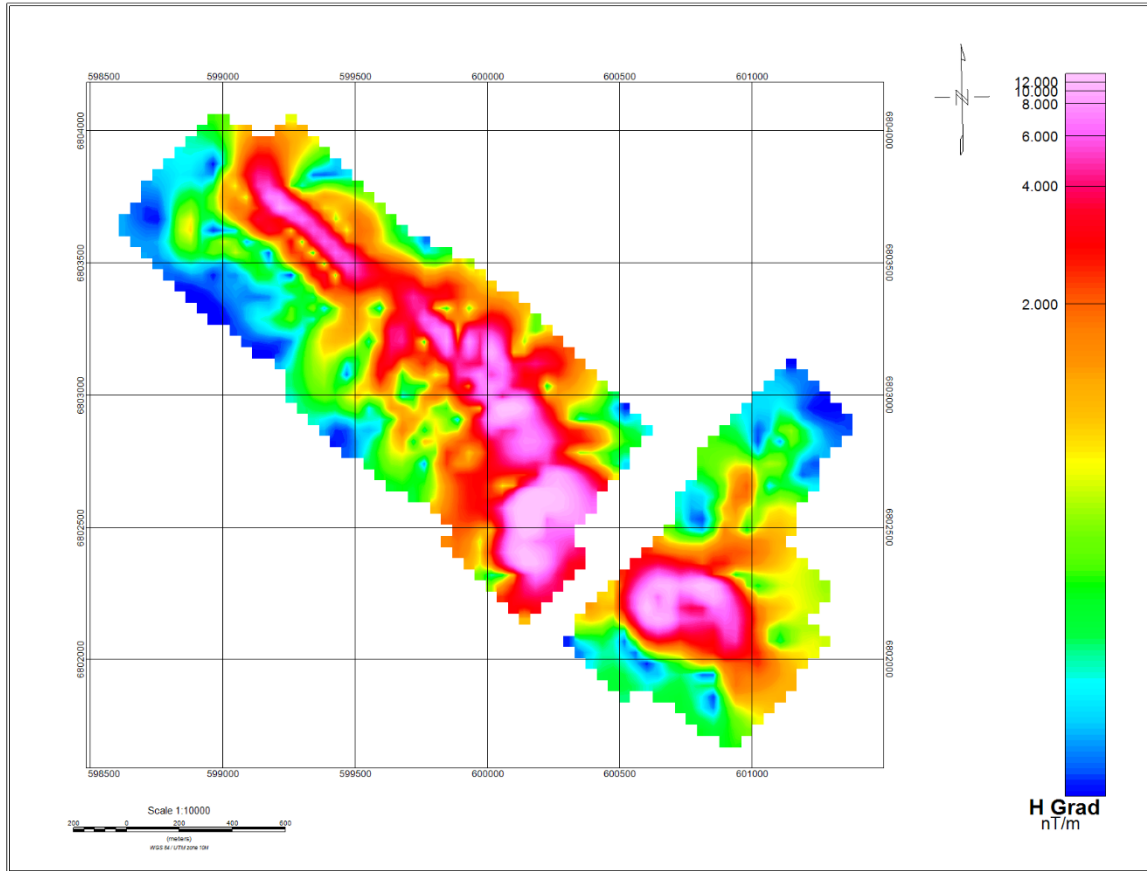
## Map 1: Total Magnetic Field



## Map 2: First Vertical Derivative

