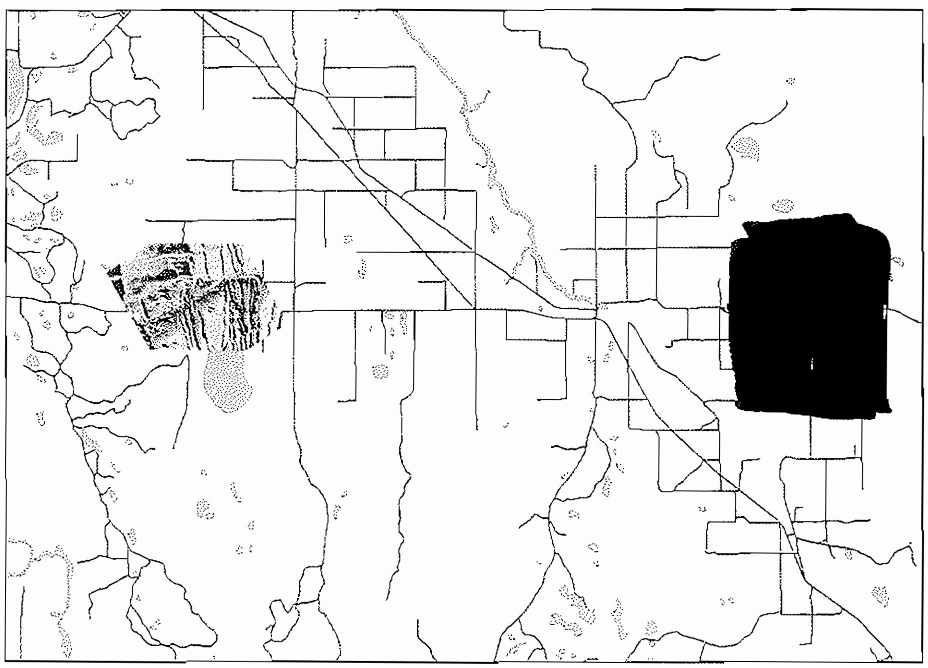
Brigus Gold Corp.

Heli-GT, 3 Axis Magnetic Gradient Survey

Black Fox Project

Matheson - Ontario

Operations and Processing Report



BY

SCOTT HOGG & ASSOCIATES LTD

October 2010

TABLE OF CONTENTS

1 INTRODUCTION

In September, 2010, Brigus Gold Corp. contracted Scott Hogg & Associates Ltd. to carry out a helicopter towed aeromagnetic gradient survey over two areas near Matheson Ontario, designated the Black Fox Mill Block [redacted]. Details of the airborne survey and compilation are documented in this report.

2 LOCATION

The Black Fox survey areas are presented in the map below.

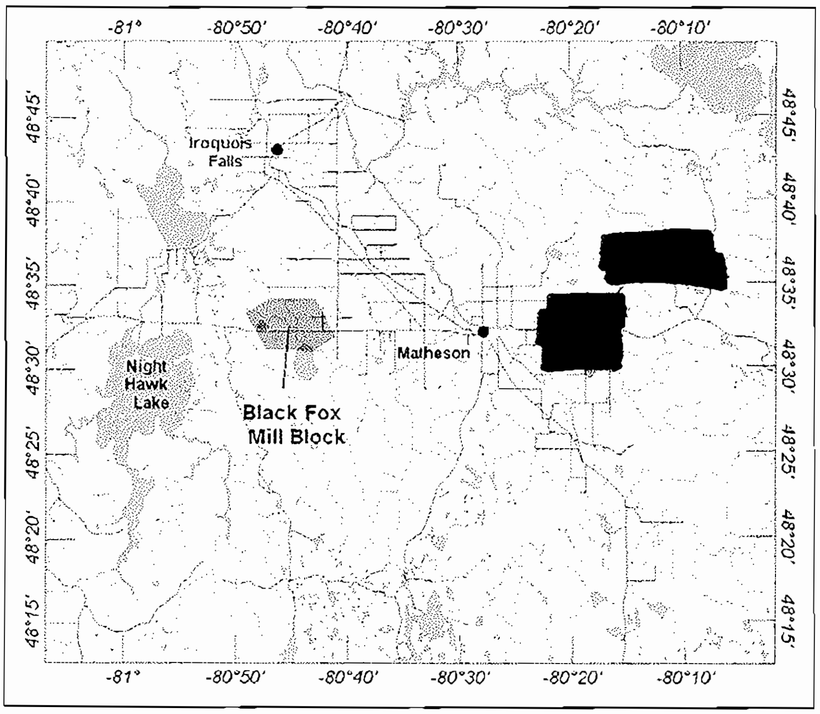


Figure 1 - Survey Location Map.

