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Report

Drone Magnetometer Survey

Claims 501134 and 501135
Bisley Township
Larder Lake Mining Division



Prepared for:

David G. Crouch

Table of Contents

- 1.0 Introduction
- 2.0 Location and Access
- 3.0 Regional and Local Geology
- 4.0 Type of Mineral Deposit
- 5.0 Property History
- 6.0 Summary of 2018 drone magnetic survey
- 7.0 Processing
- 8.0 Discussion of Results
- 9.0 Conclusions and Recommendations

Statement of Qualifications

Appendices

- Appendix I Geometrics MFAM specifications
- Appendix II Geometrics G856AX specifications (base station)
- Appendix III DJI M600 Pro specifications
- Appendix IV Project Costs (Invoice 2018-23)

List of Maps

Map

Total Field Magnetic Survey – Contours

1st Vertical Derivative – Contours

1.0 Introduction

Mining claims 501134 and 501135 are located in Bisley Twp, Larder Lake Mining Division.

A general location and access map is presented as **Figure 1**.

A detailed claim location map is presented as **Figure 2**.

On May 26th, 2018 above claims were surveyed using a Geometrics MFAM magnetometer mounted on a DJI M600 drone. Zen Geomap of Timmins, Ontario, carried out the magnetic survey on a contract basis for the client.

The survey was performed in order to evaluate the potential for kimberlite within the property.

Data processing and maps were completed between May 27 and June 18, 2018. Assessment report was prepared between June 15 and Dec 28, 2018.

2.0 Location and Access

The mining claims are located approx 24 kilometers north east of Kirkland Lake and approx 46 kilometers south east of Matheson in Bisley Township, Larder Lake Mining Division. Access was gained from Timmins by travelling 70km east to Matheson on Hwy 101 and a further 76 kilometers on Hwy 101 and Hwy 672.