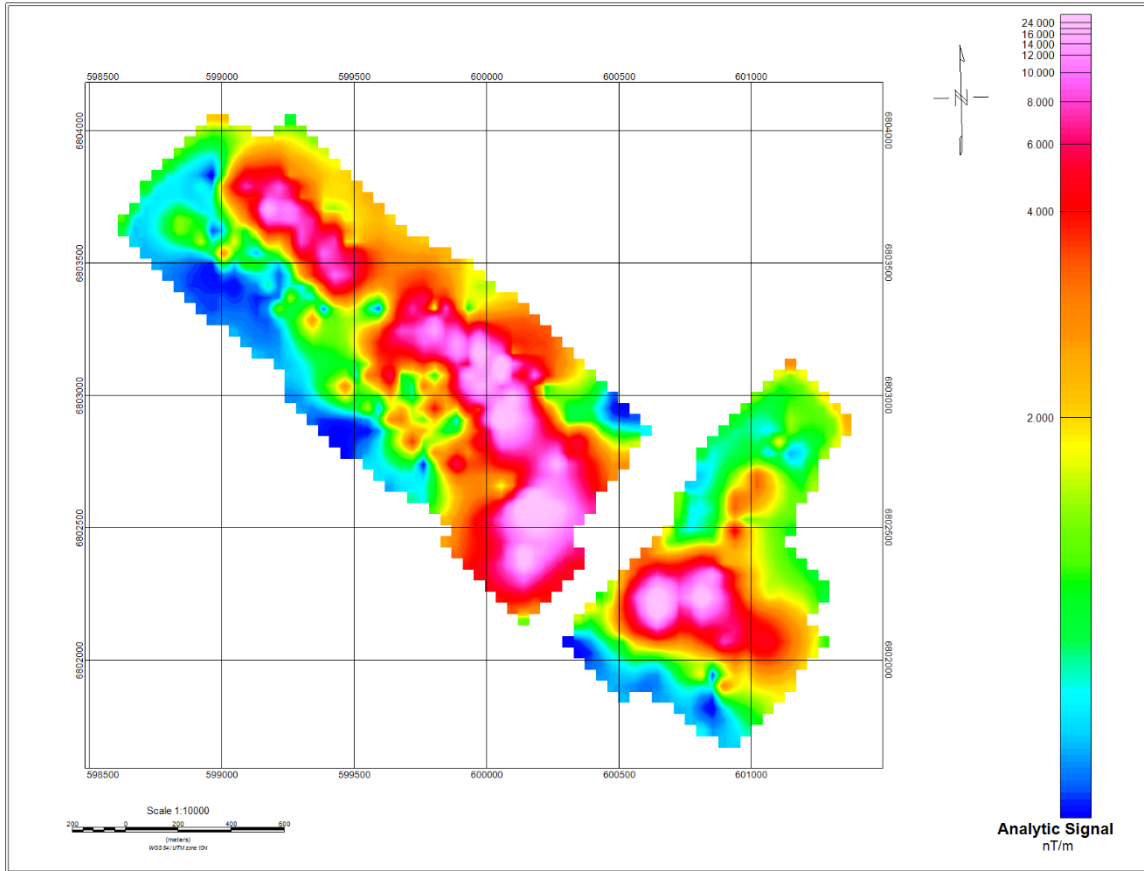


### Map 3: Total Horizontal Derivative

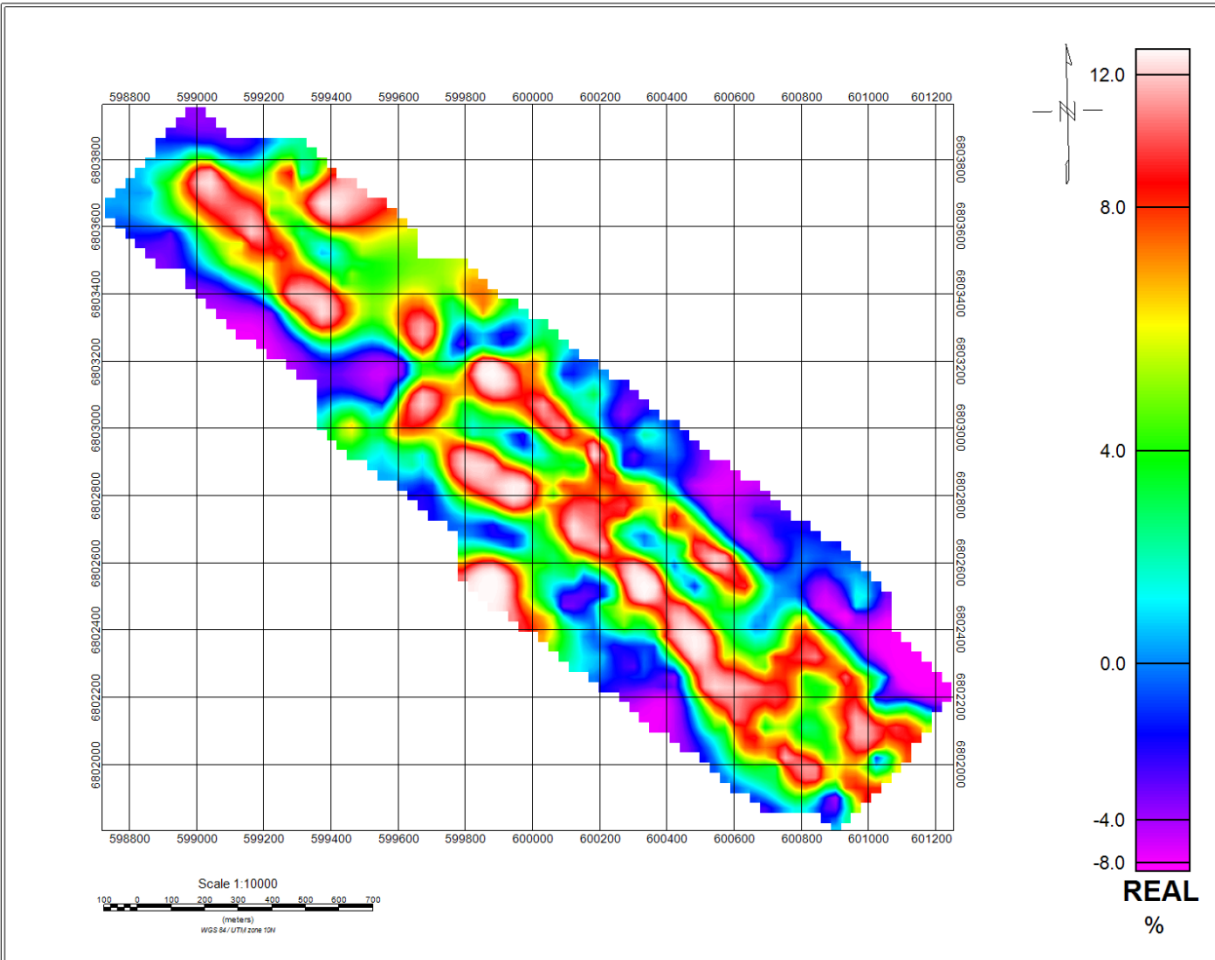