3 AIRBORNE SURVEY

The airborne survey was carried out on September 10th and 11th, 2010 from an operating base within the Black Fox Mine survey area, east of Matheson, Ontario. A total of 1074 line km of data (584km for the 'Mill' block [redacted] was collected and compiled. The airborne equipment set-up was carried on September 9th.

3.1 Flight Specifications

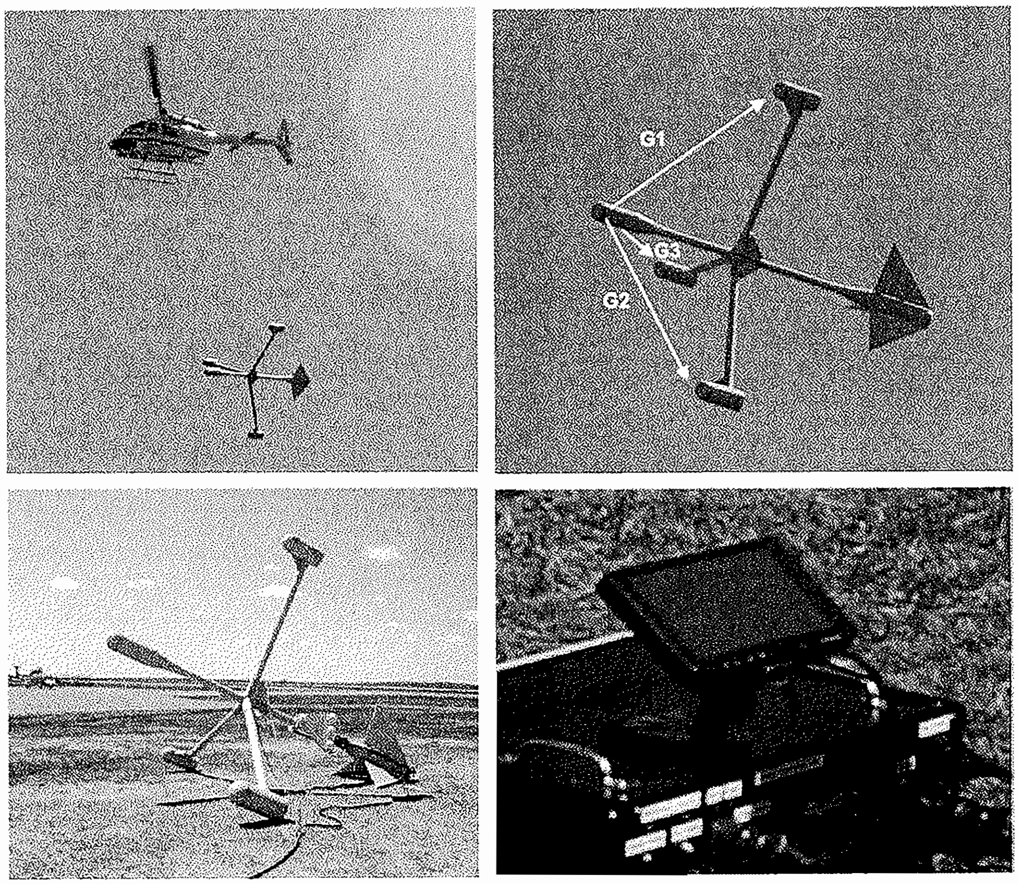
	Mill Block	[redacted]
Traverse Line Direction	UTM 150° – 330°	
Traverse Line Spacing	75 m	
Control Line Direction	UTM 55° – 235°	
Control Line Spacing	2000 m	
Terrain Clearance (sensors)	30 m	

3.2 Helicopter

Helicopter Owner / Operator	Wisk Air
Helicopter Model	Bell 206 LR
Helicopter Registration	C-FBHM
Pilot	Mike Kleywegt
Helicopter Base of Operations	Thunder Bay, Ontario

4 GEOPHYSICAL SYSTEM

The airborne geophysical Heli-GT system consists of a towed bird that contains all of the geophysical sensors as well as altimeter and GPS antennae. A computer based recording and navigation system is located in the helicopter.



The Heli-GT bird is towed 25 m. below the helicopter. The basic orthogonal magnetic gradients G1,G2,G3 are measured on 3 m. baselines. A radar altimeter and 4 GPS antennae are mounted on the towed bird. In the helicopter a computer logs the data and a touch screen display directs navigation.

4.1 Bird

All of the geophysical and ancillary equipment is housed in a towed bird designed by Scott Hogg & Associates Ltd. The bird is manufactured from non-magnetic FRP and breaks down for ease of transportation.

4.2 Magnetic sensors

Four Scintrex CS-3 cesium sensors are arranged in an orthogonal array with 3 m. sensor separation from the nose sensor to those at the end of each arm. The output from each sensor was processed by a KSM KMAG4 unit to resolve the magnetometer output to a resolution of about 0.005 nT at a rate of ten samples per second. The Heli-GT bird was flown at an altitude of 30m.