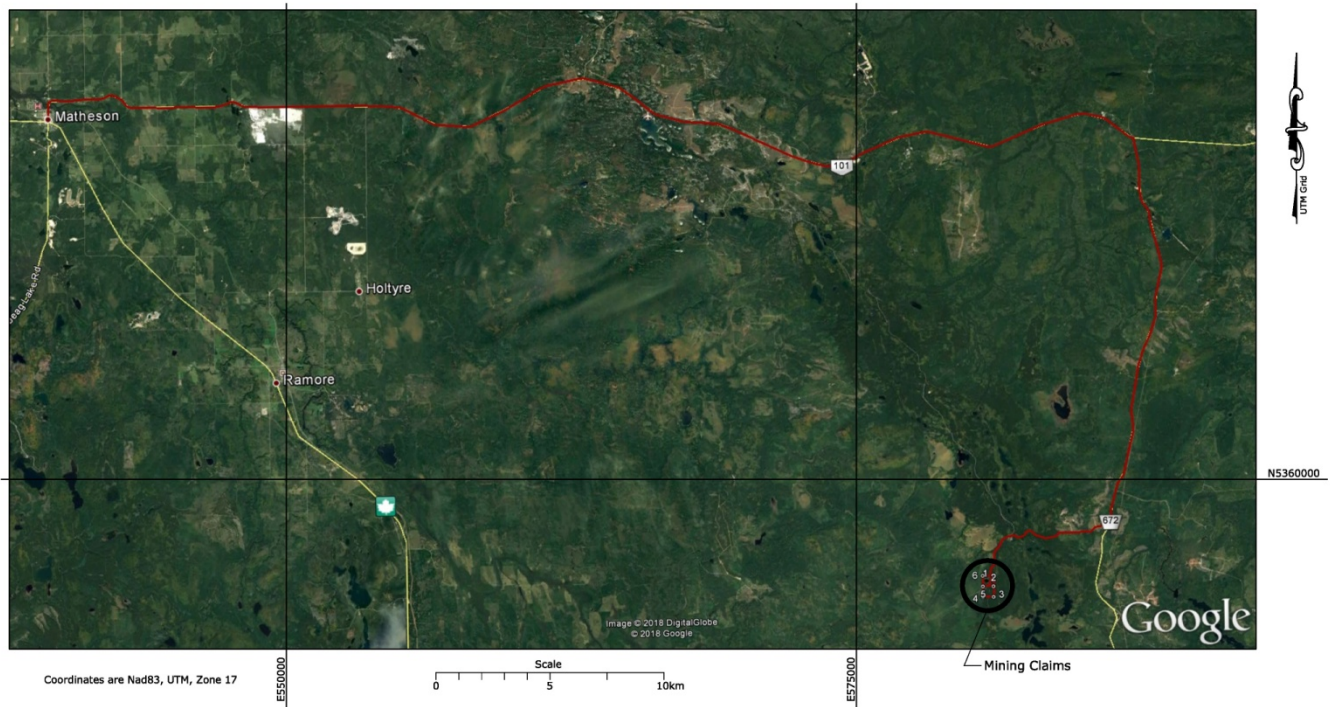


Figure 1 – Location and Access

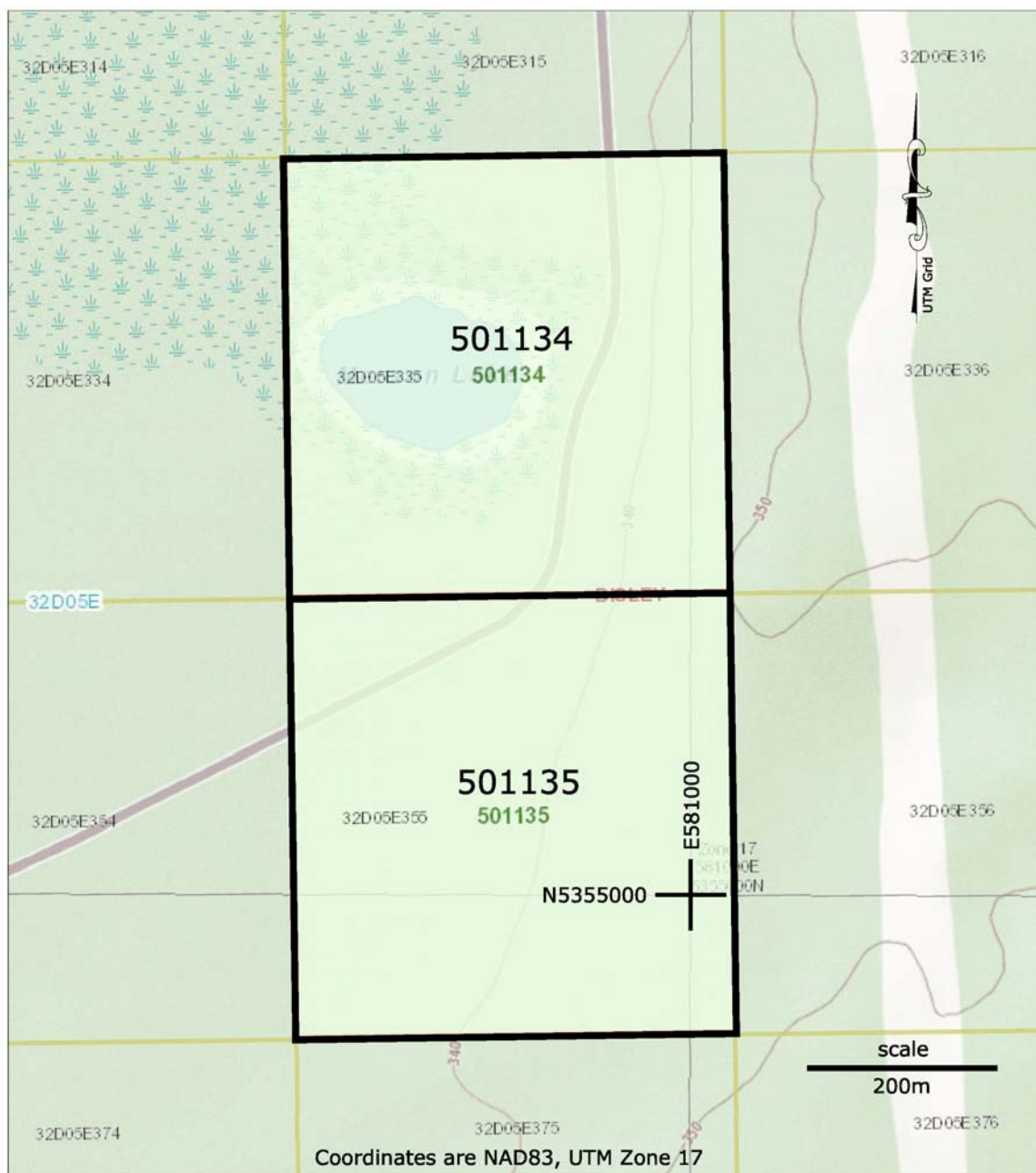


Figure 2 – Claim Location Map

3.0 Regional and Local Geology

Kirkland Lake and the surrounding area, particularly to the southeast toward Lake Temiskaming, has a well-established history for discovery of kimberlite pipes.

Figure 3 shows the location of 3 documented kimberlites within a 14km radius of the property.