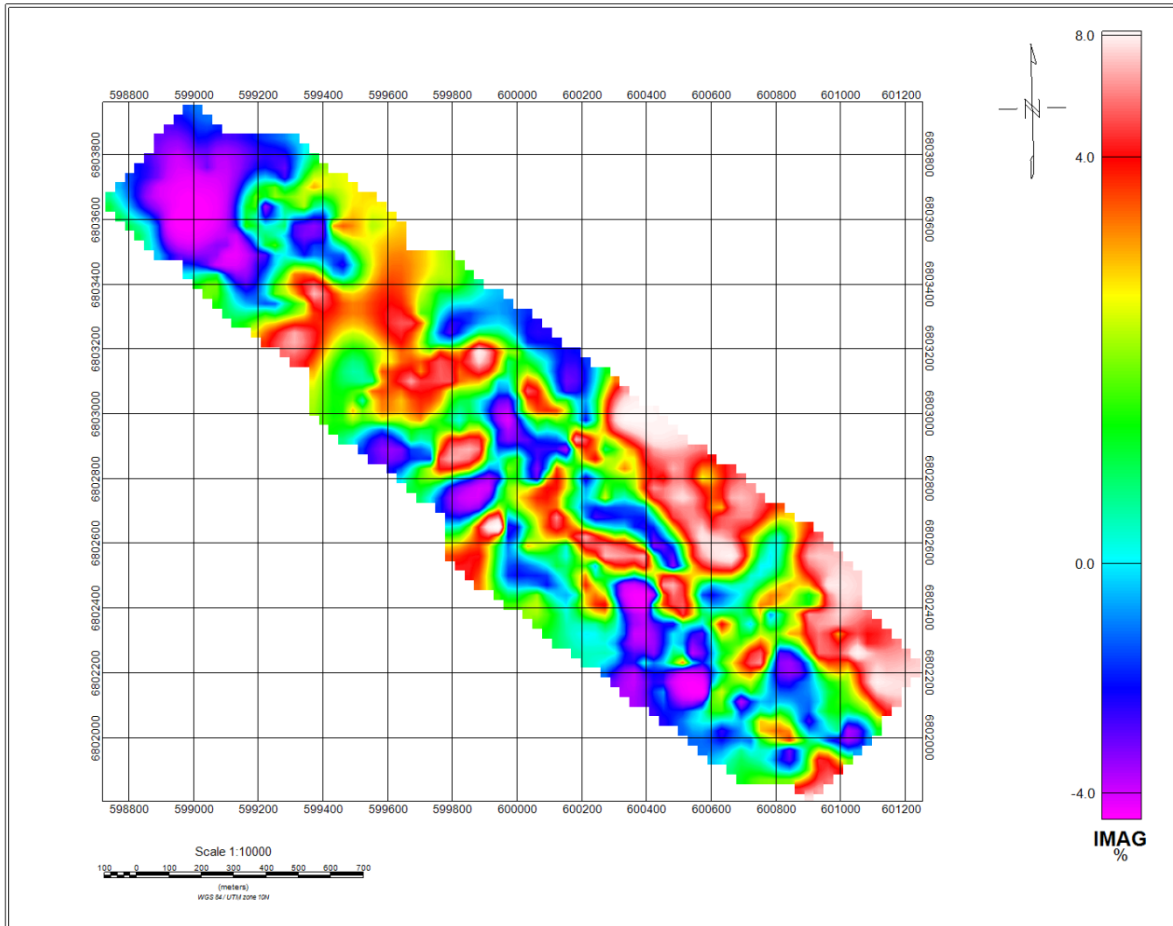
# Map 4: Analytic Signal



# Map 5: VLF Real

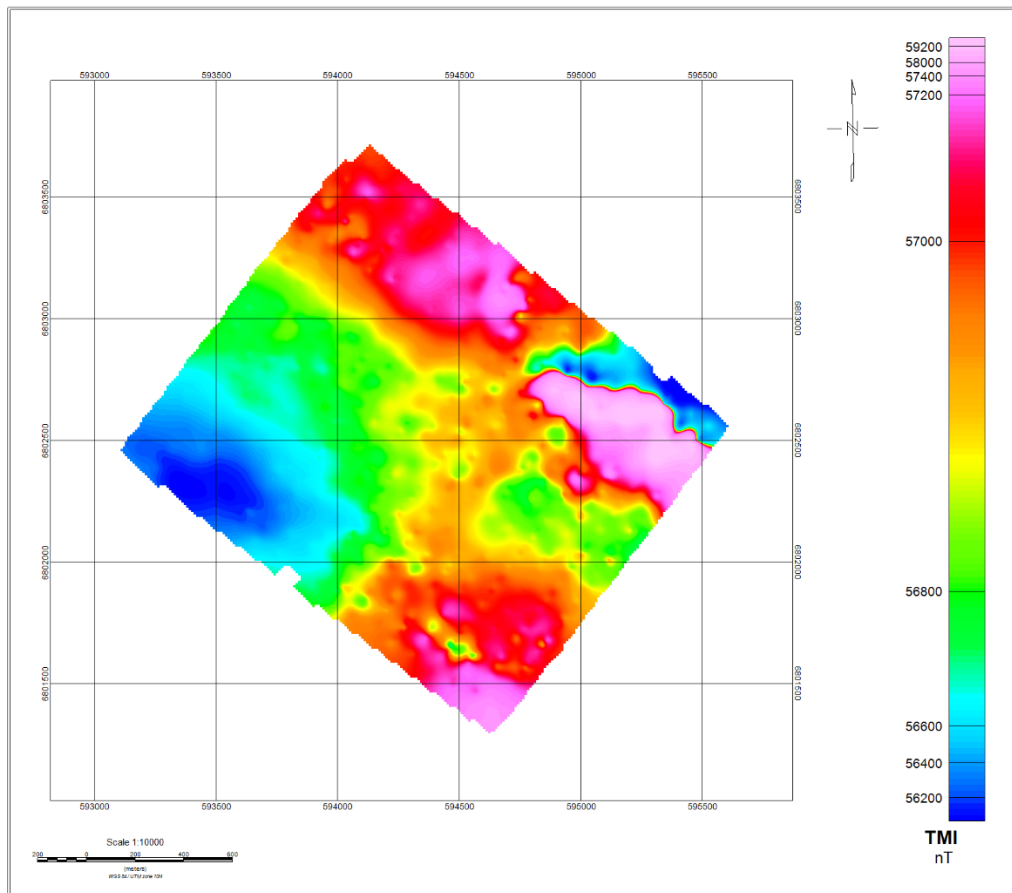