4.3 Radar Altimeter

A Terra TRA 3500 / TR 140 radar altimeter was used to measure bird height above ground. The range of operation was from 0 to 2500 ft.

4.4 Fluxgate Magnetometer

A Billingsley TFM100G2 3-axis fluxgate magnetometer was used to record the orientation of the bird with respect to the earth's magnetic field. The range of each component of the fluxgate was +/- 100,000 nT.

4.5 Analog to Digital ADC

The analog output of the VLF, radar altimeter and fluxgate magnetometer were digitized with a KVS KANA8, eight channel differential ADC. The device provides 24 bit resolution and was operated at 10 Hz.

4.6 GPS System

The GPS was recorded by an array of 4, 12 channel receivers mounted on the Heli-GT bird. In addition to the measurement of Latitude, Longitude and Altitude a calculation of bird pitch, roll and yaw was calculated from differences between antennae. The system used the WAAS signal for real-time correction. The accuracy of the positional measurements is typically in the order of a few metres and the angular measurements in the order of 1 degree.

4.7 Navigation and Recording System

The navigation and recording system was developed by Scott Hogg and Associates. The system uses a PC processor with Linux operating system. The system disk has been replaced with flash memory and all data is logged on a separate flash disk. An LCD touch screen in the cockpit provides an operator interface for monitoring the geophysical and ancillary instrumentation as well as presenting graphic navigation information for the pilot. The pps pulse from the GPS system was recorded and tied to each of the sensors with an accuracy of about +/- 0.05 seconds

Data recorded included the following:

Magnetic sensors:	10 Hz
Fluxgate sensors:	10 Hz
Radar Altimeter:	10 Hz
GPS X/Y/Z:	5 Hz
GPS Pitch/ roll/ Yaw:	5 Hz
VLF	10 HZ

4.8 Base Station

A magnetic and GPS base station was established at the base of operations. A GEM SSM19TW proton magnetometer recorded the diurnal magnetic variation at 0.5 Hz with a resolution of 0.1 nT. A UBLOCK 12 channel GPS receiver provided a GPS time reference and recorded a differential correction file.

5 DATA COMPILATION

5.1 Basic Processing

The data collected during flight, in the air and from the base station was aligned with reference to GPS time. The basic magnetic gradients, G1, G2 and G3, measured from the nose sensor to each of the radial sensors was calculated. Any noise spikes, if present, were identified and edited.

5.2 Gradient Processing

The recorded pitch, roll and yaw of the bird was used to mathematically rotate the measured basic gradients to G-north, G-east and G-down.

The GPS altitude of the bird was used to calculate a smooth drape surface This is a smooth theoretical surface above the terrain that the bird would follow under ideal conditions. There would be only smooth altitude changes, line to line and along the flight line. The difference between the GPS altitude of this smooth drape surface and the actual GPS altitude was combined with the measured vertical gradient to calculate an altitude correction.

5.3 Magnetic Levelling

The magnetic data, corrected for altitude, was used as the input for control line levelling. The intersections between traverse and control lines were calculated and the differences between the magnetic values measured. Ignoring unreliable differences in locations of steep magnetic gradient, a correction was calculated to eliminate the measured differences at the intersections. This correction profile was a piecewise linear function between intersections. As necessary, a final microlevel correction was calculated and applied.

5.4 Gradient Tensor Gridding (GT-GRID)

The leveled total field magnetic profile and the G-east and G-north gradient profiles were used by the GT-GRID process to calculate a total field magnetic grid. The grid produced by this technique simultaneously honours the total field as well as the measured gradient profiles. The GT-GRID process was also used to create a grid of the measured vertical gradient.

5.5 Vertical Magnetic Gradient

The vertical gradient accentuates shorter wavelengths and attenuates longer wavelengths. As a result the map enhances the anomalies associated with small near surface magnetic sources while suppressing large-scale regional variations. The vertical gradient presentation provides added visual detail, particularly for small anomalies superimposed on or adjacent to larger anomalies. The measured vertical gradient has been provided as well as a calculated vertical derivative.

5.6 Pole Reduction of the Calculated Vertical Derivative

The anomaly shape associated with a vertically dipping magnetic source varies with the inclination of the earth's magnetic field. At the north and south magnetic pole, the inclination is vertical and the anomaly is positive, symmetrical and centered directly over the source. At the equator, with a horizontal inducing field, the anomaly is negative, symmetrical and centered directly over the source. Between 0 and 90 degrees of inclination the anomaly is asymmetric, with a positive and negative component, and is not centered over the source. The pole reduction process reshapes the anomaly measured at intermediate inclinations to resemble the shape that would have been measured at vertical inclination. Thus a steeply dipping source, without remanent magnetization, would be transformed to a simple positive peak above the source.

