Ontario

We are committed to providing accessible customer service.
If you need accessible formats or communications supports, please contact us.

Nous tenons à améliorer l'accessibilité des services à la clientèle.
Si vous avez besoin de formats accessibles ou d'aide à la communication, veuillez nous contacter.

Assessment Report

Drone Magnetic Survey

Raney Gold Exploration Project

Raney Township

Porcupine Mining Division

Prepared for:

Rockridge Resources Ltd.

Prepared by:

Matthew Johnston, P. Geo.

Mining Claims:

113009 129236 140712 155298 160484 163175 169976 174966

192726 194493 194494 241657 249215 272775 272776 273953

303077 303806 310552 315689 322595 336619

Raney Township, Porcupine Mining District

January 5, 2021

Table of Contents

Appendices

List of Maps

Map

1.0 Introduction

Drone magnetic surveys were conducted on the Raney Gold property (see Figure 2). Mining claims covered by this survey include, 113009,129236, 140712, 155298, 160484, 163175, 169976, 174966, 192726, 194493, 194494, 241657, 249215, 272775, 272776, 273953, 303077, 303806, 310552, 315689, 322595 and 336619, and are located in Raney Township, Porcupine Mining Division.

Between July 16 and October 16, 2020, (see Table 2) the mining claims listed in Table 1 were surveyed using a Geometrics MFAM magnetometer mounted on a DJI M600 drone. Zen Geomap Ltd. of Timmins, Ontario, carried out the magnetic survey on a contract basis for the client. The survey was performed to evaluate the potential for gold mineralization and structural lineaments within this claim group.

Data processing and maps were completed between July 23 and December 15, 2020 and the assessment report was prepared between December 1, 2020 and January 5, 2021.

2.0 Location and Access

The property is accessed by travelling west along Hwy 101 from Timmins for 92 km. A sign on the south side of the highway indicates the start of the Foleyet Timber Road (#105). Travel south along the Foleyet Timber Road for 42 km, yellow mileage markers are posted along the road, travel to mileage marker 26 located near a T junction in the road. Signage indicates the Foleyet Timber Camp on the west branching Rollo road (#216) off the Foleyet Timber Road. Travel west along the Rollo Road. The Rollo road has white kilometre markers posted, with the Foleyet Timber Camp located at the 2 km marker. Proceed west past the timber camp along the Rollo road to kilometre marker 14 km. Approximately 100 metres past the14 km marker is the start of a trail on the north side of the Rollo Road. Follow the trail north/west for 11 km to the Raney Gold Project. The trail can be travelled in summer with truck, depending on water conditions and activity of beavers at two ponds along the trail.

3.0 Regional Geology

The Raney Township Gold Property is located within the northwestern part of the Swayze Greenstone Belt, which in turn is at the western most part of the Abitibi Sub-Province of the Canadian Shield. The first geological reconnaissance of the area by the Ontario Department of Mines was completed by