# Map 6: VLF Imaginary

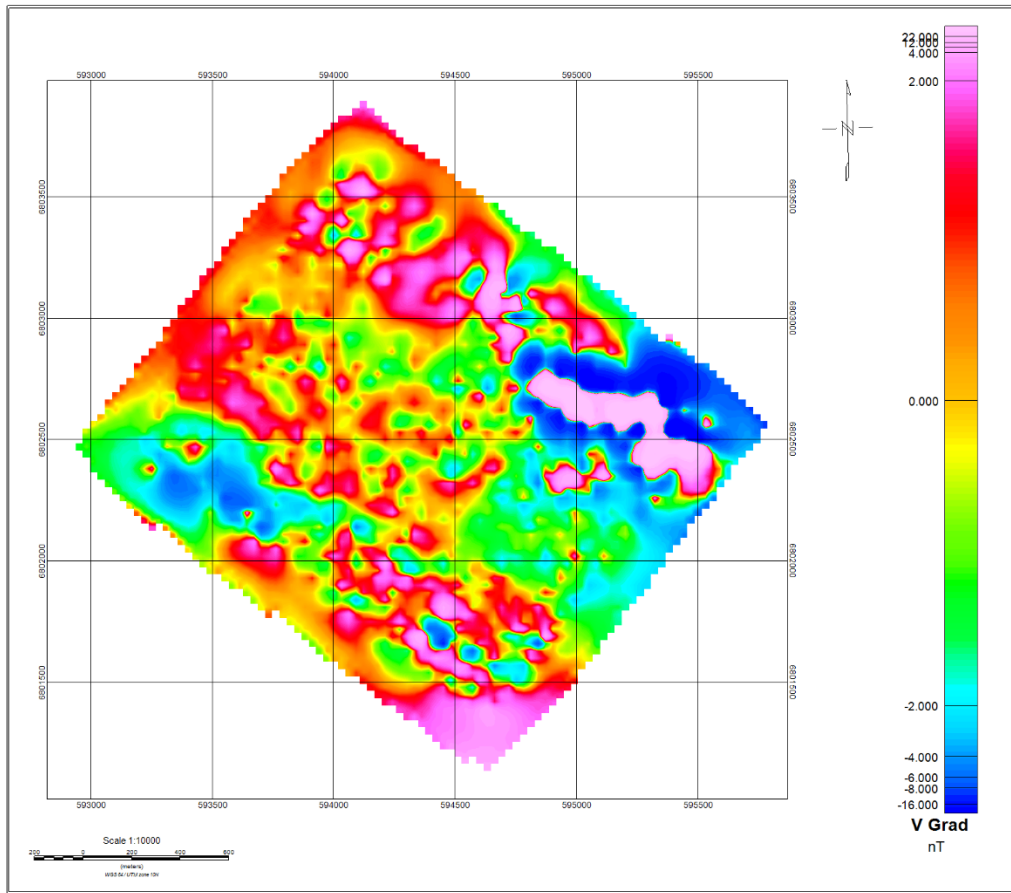


# West Grid Maps

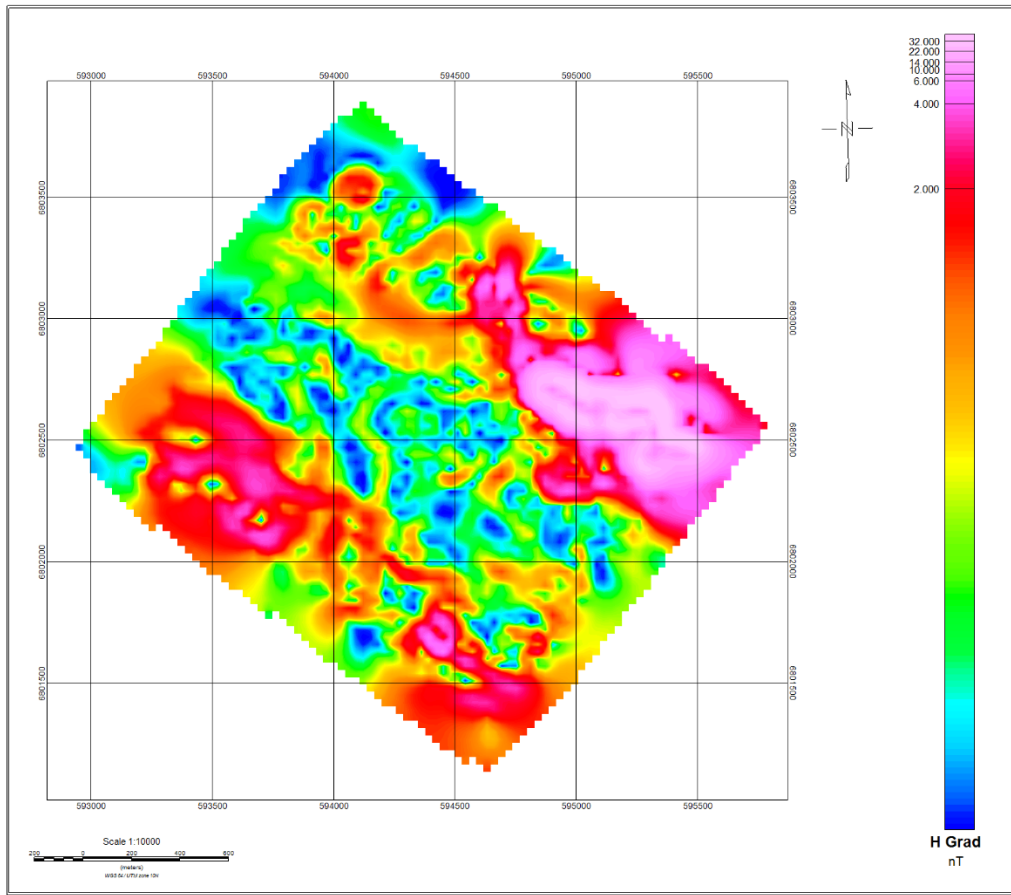