The measured or calculated vertical magnetic gradients are also sensitive to the inclination of the earth's magnetic field. In the same manner as the total field, the asymmetry and peak displacement, arising from an inclined field, is removed by the pole reduction process. The horizontal width of the vertical gradient anomaly is about one half of that of the total field anomaly. If the width of the magnetic source is significant, greater than the sensor height above the source, the zero contour of the pole reduced vertical gradient reflects the location of the magnetic contact and the response peak will lie directly above a steeply dipping source.

5.7 Digital Terrain Model

The digital terrain model was calculated by subtracting the radar altimeter profile from GPS altitude. Slight errors in GPS altitude were corrected by microlevelling.

6 DIGITAL DATA ARCHIVE

All of the maps, grid and profile data have been provided in digital form.

6.1 Profile Data

The profile data is in the Geosoft "gdb" format and includes the following channels.

Channel	Units	Content
gpstime	seconds	GPS time
long	degrees	GPS Longitude NAD 83
lat	degrees	GPS Latitude NAD 83
gpsalt	metres	GPS altitude
x_n83	metres	UTM easting NAD83, Zone 17N
y_n83	metres	UTM northing NAD83, Zone 17N
Rad_Alt	metres	radar altimeter, bird height m.
GPSAlt_Lev	metres	levelled GPS altitude
DTM_Lev	Metres	levelled Digital Terrain elevation
Fx	nT	Fluxgate axis x (foreward)
Fy	nT	Fluxgate axis y (port)
Fz	nT	Fluxgate axis z (up)
Heading	degrees	Bird heading
Pitch	degrees	Bird pitch
Roll	degrees	Bird roll
basemag	nT	base station magnetometer
mag1	nT	upper port magnetometer
mag2	nT	down magnetometer
mag3	nT	upper starbord magnetometer
mag4	nT	nose magnetometer
G1	nT/m	magnetic gradient: mag4 to mag1
G2	nT/m	magnetic gradient: mag4 to mag2
G3	nT/m	magnetic gradient: mag4 to mag3
Mag4_HCor	nT	height corrected magnetometer 4 (nose)
TL_Lev_Mag	nT	Control Line levelled Mag4_Hcor
ML_Mag	nT	Microlevelled TL_Lev_Mag
Ge	nT/m	measured magnetic east gradient
Gn	nT/m	measured magnetic north gradient
Gv	nT/m	measured magnetic down gradient

6.2 Gridded Data

The grids are in Geosoft "grd" format. The cell size in all grids is 15 metres. The grids are projected in NAD83 UTM Zone 17n coordinates. For each block (Mine and Mill) The following grids are included with this report.

Grid Name	Units	Description
DTM	metres	Levelled digital elevation model
GT_TF	nT	Total magnetic field GT-Grid
GT_CVG_RP	nT/m	Calculated Vertical Derivative GT-Grid reduced to magnetic pole.
Ge	nT/m	Magnetic gradient east
Gn	nT/m	Magnetic gradient north