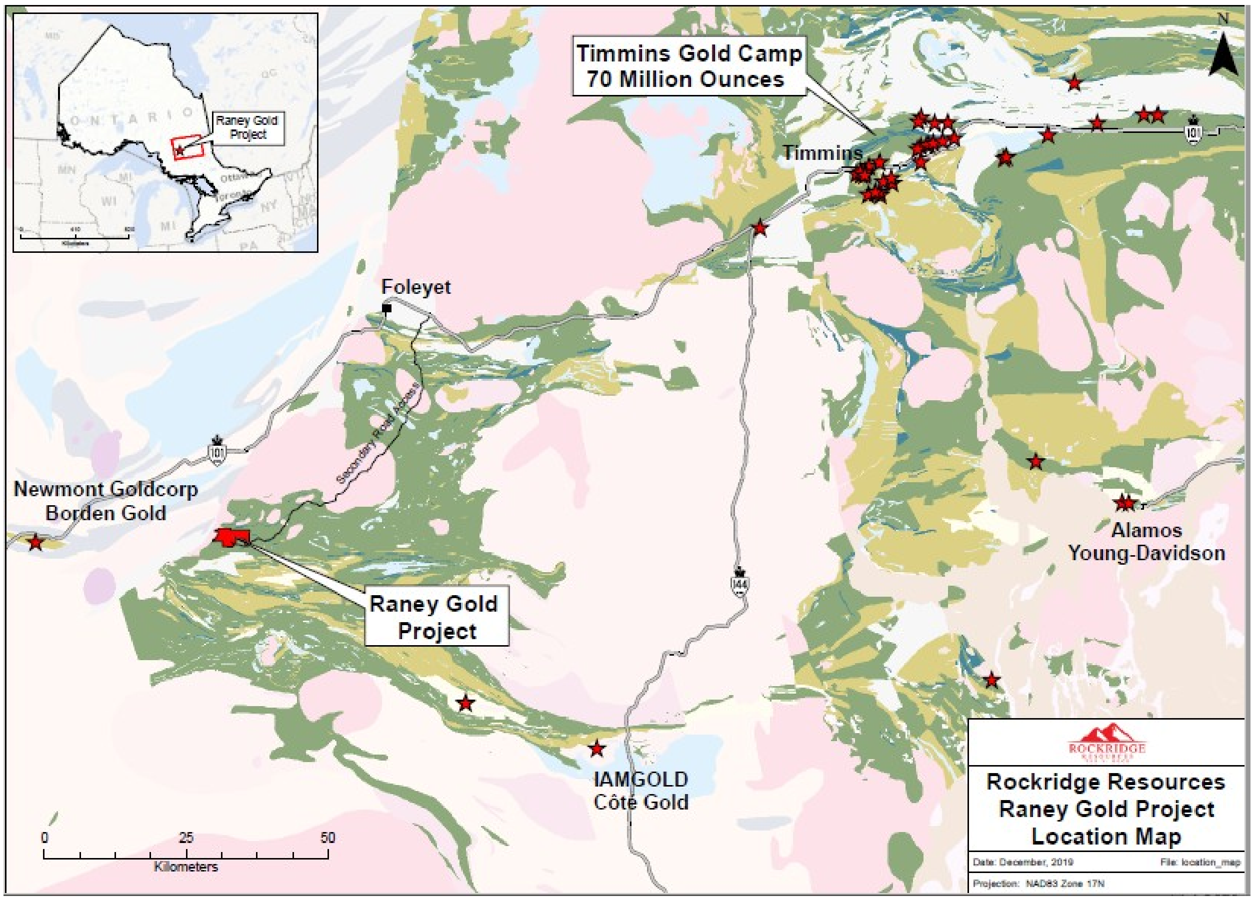
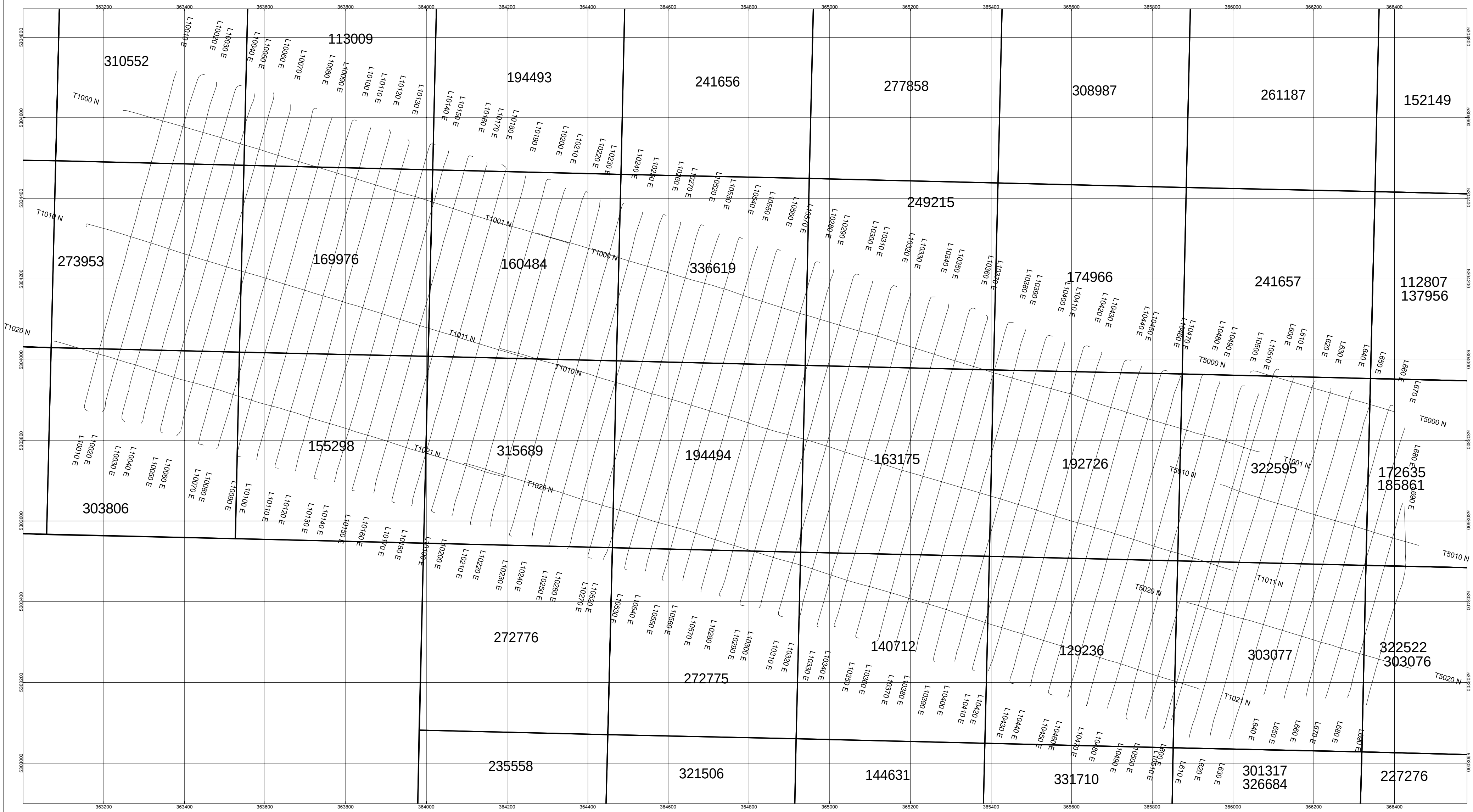