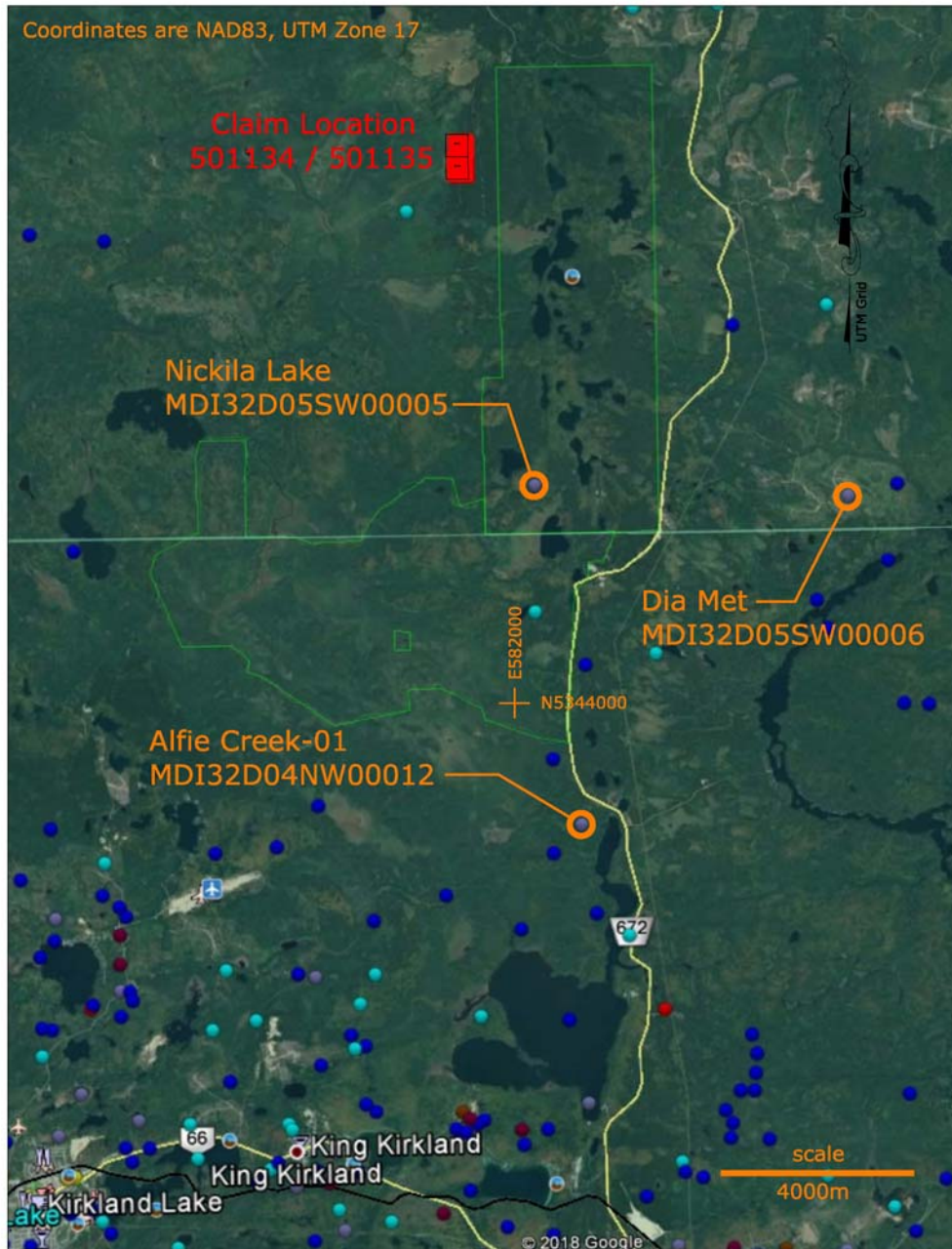


Figure 3 – nearby kimberlite pipes

Nickila Lake (MDI32D05SW00005)

- Discovered by Monopros Ltd. in 1983.

Dia Met (MDI32D05SW00006)

- 1987, Lac Minerals 13 DDH
- 1994, GSC completed 1 vertical RC hole
- Lac Minerals recovered 8 diamonds, some gem quality (0.3 carats/15.04 t)

Alfie Creek-01 (MDI32D04NW00012)

- Discovered by Monopros Ltd. in 1983
- 1987, Bulk Sample (Lac Minerals)
- 2 macro diamonds recovered from 47t
- 5 micro recovered from 103.8kg
- 1 macro and 4 micro recovered from 147kg

Reference; please refer to above listed MDI numbers available through the OGS.

Geology Map P520 – Bisley Township

Figure 4 shows location of the subject property overlaid on map P520.

The claims are located on the west edge of Munro Esker.

Bedrock within the property is covered by unknown thickness of esker material.

The resolution / intensity of magnetic readings from the current survey should be viewed with this in mind, as the distance above bedrock will affect survey resolution.

Reference; Map P520 – Bisley Township, published by O.D.M. in 1969. Geology by L.S. Jensen.

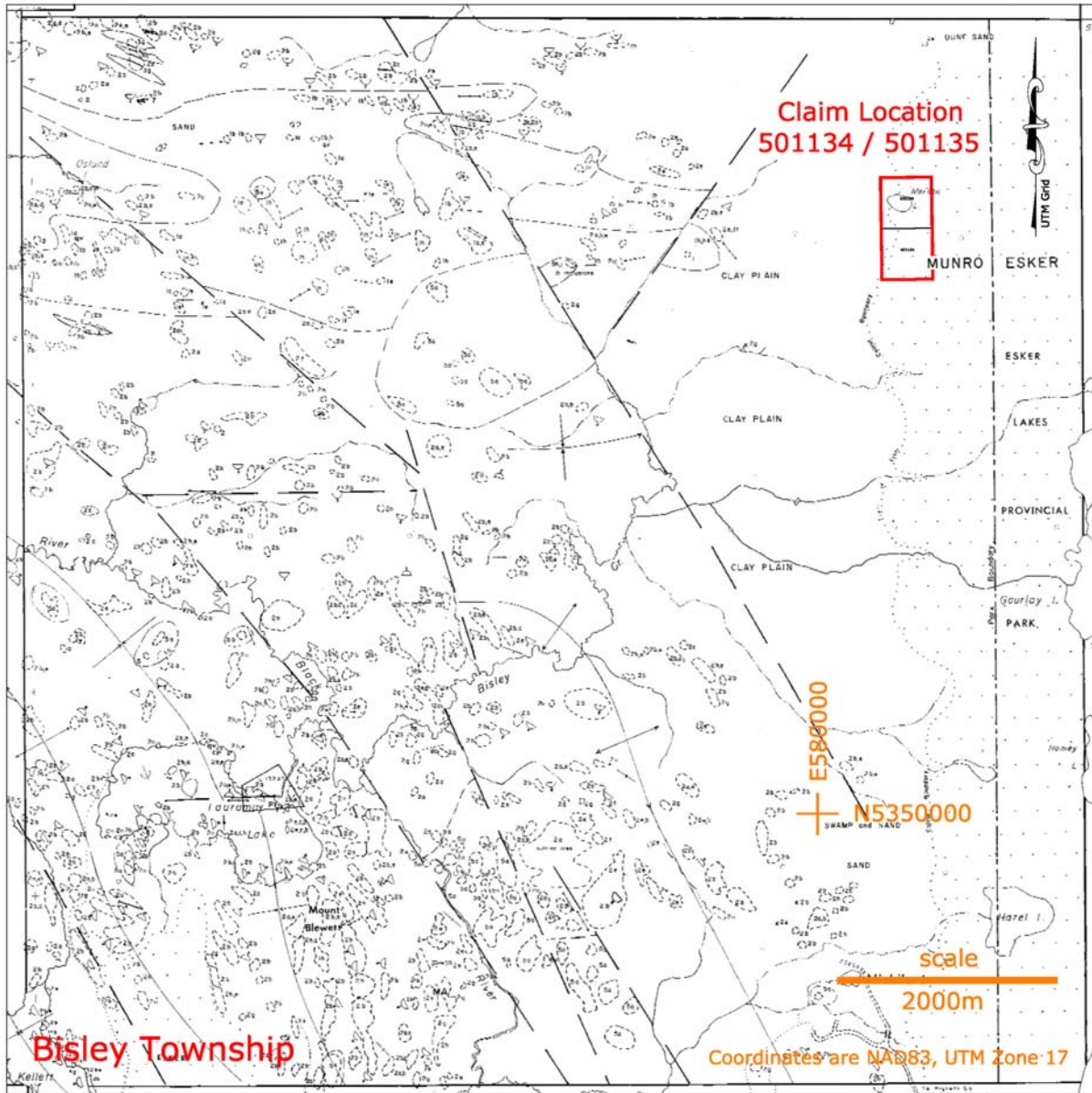


Figure 4 – Claims overlaid on map P520

4.0 Type of Mineral Deposit

The client is exploring for kimberlite in a region known for past discovery of kimberlite pipes. Magnetometer is an effective tool for kimberlite exploration, as the host rock surrounding the emplaced pipe often has different magnetic properties than the pipe itself.