6.3 Map Files

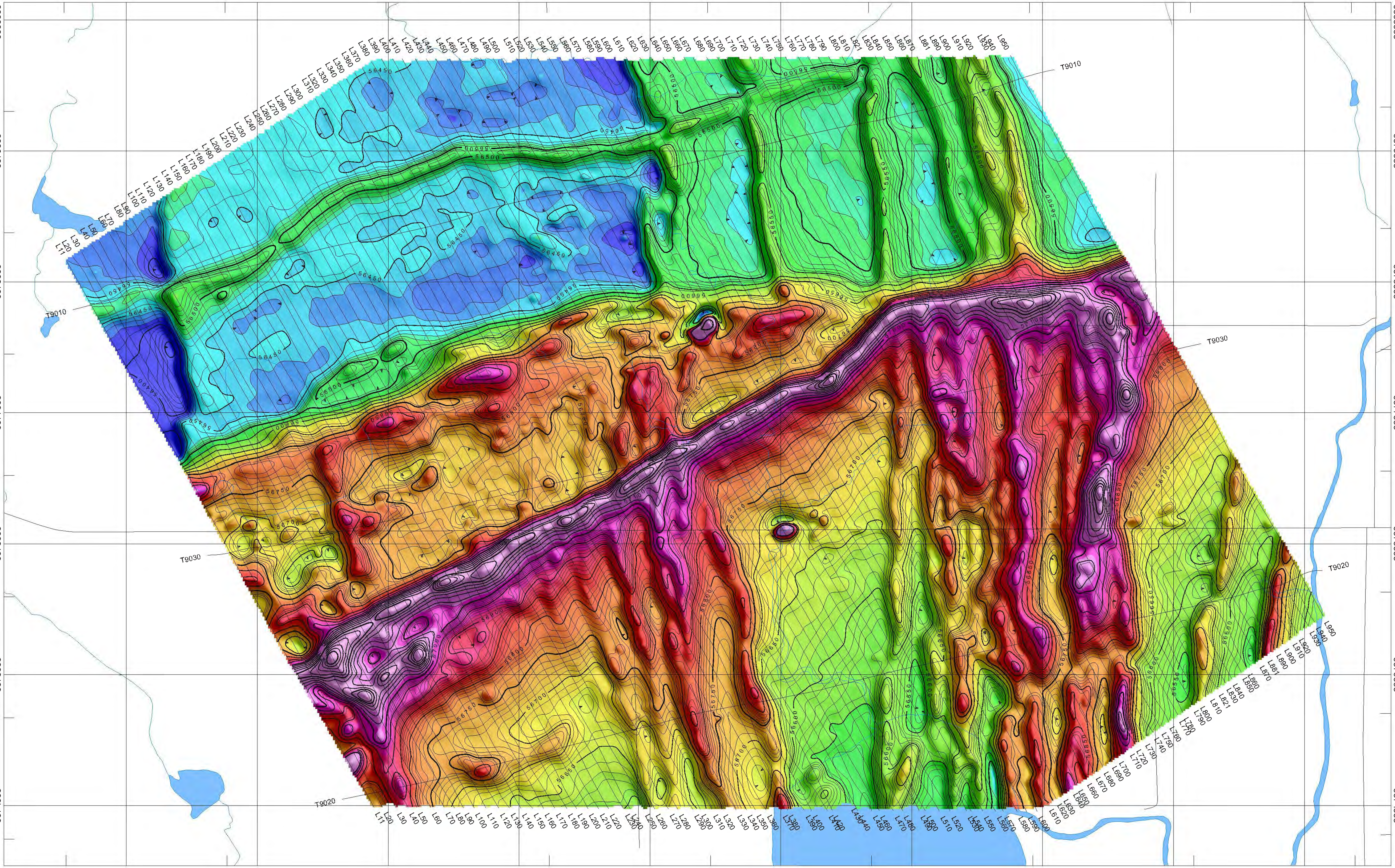
The following Geosoft format map files have been provided. Using the Geosoft Viewer, also provided, the map layers may be selectively viewed and exported in a variety of formats.

Digital Elevation
GT Total Magnetic Field
GT Measured Vertical Derivative
GT Calculated Vertical Derivative (Reduced to Pole)

Respectfully submitted,

Steve Munro
Scott Hogg & Associates Ltd.
Toronto, Ontario
October 2010

N
P1226420
P1226419
P1226421
P1226665
P1226664
P1226661
P1226660
145735EC
1213713
P1226666
P1226663
P1226659
P1226658
1226678
1226677
1227487
1227488
1227489
P1226667
P1226662
P1226652
P1226656
L70544
L70545
L70546
L70547
L76087
L76084
P354607
P354608
1226669
1226670
1227493
1227494
1227495
L70536
L70537
L70538
L70539
L70540
L70541
L70542
L70543
L76082
L76083
P354606
P354605
P516673
P516672
P525654
P567927
L43223
L70548
L70549
L70550
L70551
5714
L76080
L76081
L70554
L70555
P354555
P354552
7130
P522388
P522387
P73709
L76079
L342351
L70552
L70553
L76086
L76085
L70556
L70557
P354554
P354553
P522390
P522389
L73710
8458
18786
14806
1219102
P522392
P522391
5183
1206783
4240516
1207249
1207254
1207251
3003093
1207243
1207250
1227930
LEGEND
Airborne Flight Line
Image © 2010 DigitalGlobe
© 2010 Google
0
1,000
meters



57130
57030
56960
56920
56890
56860
56830
56820
56800
56780
56770
56760
56750
56740
56730
56720
56710
56700
56680
56670
56650
56630
56610
56590
56570
56550
56530
56510
56500
56480
56470
56450
56440
56430
56420