## Map 1: Total Magnetic Field



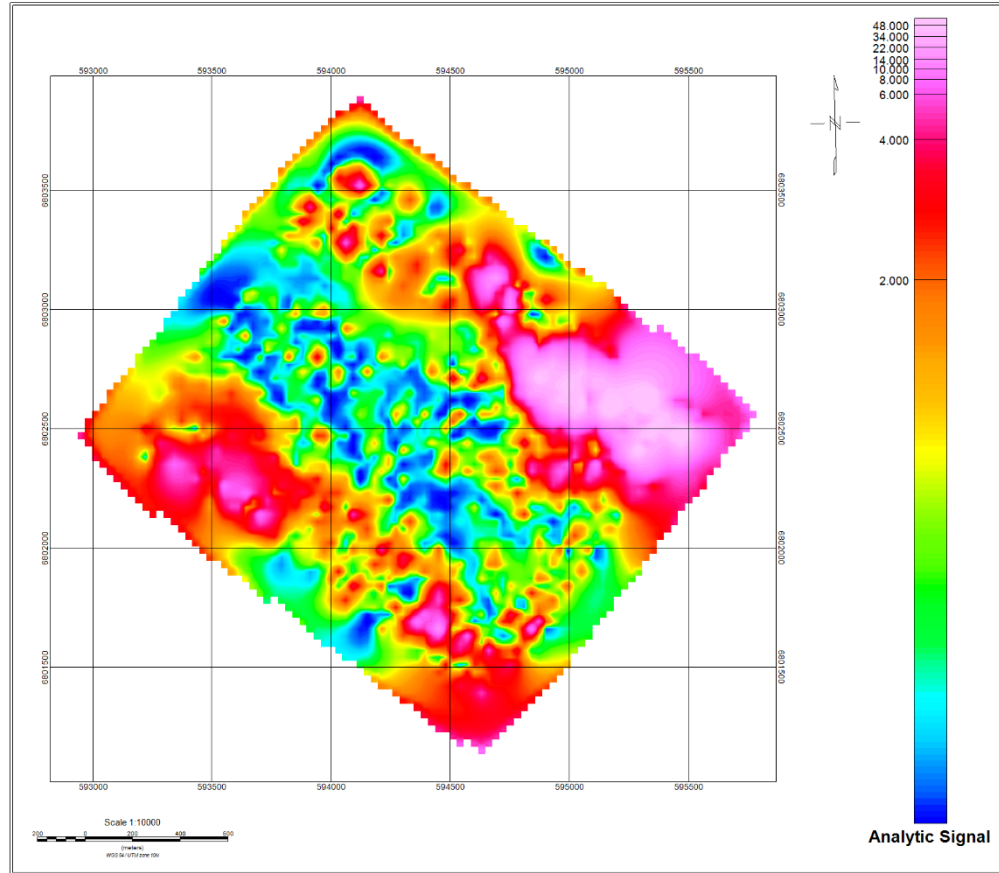
## Map 2: First Vertical Derivative