5.0 Property History

Claims 501134 and 501135 were registered on April 10th, 2018 as map cell claims under new Ontario Map Staking rules.

The claims are held 100% by David Crouch (Client # 413590) and are currently valid until April 10th, 2020.

No previous work has been filed on the property.

6.0 Summary of 2018 drone magnetic survey

The program consisted of a drone magnetic survey carried out on a grid with 19 N-S lines spaced at 25m and 18 E-W lines spaced at 50m.

Total line kilometers: 26.2
Altitude: 50m AGL

A Geometrics MFAM magnetometer mounted on a DJI M600 Pro hexacopter drone was used to survey all grid lines.

A Geometrics G856AX proton procession magnetometer was operated as a base station throughout the survey to provide diurnal correction.

Equipment specifications are provided in ***Appendix I, II and III.***

7.0 Processing

Magnetometer data was collected on 2 Geometrics MFAM sensors operating at 1000hz. The data was processed through a custom program operating in Python. This converts raw data from Geometrics MFAM into a format compatible with Geosoft Oasis Montaj.

Customized import templates were used within Geosoft, to identify and separate mag readings into organized grid and tie lines. This step eliminates extraneous mag data collected as the drone travels to and from the grid.

Grid and tie line data were corrected to remove heading error and lag. Corrected grid data was then leveled based on tie lines.

8.0 Discussion of Results

The magnetic survey indicates a relatively quiet magnetic background with magnetic values ranging between 55564 and 55610 nT. The background magnetic field strength is 55,590 nT.

Higher magnetic values are present on the north 1/3 of survey, on claim 501134 near a small circular lake known as Merson Lake. The southern 2/3 of survey has predominantly low magnetic values ranging between 55564 and 55585 nT.

There is a closed magnetic-high anomaly on the south shore of Merson Lake, centered at E580775 / N5355450. The low intensity of this anomaly (approx 5nT) is not typical of a kimberlite pipe magnetic signature, where it is not uncommon to see a total field range between 20nT and 200nT on known kimberlite pipes in Ontario.

However - the calculated 1st vertical derivative map indicates a relatively steep magnetic gradient around the fringes of this anomaly. This generally indicates a sharp contact or interface between surrounding host rock and the causative body.

As the claims sit on the Munro Esker, it is quite possible the bedrock source of this anomaly (bedrock elevation), could easily sit 100m below the drone mag sensor altitude of 50m AGL used on the current survey.

9.0 Conclusions and Recommendations

The magnetic survey completed over the claims has identified a closed magnetic-high anomaly on the south shore of Merson Lake.

Sitting on the Munro Esker, makes it difficult to directly sample local till in search of supporting kimberlite indicator minerals (KIM's).

Unknown overburden thickness makes it difficult to interpret magnetometer data. It's possible that 3D inversion modeling would provide further insight. The current mag data was collected at 1000hz with sensitivity of 0.00003nT.

The cost for this type of advanced modeling would start at approximately \$2,000 and up to \$4,000. 3D inversion modeling is recommended as the next step for evaluating the claims.

Statement of Qualifications

Author - Kevin Cool		
<i>Education</i>		
from	to	Description
	1983	Photography - 1 year, Humber College, Toronto Ontario
1988	1990	Survey Engineering Technician - 2 year honours diploma, Northern College Porcupine Campus
	2014	Received Permanent Prospectors Licence, by reason of having held a Prospector's Licence for 25 years or more
	2014	Aviation Ground School, Transport Canada Compliant Unmanned Aerial System training seminar
	2014	Radio Operators Certificate - Aeronautical
<i>Companies owned and operated</i>		
1990	2001	General Surveys & Exploration - mining, exploration, aggregate, construction survey and computer drafting.
2000	2005	Big Red Diamond Corp. - traded publicly on TSX Venture exchange under symbol DIA. Junior mining company exploring for diamonds. Participated in and managed regional-scale airborne geophysical programs, stream sampling, geochem sampling and camp construction. Property-scale work includes ground magnetometer, grid cutting and survey.
2005	2011	True North Mineral Laboratories Inc. - heavy mineral separation by heavy liquid. Crushing / pulverizing for other assay. 30+ employees. Provided services to the mining and exploration industry such as claim staking, till and geochem sampling, magnetometer survey.
2014	current	UAV Timmins - drone aerial mapping and survey. 1st company to apply drone air photo survey as valid mining claim assessment in Ontario.
2017	current	Zen Geomap Inc. - drone magnetometer survey. 1st company to apply drone mag survey as valid mining claim assessment in Ontario.

I, Kevin Scott Cool, of 15 Prospector St., Gold Centre in the City of Timmins, Province of Ontario, hereby certify that:

- 1) I am a graduate of Northern College of Applied Arts and Technology, May 26th 1990, Porcupine Campus, with a 2 year Honors Diploma in Survey Engineering Technology
- 2) I have subsequently operated above businesses, directly engaged with the mining and exploration industry.
- 3) I have been actively engaged in my profession since May, 1990, in all aspects of ground and airborne exploration programs including the planning and execution of regional and property-scale programs, supervision, data processing, maps, interpretation and reports.