Timmins Gold Camp
70 Million Ounces
Timmins
Foleyet
Secondary Road Access
Newmont Goldcorp
Borden Gold
Raney Gold
Project
Alamos
Young-Davidson
IAMGOLD
Côte Gold
Rockridge Resources
Raney Gold Project
Location Map
Date: December, 2019
File: location_map
Projection: NAD83 Zone 17N
Kilometers
0
25
50
ONTARIO
Raney Gold Project

Figure 1



50 0 50 100 150
metres
NAD83 / UTM zone 17N

Figure 2
Grid Location and Survey Lines
Raney Twp. Porcupine Mining Division

Furse (1932) in the Swayze area, and subsequently further geological mapping of the area was completed by Rickaby (1934) in 1932 and 1933 with special attention to the gold occurrences. Various studies of the Swayze Belt were carried out following this, but the next more detailed geological survey of the Raney Township area occurred in 1971 and 1972 by P. Thurston (Thurston et al., 1977) of the Ontario Geological Survey (OGS). At this time, mineral occurrences were also documented. In 1993, the Geological Survey of Canada (GSC) in conjunction with the OGS initiated a three-year project involving the compilation and analysis of a wide range of digital data over the Swayze greenstone belt using geographic information system (GIS) technology. The Northern Ontario Development Agreement (NODA) funded project involved the compilation and analysis of geoscience data and the production of digital datasets and hard copy maps useful for regional mapping and exploration within Ontario. Data for the project was provided by Falconbridge Ltd., Noranda Inc., the OGS, and the GSC. As part of this project, Fumerton and Houle (1995) compiled information on the many occurrences of the Swayze Belt in detail in 1991 to 1993, and this data was also released as a MDI file (Fumerton et al., 1996). Heather (1993, 1999) reported on the geology of the Swayze Belt, and produced eight 1: 50,000 scale maps over several townships in the Swayze Belt, although none were over Raney Township. A more regional compilation geological map of the Swayze Belt which includes Raney Township was produced by Ayer and Trowell (2002).