Total Magnetic Field
nT

Contour Intervals: 10, 50, 250 and 1000 nT

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres

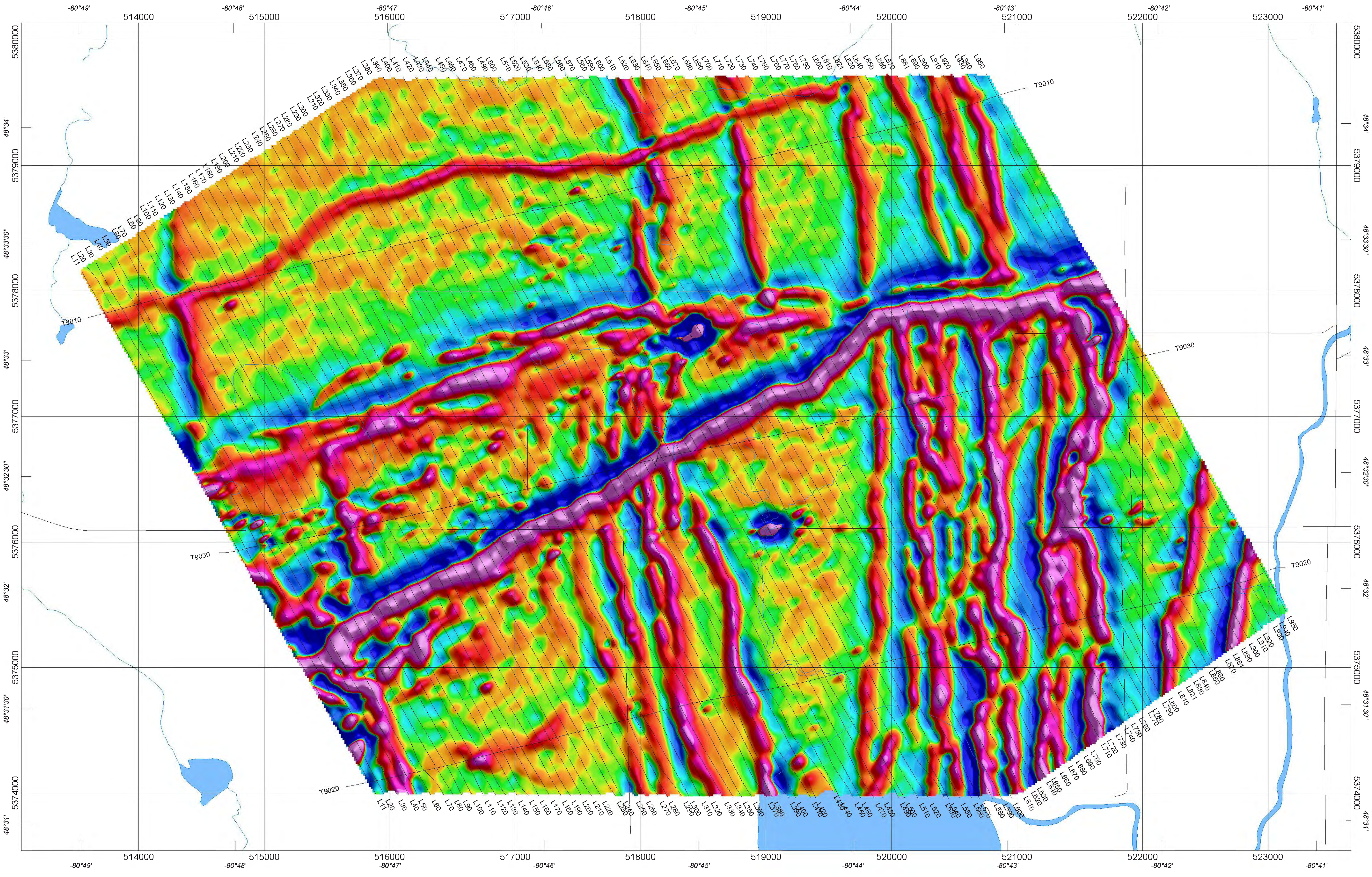
NAD83 / UTM zone 17N

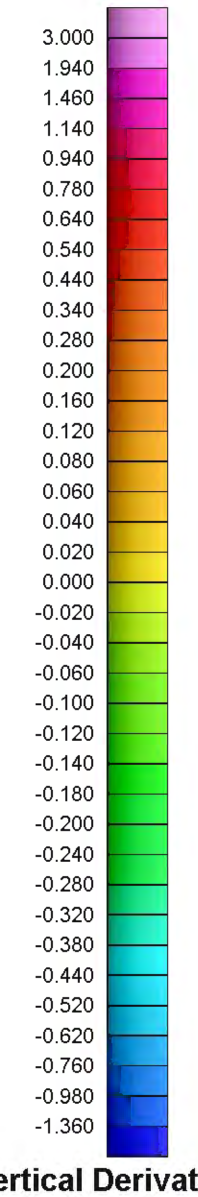
Brigus Gold

Black Fox Project - Mill Block
Matheson, Ontario

Total Magnetic Field

Scott Hogg & Associates Ltd
Geophysical Services
shageophysics.com





Vertical Derivative
nT/m

Scale 1:20000

250 0 250 500 750 1000 1250 1500

metres