Kevin Scott Cool



Zen Geomap
204-70C Mountjoy ST. N.
Timmins, ON P4N 4V7

Appendix I

Geometrics MFAM Magnetometer Specifications

System Basics

- System utilizes 2 MFAM sensors
- Sensors are controlled by 1 sensor module
- Sensor module communicates with a Texas Instruments main board
- Sensitivity: 0.00003nT
- Sensors operate at 1000Hz (collect 1000 readings per second on both sensors)

Technical Specifications

SPECIFICATIONS:

Mechanical:

Enclosure Dimensions: 9" x 6 5/8" x 1 3/16"

Sensor Cable length (Development box to Sensor): 20.5 inches

Power:

AC adapter: 13.5 to 16 Volts DC at 1.0A

Battery Pack: 12 volt 1800 mA-Hour Lithium Polymer

FEATURES:

- 1) **TIVA TM4C1294NCPDT Micro controller:** This is a 32 bit ARM Cortex-MF4 based microcontroller running at up to 120 MHz. It has 1024K of flash, with 256K bytes of RAM, and 6 KBytes of EEPROM.
- 2) **USB 2.0 Micro Connector:** USB functionality is provided by the TIVA microcontroller and TIVAWare support libraries.
- 3) **Four User LEDs:** Four user controlled LEDs are wired to TIVA microcontroller GPIO pins PK0, PK1, PN0, and PN1.
- 4) **Two User Switches:** Two user read switches are wired to the microcontroller pins PK6 and PJ1.
- 5) **One Microcontroller Reset Switch:** This switch is used to reset the microcontroller.
- 6) **Wi-Fi port for TI CC3100 Wi-Fi Booster Pack:** The Development board layout allows a TI CC3100 Wi-Fi Booster pack to be directly plugged in. Using TIVAWare libraries, software can be developed to allow Wi-Fi communication between the Development board and a computer.
- 7) **USB XDS110 Port for Firmware Downloading and Debugging:** This second USB port is used as a debug/firmware download interface between the TI Code Composer Studio development suite and the Development Kit.

- 8) **Two RS-232 Serial Ports with RJ-45 Connectors:** Two general purpose serial ports are available to the user. The first serial port is wired to TIVA microcontroller UART4, and supports RTS and CTS handshaking. The second serial port is wired to TIVA microcontroller UART5. This port supports only TxD and RxD. Both of these ports use +/- 8 volt voltage swings, and support baud rates up to 920 KBaud. Note that these two ports are wired as Data Terminal Equipment (DTE) Thus to connect either of these two ports to a computer it would need to connect through a null modem. .

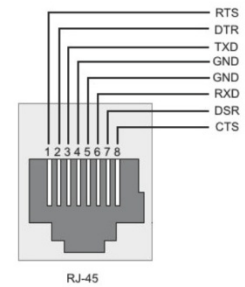


Figure 3: Serial Port Pinout

- 9) **On Board GPS Module:** An Adafruit GPS module is included with the Development Kit. It features 66 channels, -165 dBm sensitivity, and 3 Meter accuracy. An external GPS antenna is included so that signals can be received inside the box even with the cover in place. By default the GPS powers up to 9600 baud with several GPS sentences being output. The firmware that comes with the Development kit reconfigures the GPS to output only an RMC sentence at 115200 baud. This RMC string is sent with the output TCP data packet as described in the “Ethernet Data Format” section. The GPS is wired to UART7 on the TIVA microcontroller using 0-3.3 volt logic swings.

The 1PPS pulse from this GPS goes to the MFAM development module and disciplines the cycle rate to exactly 1 kiloSamples per second.

- 10) **Micro SD Card Slot for Storing Data Locally:** A micro SD card slot is available for the user to read and write data using a SPI interface. It is connected to SPI port 1 of the TIVA microcontroller.
- 11) **10 MHZ Timing Reference Input Port:** This input port takes a 10 MHz reference signal from a GPS disciplined reference oscillator, buffers and squares it up, and sends it to the MFAM module. The purpose of this signal is to lock the MFAM clocking system to this reference signal so that the Larmor frequency can be measured to an absolute standard. At this time, the MFAM does not support this feature. This function will be implemented in the future.
- 12) **Ethernet port with Power over Ethernet Compatibility:** The Tiva microcontroller contains a fully integrated Ethernet MAC and PHY. In addition, the Ethernet port can power the Development Kit via Power over Ethernet (PoE) using an Ethernet power injector.
- 13) **1.8 Amp-Hour Battery pack:** Three on board lithium/polymer batteries can power the system for 2 hours. A switch on the Development board allows the battery to be turned on/off. In addition, if the battery voltage falls below 8 volts the MFAM module will automatically shut down while keeping the microcontroller alive.
- 14) **Integrated Battery Charging system:** A lithium/polymer battery charging system is on board. If the battery switch is turned on, and the AC power adapter is plugged in, the batteries will be charged.
- 15) **Four Differential Analog Input Channels:** There are four differential analog inputs available for use. Channels 0 and 1 are +/- 2.5 volts full scale, while channels 2 and 3 are 0 to +5 volts full scale. In the firmware supplied with the Development kit (which sends MFAM/GPS data to the MFAMConsole program on the computer), all four channels are sampled synchronously with the MFAM data input to the Tiva are included in the data stream.
- 16) **On board Power/Status LEDs:** Several Status and Power LEDs are arranged along the front edge of the board. They include the four user LEDs, Power status LEDs (which power source is powering the board, and whether the battery is charging or the voltage low). They are listed in the Front and Back Panel Connection and Indicator section below.

Appendix II

Geometrics G856AX
Proton procession magnetometer specifications

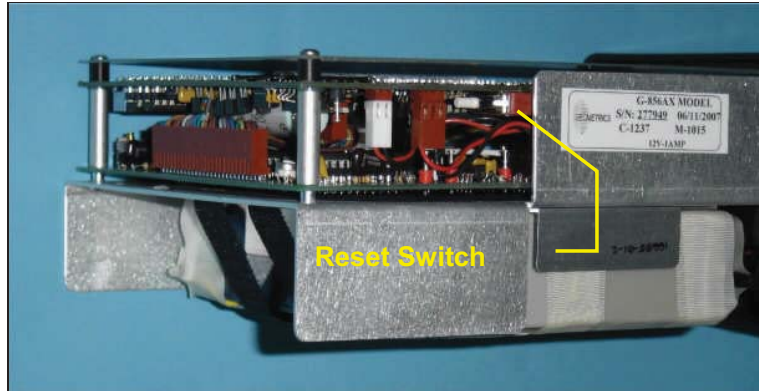


Figure 23. Internal reset switch.