In 1981 and 1982, the OGS completed a Questor Airborne Electromagnetic and Total Intensity Magnetic Survey over the Swayze Area. No significant E.M. anomalies were identified over the Property (OGS, 1982). In 2003, the OGS released a geophysical dataset which involved the recompilation and reprocessing of previous surveys over the Swayze Belt, including data provided by mining companies (OGS, 2003). This was part of the Swayze Belt NODA project, mentioned previously, and resulted in greater detailed airborne magnetics and Electromagnetic data; no significant EM anomalies were noted in the area of interest.

In 1993-94 the OGS conducted a Quaternary geological study over the Swayze belt area, including surficial sediment sampling and analyses of gold grains and other heavy metal components. The survey outlined a number of clusters of sediments anomalous in gold; the immediate area was not identified as prospective, although the area was anomalous in heavy mineral abundances which are an effect of the Kapuskasing structural zone (Bernier, 1994).

The Swayze greenstone belt (SGB) is located within the western Abitibi Subprovince of the Superior province, a Neo-Archean granitoid-greenstone terrane that developed between 2.8 Ga and 2.6 Ga. (Jackson and Fyon, 1991). It is bounded to the west by the Kapuskasing structural zone, to the east by the Kenogamissi batholith and to the north and south by several granitoid complexes. The SGB is connected to the Abitibi greenstone belt by a narrow band of metavolcanic-metasedimentary rocks which wrap around the north and south margins of the Kenogamissi Batholith. Although largely separated from the Abitibi greenstone belt by the Kenogamissi Batholith, the two greenstone belts are considered roughly equivalent in age. Recent mapping and geochronological evidence indicates the Swayze Greenstone Belt contains many of the structures and stratigraphic ages typical of the Abitibi belt in the Timmins-Kirkland Lake area. The Swayze Greenstone Belt is now interpreted to represent a deeper, erosional level of a once continuous Abitibi greenstone belt (Heather et al., 1995), shown in Figure 7-1. It is described as an arc-like volcano-sedimentary greenstone belt that is convex to the west. The SGB consists of a wide variety of metavolcanic, metasedimentary, and metaplutonic rock types.

Thurston et al. (1977) describes the Swayze Belt as an east-trending belt of metavolcanics and metasediments 26 km (16 miles) wide at the eastern edge of the property area. It extends westward from the eastern boundary of the region miles 74 km to the Mountbatten-Crockett Townships area, where it is terminated by a north-trending fault zone. The complex consists, from the margins inwards, of mafic metavolcanics succeeded by metasediments termed the Ridout Series by Rickaby (1934, p.7), up to 7.2 km wide. Scattered along the length of the complex are several centers of active felsic volcanism of Early Precambrian and related shallow-water shelf and continental-rise volcanogenic sedimentation, i.e. the Benton-Marion Townships center, the Denyes-Swayze Townships center, and the Raney Township center.

The Abitibi Greenstone Belt contains the Porcupine Gold Camp, the Kirkland Lake - Larder Lake mining camps, as well as the Val d'Or mining camp (in Quebec), and they are three of the most prolific lode gold producing camps in the world that have historically produced over 100 million ounces of gold. The Swayze Greenstone Belt, which is the western and deeper part of the Abitibi, has a high potential for mesothermal gold as indicated by the number of significant gold occurrences. The regional geology of the Swayze Belt, and the locations of the Jerome Mine, several developed prospects, and the numerous gold occurrences in the belt (documented by the OGS) are contained in Figure 7-2. Table 7-1 outlines the rock units present in the western Swayze Belt, where the property is located.