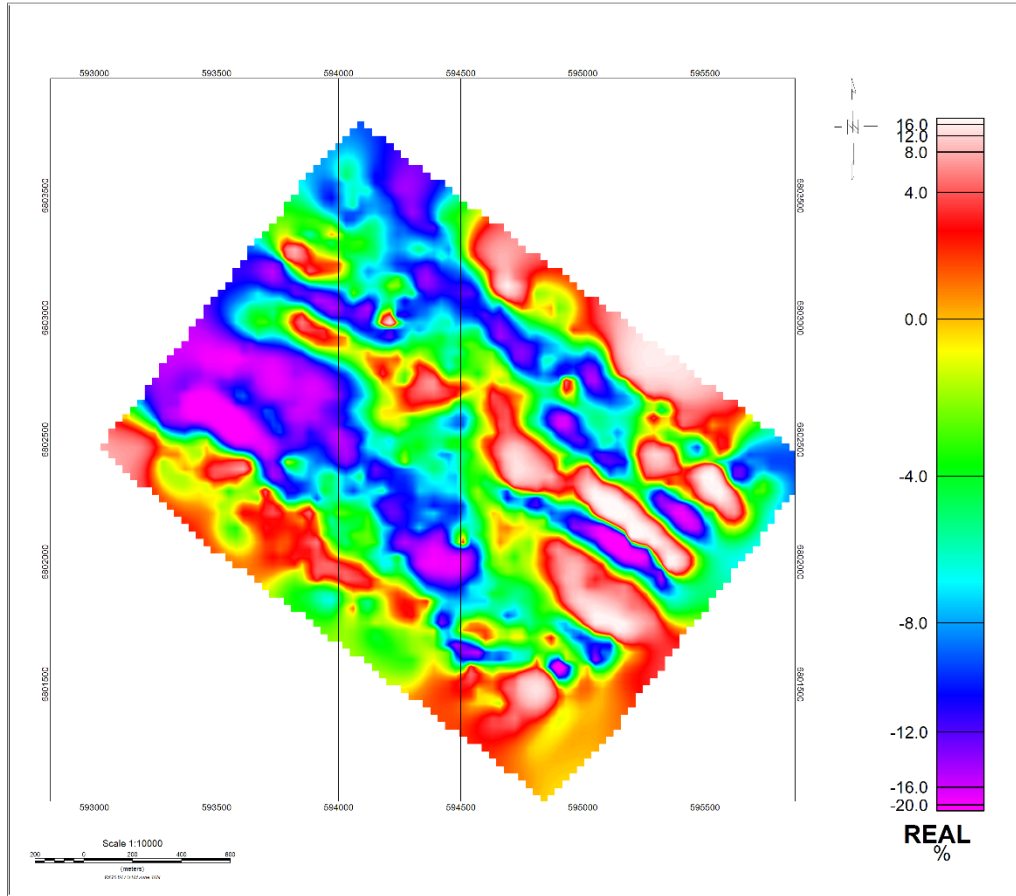
### Map 3: Total Horizontal Derivative



# Map 4: Analytical Signal