Specifications

- Displays - Six digit display of magnetic field to resolution of 0.1 gamma or time to nearest second. Additional three-digit display of station, day of year, and line number.
- Resolution - Typically 0.1 gamma in average conditions. May degrade to lower resolution in weak fields, noisy conditions or high gradients.
- Absolute accuracy - One gamma, limited by remnant magnetism in sensor and crystal oscillator accuracy.
- Clock - Julian clock with stability of 5 seconds per month at room temperature and 5 seconds per day over the temperature range of -20 to +50 degrees Celsius.
- Tuning - Push button tuning from keyboard with current value displayed on request. Tuning range 20 to 90 μ T.
- Gradient - Tolerates gradients to 1800 gammas/meter. When high Tolerance gradients truncate count interval, maintains partial reading to an accuracy consistent with data.
- Cycle Time - Complete field measurement in three seconds in normal operation. Internal switch selection for faster cycle (1.5 seconds) at reduced resolution or longer cycles for increased resolution.
- Manual Read - Takes reading on command. Will store data in memory on command.
- Memory - Stores more than 5700 readings in survey mode, keeping track of

time, station number, line number day and magnetic field reading. In base station operation, computes for retrieval but does not store time of recording designated by sample interval, allowing storage of up to 12,000 readings.

- Output - Plays data out in standard RS-232 format at selectable baud rates. Also outputs data in real time byte parallel, character serial BCD for use with digital recorders.
- Inputs - Will accept an external sample command.
- Special - An internal switch allows:
 - adjustment of Functions polarization time and count time to improve performance in marginal areas or to improve resolution or speed operation
 - three count averaging
 - choice of lighted displays in auto mode.
- Physical -
 - Instrument console: 7 x 10 ½ x 3 ½ inches (18 x 27 x 9 cm), 6 LB (2.7 kg)
 - Sensor: 3 1/2 x 5 inches (9 x 13 cm), 4 LB (1.8 kg)
 - Staff: 1 inch x 8 feet (3cm x 2.5m), 2 LB (1kg)
- Environmental: Meets specifications from 1 to 40°C. Operates satisfactorily from -20 to 50°C.
- Power - Depending on version, operates from internal rechargeable Gel-cells or 9 D-cell flashlight batteries . May be operated from external power ranging from 12 to 18 volts external power. Power failure or replacement of batteries will not cause loss of data stored in memory.
- Standard system (P/N 16600-02) components:
 - Sensor (P/N 16076-01) and sensor cable (P/N 16134-01)
 - Console (P/N 16601-01)
 - Staff, one top section (P/N 16535-01), two middle sections (P/N 16536-01) and 1 bottom section (P/N 16537-01)
 - Carry harness (P/N 16002-02)
 - Two sets of rechargeable batteries (P/N 16697-01) and battery charger (P/N 16699-01)
 - Carrying case (P/N 16003-01)
 - Download cable (P/N 16492-01)
 - Hardcopy operation manual (P/N 18101-02)
 - Magnetometer CD (P/N 26648-01)
- Optional accessories:
 - Tripod kit for base-station operation (P/N 16708-02)
 - Gradiometer kit (P/N 166651-01)
 - Gradiometer carry/storage case (16003-01)

Appendix III - DJI Matrice 600 Pro Specifications

Specifications

• Aircraft

Diagonal Wheelbase	1133 mm
Dimensions	1668 mm × 1518 mm × 727 mm with propellers, frame arms and GPS mount unfolded (including landing gear) 437 mm × 402 mm × 553 mm with propellers, frame arms and GPS mount folded (excluding landing gear)
Weight (with six TB47S batteries)	9.5 kg
Weight (with six TB48S batteries)	10 kg
Max Takeoff Weight Recommended	15.5 kg
Hovering Accuracy (P-GPS)	Vertical: ±0.5 m, Horizontal: ±1.5 m
Max Angular Velocity	Pitch: 300°/s, Yaw: 150°/s
Max Pitch Angle	25°
Max Wind Resistance	8 m/s
Max Ascent Speed	5 m/s
Max Descent Speed	3 m/s
Max Speed	40 mph / 65 kph (no wind)
Max Service Ceiling Above Sea Level	2170 propellers: 2500 m, 2195 propellers: 4500 m
Hovering Time* (with six TB47S batteries)	No payload: 32 min, 6 kg payload: 16 min
Hovering Time* (with six TB48S batteries)	No payload: 38 min, 5.5 kg payload: 18 min
Flight Control System	A3 Pro
Supported DJI Gimbals	Ronin-MX; ZENMUSE™ Z30, Zenmuse X5/X5R, Zenmuse X3, Zenmuse XT, Zenmuse Z15 Series HD Gimbal: Z15-A7, Z15-BMPCC, Z15-5D III, Z15-GH4
Retractable Landing Gear	Standard
Operating Temperature	14° to 104° F (-10° to 40° C)

• Remote Controller

Operating Frequency	920.6 MHz to 928 MHz (Japan); 5.725 GHz to 5.825 GHz, 2.400 GHz to 2.483 GHz
Max Transmission Distance	FCC Compliant: 3.1 mi (5 km), CE Compliant: 2.2 mi (3.5 km) (Unobstructed, free of interference)
Transmitter Power (EIRP)	10 dBm @ 900M, 13 dBm @ 5.8G, 20 dBm @ 2.4G
Video Output Port	HDMI, SDI, USB
Operating Temperature	14° to 104° F (-10° to 40° C)
Battery	6000 mAh LiPo 2S

• Charger (Model: MC6S600)

Voltage Output	26.1 V
Rated Power	600 W
Single Battery Port Output Power	100 W



• Standard Battery (Model: TB47S)

Capacity	4500 mAh
Voltage	22.2 V
Battery Type	LiPo 6S
Energy	99.9 Wh
Net Weight	595 g
Operating Temperature	14° to 104° F (-10° to 40° C)
Max Charging Power	180 W

• Optional Battery (Model: TB48S)

Capacity	5700 mAh
Voltage	22.8 V
Battery Type	LiPo 6S
Energy	129.96 Wh
Net Weight	680 g
Operating Temperature	14° to 104° F (-10° to 40° C)
Max Charging Power	180 W

* Hovering time is based on flying at 10 meters above sea level in a no-wind environment and landing with a 10% battery level.