Previous Work

Earliest exploration in the Raney Township area is known from 1932 onwards. Exploration work has been conducted since this time in at least five previous exploration campaigns by companies and prospectors. The property is part of the Swayze area, which is one of Ontario's historic gold areas and has seen prospecting activities for a variety of metals. There are several recent discoveries of gold mineralization within the belt; supporting the fact the Swayze has a rich mineral endowment typical of the Abitibi Orogenic Belt. The only documented past producing gold mine in the Swayze greenstone belt is the Jerome Mine, located southeast of the Property in Osway Township. There are numerous occurrences close to the property that are undeveloped prospects, with no known reserves.

The only known gold occurrence on MPH Venture’s Raney Township Gold Property is the Raney Occurrence. The history of past exploration activities on the Property is described below.

The earliest documented exploration on the Property was by the Raney Lake Prospecting Syndicate in 1932. A group of 35 claims northeast of Raney Lake was staked, prospected and explored by selective trenching and sampling. Two high-grade (l oz./ton) gold-bearing quartz veins were discovered and exposed during this program. The first quartz vein, the “No. 1 showing” was striking easterly and dipping steeply north and was traced for 100 feet with a maximum width of 2 feet. Host rocks were indicated as arkose and/or impure quartzite. The vein contained minor pyrite and carbonate, native gold was noted in one spot. A second quartz vein, the “No. 2 showing”, was exposed 500 feet southwest of the No. 1 showing. It strikes N60E, was exposed continuously for 100 feet, and averaged 6 inches in width. Host rocks were feldspar porphyry which contained trace pyrite, chalcopyrite, and galena. Native gold was observed in one place. These two are veins were originally referred to as the “Thorne-Greaves gold showing” (Furse, 1932).

In 1972, J-Dex Exploration Limited staked 4 claims containing the two gold-bearing veins. Most of the property they worked is south of the present day Raney Property, near the north shore of Denyes Lake. The claims lapsed, but were later staked in 1978 by D.O. Baker. One Winkie drill hole, with a length of

66 m (218 feet), was drilled in the vicinity of the No. l showing (Baker, 1979). The location of this hole is uncertain and no assay results are available.

J-Dex Mining and Exploration acquired claims over the gold showings in 1978, and performed geophysics consisting of a magnetometer and VLF-EM survey. This was followed up with geological mapping and sampling (Caira and Coster, 1984). Assays up to 34.0 g/t Au were reported from the surface sampling. In 1984 a limited Winkie drilling program was completed, totaling 11 drill holes for 615 m (2,017 feet). Seven holes were positioned at three collar locations to test the No. l gold showing. These holes generally cut the vein zone at very shallow depths. Intersections included 4.79 m of 2.16 g/t Au and 2.36 m of 1.21 g/t Au. Four holes were positioned at a single collar location to investigate VLF-EM anomalies located to the northwest of the vein (Caira, 1984). The No. 2 gold showing was not tested during this program.

In 1986 J-Dex Mining and Exploration formed a joint venture with Goldrock Resources and Glen Auden Resources, and they extended the original J-DEX claims to a 72 claim property. Induced Polarization, magnetic, VLF-EM and lithogeochemical surveys were completed over 15 km of grid covering a portion of the present property (Hodges, 1986). The surveying did not include the swampy area immediately to the east of the No l showing.

In 1988 a drilling program was performed to test the IP anomalies, as well as some magnetic anomalies and structures associated with the No. 2 gold showing. A total of thirteen Winkie holes were completed, totaling 375.82 m (1233 feet). Many of the planned targets were never intersected and thus untested. Assay values were not submitted for the drill core samples. The No. l gold showing was not tested in this program (MPH Consulting, 1993).

In 1991 Joe-Anne Salo staked several claims which form part of the current property. She and her partners, Larry Salo and William Brereton, cleaned out the old trenches over the No. 1 and No. 2 showings, performed sampling of these showings, and completed geological mapping (Salo, 1992). Assays were not reported.