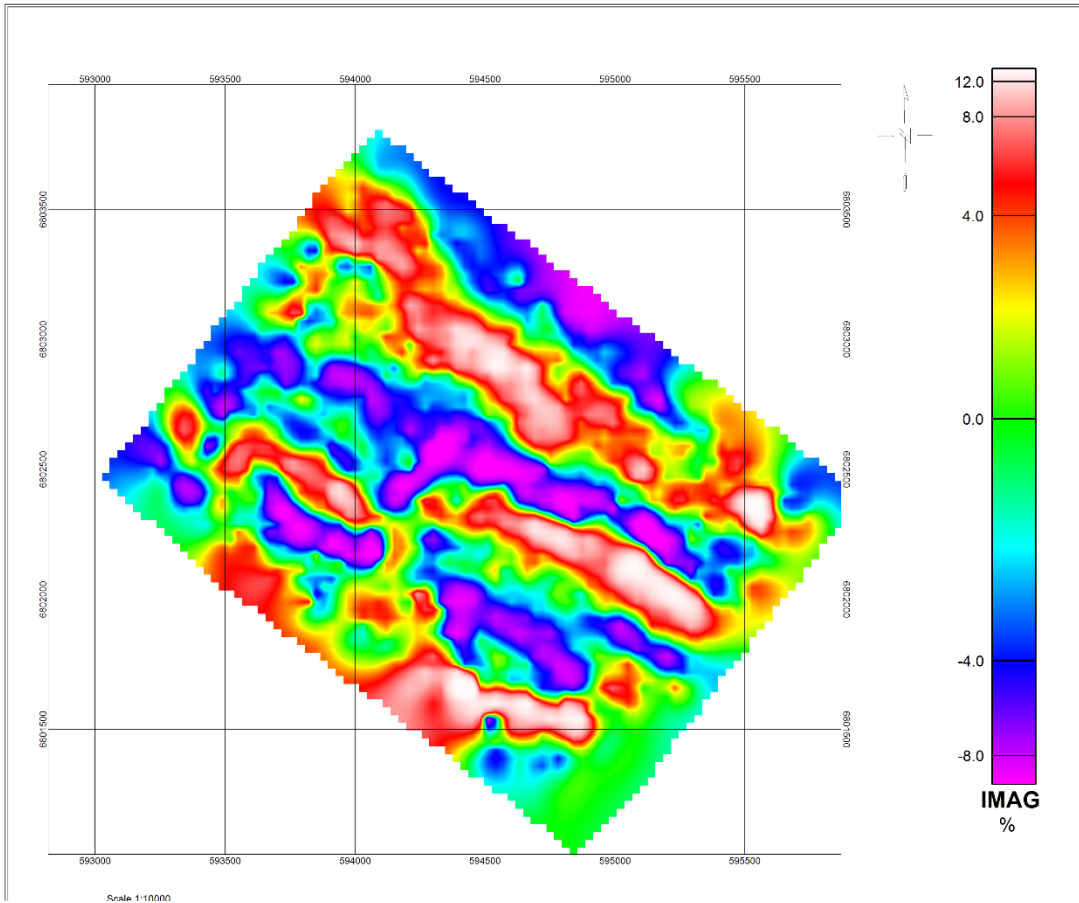


# Map 5: VLF Real

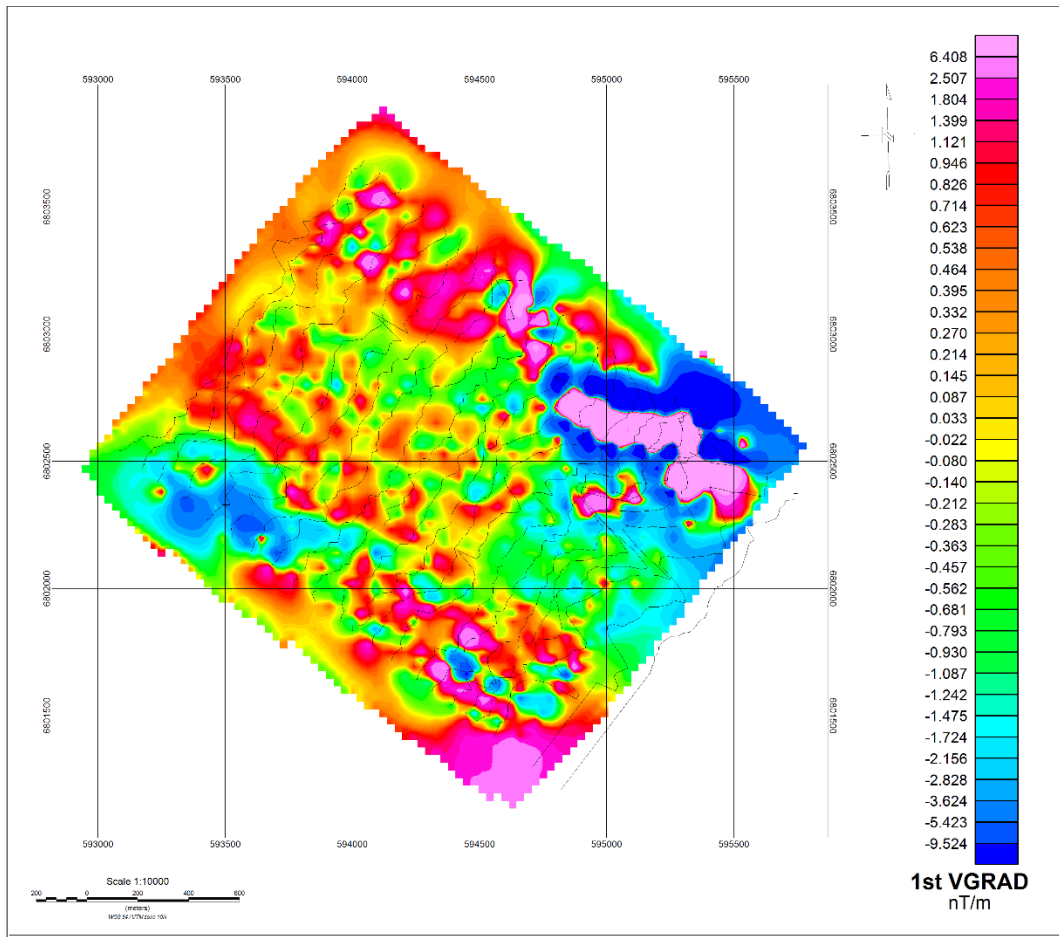




# Map 6: VLF Imaginary



Map 7: VLF Real + Magnetic 1<sup>st</sup> Vertical Derivative



# Map 7: VLF Real + Magnetic 1<sup>st</sup> Vertical Derivative(2)