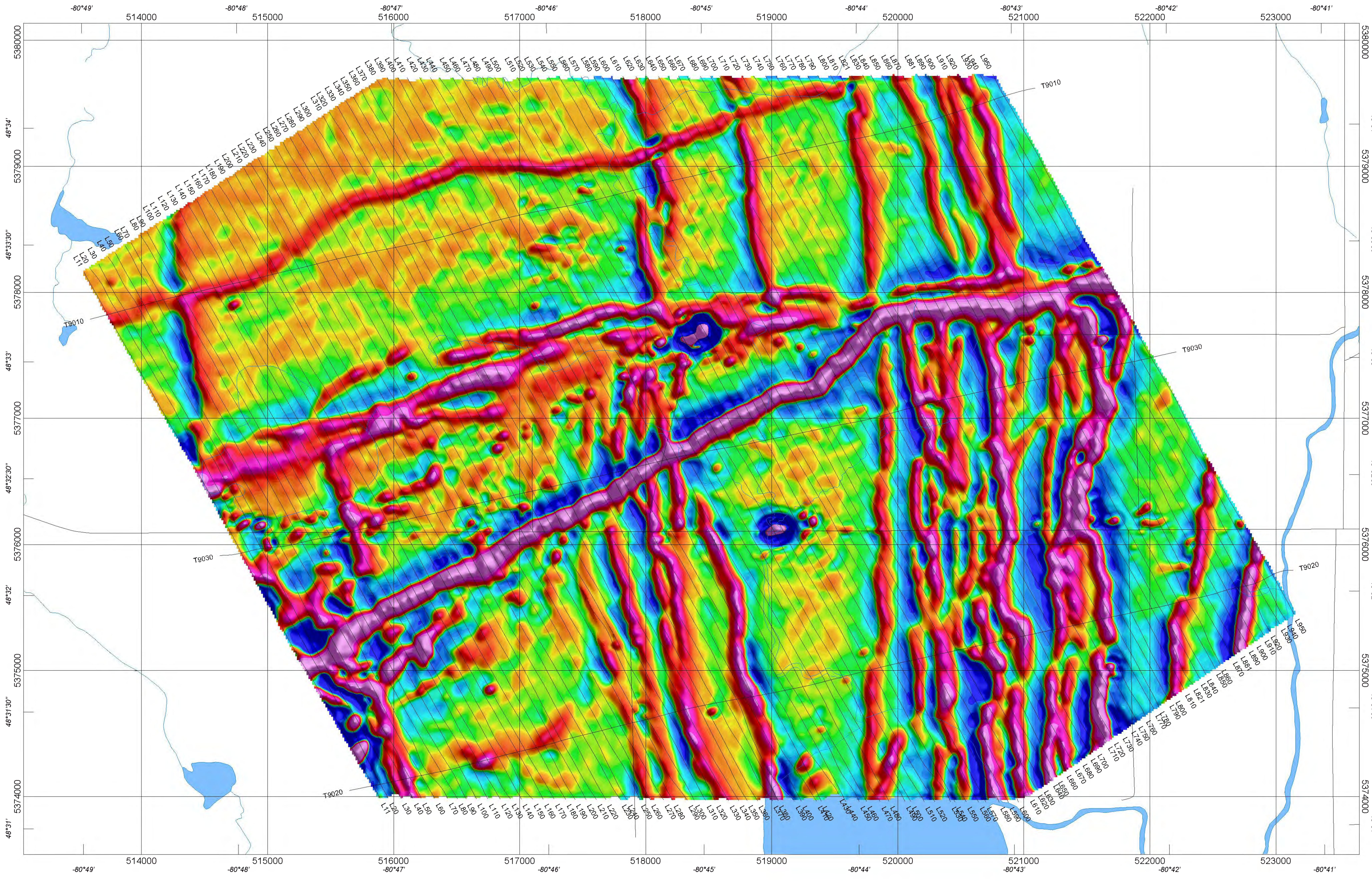
NAD83 / UTM zone 17N

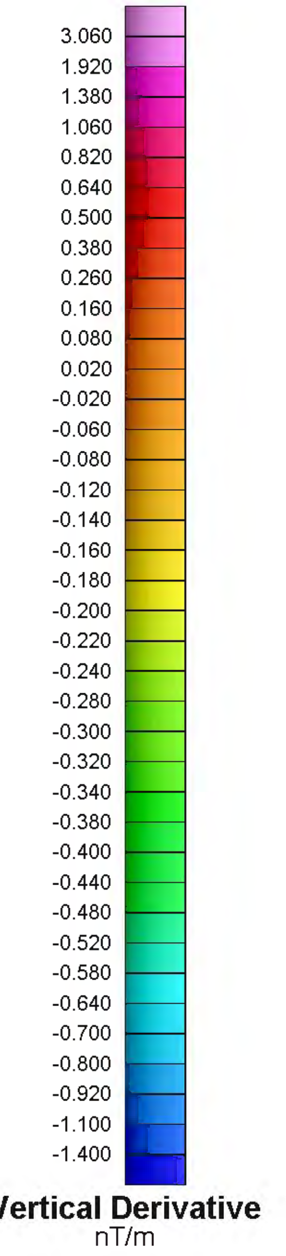
Brigus Gold

Black Fox Project - Mill Block
Matheson, Ontario

Measured Vertical Derivative

Scott Hogg & Associates Ltd
Geophysical Services
shageophysics.com





Scale 1:20000

250 0 250 500 750 1000 1250 1500

metres

NAD83 / UTM zone 17N

Brigus Gold

Black Fox Project - Mill Block

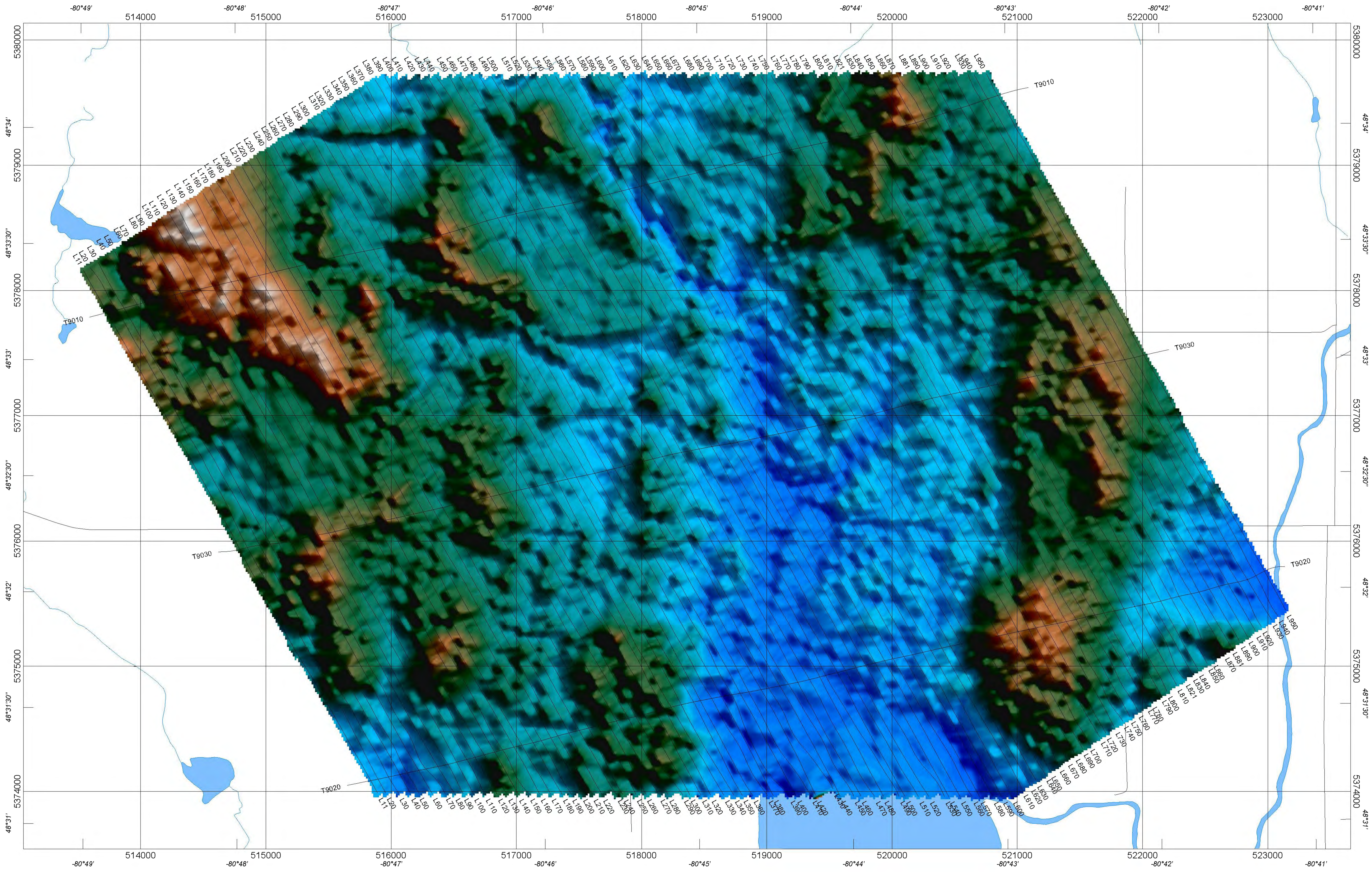
Matheson, Ontario

Pole-Reduced Calculated Vertical Derivative

Scott Hogg & Associates Ltd

Geophysical Services

shageophysics.com



Elevation
metres

300 299 298 297 296 295 294 293 292 291 290 289 288 287 286 285 284 283 282 281 280 279 278 277 276 275 274 273 272 271 270 269 268 267 266 265 264 263 262 261 260

Scale 1:20000

250 0 250 500 750 1000 1250 1500

metres

NAD83 / UTM zone 17N

Brigus Gold

Black Fox Project - Mill Block
Matheson, Ontario

Digital Terrain Model

Scott Hogg & Associates Ltd
Geophysical Services
shageophysics.com