In 1993 Cree Lake Resources Corp. optioned the property and carried out a program of geological mapping, rock sampling and till sampling over a larger group of claims which included most of the present day property. Rock sampling confirmed previously indicated values. A soil geochemistry survey outlined a broad zone of weakly anomalous gold-in-soils over the No. 2 gold showing (see Figure 9-2). The soil program did indicate the No. 2 gold showing had the possibility of some strike extension. The geochemical anomaly over this showing is coincident with IP chargeability anomalies defined during previous exploration and is largely untested (MPH Consulting, 1993; see Figure 9-2). A compilation program by Cree Lake Resources interpreted a gold-bearing alteration envelope surrounding the No. l auriferous quartz vein, and suggested the vein zone was increasing in intensity and potential to the east. Recommendations for a drilling program to test both gold showings were made, however the company did not have the funds to implement the program and no further work was recorded by Cree Lake Resources. In 1993, Induced Polarization surveys were reported to have been completed over portions of the current property, the data has not been located in assessment files. The survey work is indicated on Compilation of this survey work are incomplete.

In 1999 Joe-Anne Salo and William Brereton completed one drill hole on the property; this program was funded by Ontario Prospectors Assistance Program (OPAP). A total of 251 m (823 ft) was drilled on the projected east extension of the historic No. l gold showing. Two zones of irregular quartz-carbonate flooding, patches and veinlets with minor disseminated pyrite were intersected from 127 to 134 m and 148 to 159.5 m. The upper zone returned assay results of 2.50 g/t Au over 1.0 m, while the lower zone assayed 3.37 g/t Au over 6.8 m (Brereton, W., 1999). During this same period of work limited stripping work was carried out over the No. 2 showing. A strong, wide (100 m) shear zone was mapped with white weathered feldspar porphyritic rocks. Systematic sampling was not carried out at this time, further drilling was recommended.

In 2005 Wallbridge Mining Company Ltd. evaluated the property, they compiled previous work and re-logged and sampled the 1999 drill hole. The best assay returned from this sampling was 3.85 g/t Au over 5.9 m within the lower gold zone or No. 2 showing (Oosterman, 2005).

Hinterland Metals Inc. optioned the property in 2007, and from the end of 2007 to mid-2008 completed four drill holes totaling 758 m (Fekete and Simper, 2008). Three of the drill holes tested the No.1 showing, and one of these, RAN07-02, was lost at 99.1 m. The other two drill holes were successful in intercepting two mineralized gold zones over the Main showing. The best results were 2.76 g/t Au and 0.51 g/t Ag over 15.5 m in hole RAN08-04 from the lower zone and 1.62 g/t Au and 0.27 g/t Ag over 1.5 m in hole RAN08-03 from the upper zone. The fourth drill hole tested the No. 2 showing, and did not intercept any mineralization. The drill core is still available, and some of it was re-sampled by MPH Ventures Inc. in 2009. The report of work is documented by Fekete and Simper (2008) and a

review of this document indicates that industry best practices of standards were employed during the program. No further work was carried out by this company; recommendations included magnetometer and IP surveys, sampling, followed by 6000 m of drilling.
MPH Ventures Corp. conducted trenching and sampling, Induced Polarization (IP) surveys (see Figure 9-2), followed by drilling over the Raney Township Gold Property during the winter of 2009 and 2010.

6.0 Summary of 2020 Drone Magnetic Survey

The program consisted of 1 grid summarized as follows:

Main Grid Surveyed Between July 16 and Jul 23, 2020
(58.9 Km)

Additional Lines Added to SE portion of Grid on October 16
(9.2 km)

Total line kilometers: **68.1**
Altitude: **35m above ground level**

The grid lines were spaced 50 m apart and flown at an azimuth of 15 degrees with tie lines spaced at 300 m intervals and flown at an azimuth of 105 degrees.
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 monitoring of the local magnetic field variations.

Equipment specifications are provided in ***Appendix 1, 2 and 3***.
The survey covered a portion of 24 mining claims.

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 levelled based on tie lines.