CE1313  **RoHS** 

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

HDMI
HIGH-DEFINITION MULTIMEDIA INTERFACE

DJI incorporates HDMI™ technology. The terms HDMI and HDMI High-Definition Multimedia Interface, and the HDMI Logo are trademarks or registered trademarks of HDMI Licensing LLC in the United States and other countries.

Download the detailed user manual at:
www.dji.com/matrice600-pro

※ This content is subject to change without prior notice.

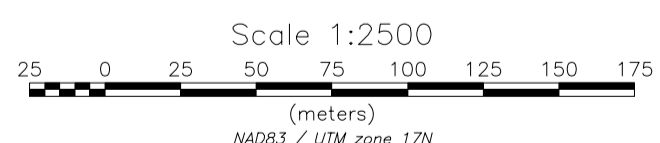
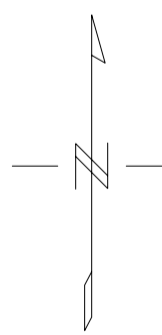
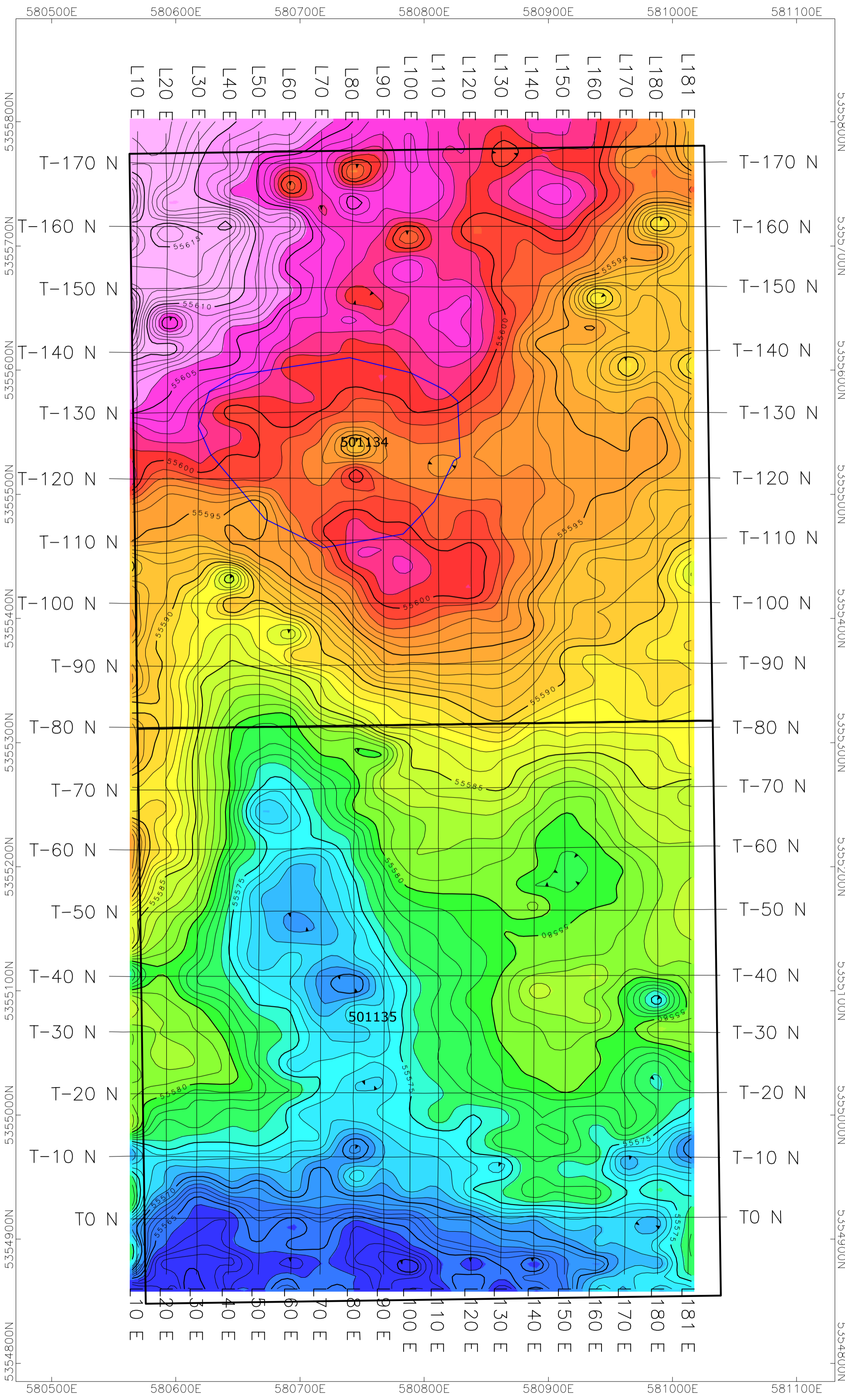
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Appendix IV

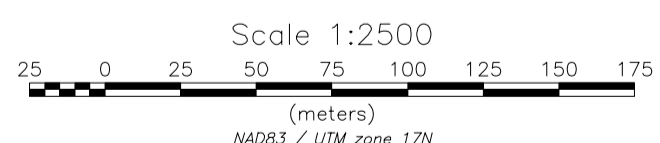
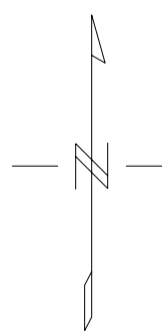
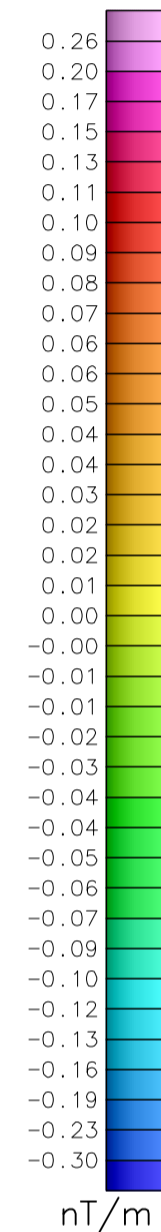
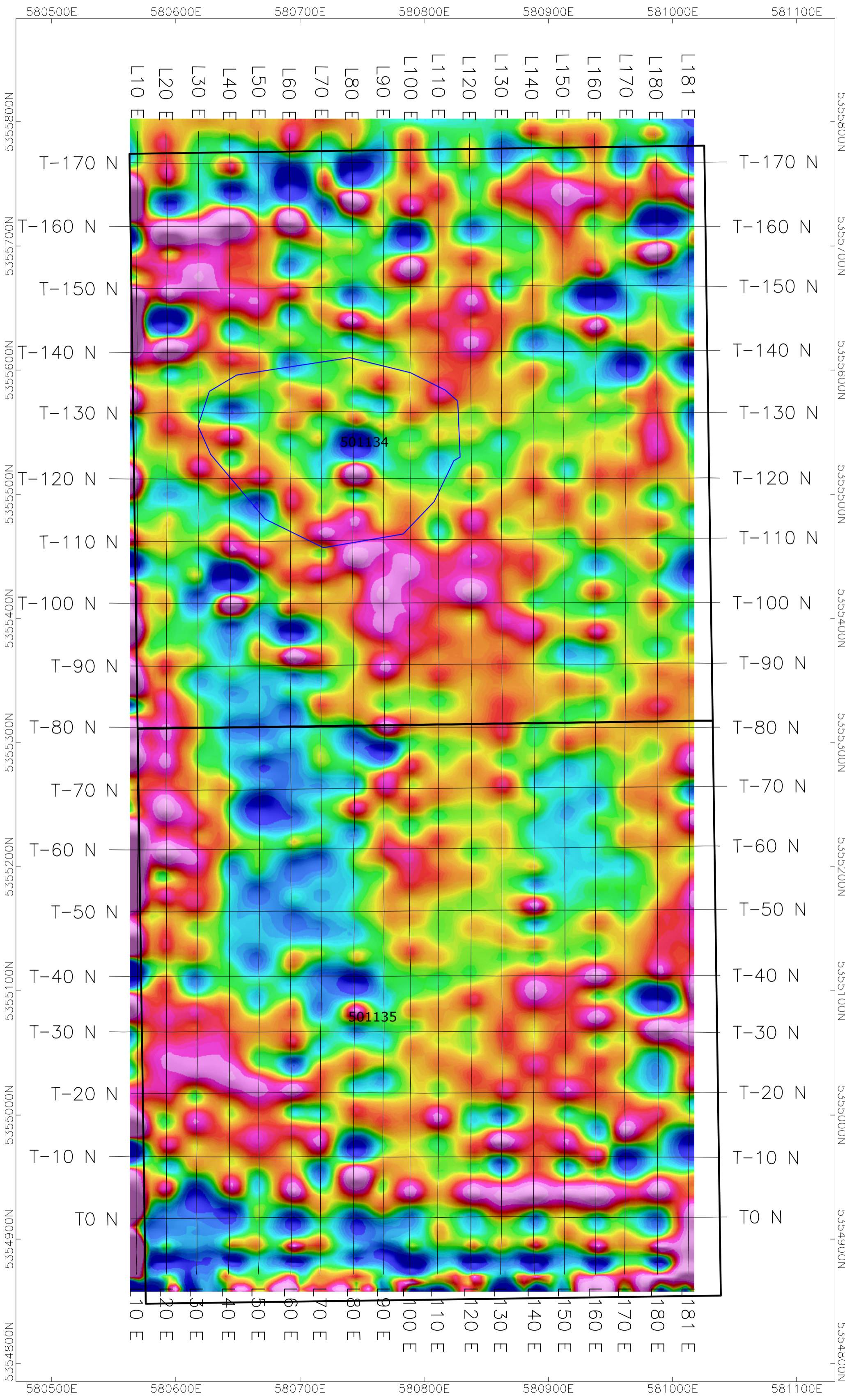
Project Costs
Invoice 2018-23

[Withheld for client confidentiality]



Line Kilometers Surveyed: 26.2

DAVID G. CROUCH
BISLEY TWP. PROPERTY TOTAL FIELD MAGNETIC SURVEY - CONTOURS MAY 2018
BISLEY TWP. - LARDER LAKE MINING DIVISION CLAIM CELLS: 501134 501135 CONTOUR INTERVAL - 2, 10 nT. INSTRUMENT: DRONE MOUNTED GEOMETRICS MFAM MAGNETOMETER
<i>SURVEYED BY: ZEN GEOMAP</i>



Line Kilometers Surveyed: 26.2

DAVID G. CROUCH
BISLEY TWP. PROPERTY Calculated 1st Vertical Derivative Magnetics MAY 2018
BISLEY TWP. - LARDER LAKE MINING DIVISION CLAIM CELLS: 501134 501135 CONTOUR INTERVAL
INSTRUMENT: DRONE MOUNTED GEOMETRICS MFAM MAGNETOMETER
<i>SURVEYED BY: ZEN GEOMAP</i>