9.0 Conclusions and Recommendations

The current survey was successful at identifying and mapping the magnetic anomalies at the Raney Gold project. The magnetic survey on the Raney grid indicates a relatively quiet magnetic background with residual magnetic values ranging between -162 and 602 nT. The background magnetic field strength is -20 nT. The overall magnetic pattern is disrupted by one several moderate strength linear anomalous magnetic highs striking at approximately 11 degrees azimuth and 310 degrees azimuth. These magnetic responses are located in the central and west portion of the grid area and are easily observed on the magnetic contour map. These magnetic anomalies may represent mafic diabase dikes, common to this geologic setting or possibly maficor ultramafic lithology.
The isomagnetic contour pattern suggests an underlying lithology striking in a northwest-southeast direction; notwithstanding the disruptive magnetic anomalies located within the grid area. All of the anomalies are easily identified on the contour maps.
The results of the magnetic survey are presented as contoured total field and 1st vertical derivative maps.
The magnetic survey completed over the Raney grid was successful in mapping areas of anomalous magnetic anomalies. These anomalies are thought to arise from bedrock sources, and may have implications for follow-up exploration.
Any existing geological or geochemical information for the surveyed grid area will aid in further assessing any geophysical anomalies and should be incorporated

into an overall assessment of the property prior to further exploration.
Magnetic data collected by drone at high density and low altitude is ideal for 3D inversion modelling. The cost for this type of advanced modelling would start at approximately $2,000 and up to $8,000. 3D inversion modelling is recommended as the next step for evaluating Raney property.
Drone magnetometer survey provides greater detail than available, published government mag.

Statement of Qualifications

This is to certify that: MATTHEW JOHNSTON

I am a resident of North Bay; province of Ontario since November 1, 2017.

I am self-employed as a Consulting Geophysicist, based in North Bay, Ontario.

I have received a B.Sc. in geophysics from the University of Saskatchewan; Saskatoon, Saskatchewan in 1986.

I have been employed as a professional geophysicist in mining exploration, environmental and other consulting geophysical techniques since 1986.

I am a member in good standing with the Association of Professional Geoscientists of Ontario as a Practicing member; membership no. 2046

Signed in North Bay, Ontario, this Janaury 5, 2021

References:

ALS. (2019). Schedule of Services and Fees, Geochemistry, 2019, Canada (pg. 1-52). alsglobal.com

Amedjoe, C.G. & Adjovu, I.T. (2013). Application of the mobile metal ion geochemical technique in the location of buried gold mineralization in Essase Concession, Eastern Region, Ghan. Journal of Geology and Mining Research, 5(6), 147-160.

Asarco Exploration Company of Canada Limited. (1971). Geological Report on Asarco Claims Pattern River Area, St Laurent Township, Larder Lake Mining Division, District of Cochrane (pg. 1-40). Ontario Assessment Files Database: 32E05SE0900

Bowen, R. P. & Darbha, D.M. (1983). An Airborne Magnetic and Electromagnetic Survey for Assessment Work Credit of the Pattern River Claim Groups in Hurtubise and Raney Townships, Ontario (pg. 1-64). Ontario Assessment Files Database: 32E05NE0067

Falconbridge Limited. (2005). Report on Airborne Geophysical Surveying, Pattern River Property, Raney Township, Larder Lake Mining Division (pg. 1-103). Ontario Assessment Files Database: 20000001098

Falconbridge Limited. (2006). Report on Geochemical Sampling Program, Pattern River Property, Raney Township, Larder Lake Mining Division (pg. 1-14). Ontario Assessment Files Database: 20000001839

Groves, B. (1987). Report on an Aeromagnetic Survey, Noranda Exploration Company Limited, Hurtubise Township, Northern Ontario (pg. 1-18). Ontario Assessment File Database: 32E12SE0065

Guoth, T. (1988). Summary Report on the Diamond Drill Program on the Glen Auden Resources Limited/Tarzan Gold Inc. Joint Venture Property, Raney Township, Ontario, (pg.1-58). Ontario Assessment Files Database: 32E05NE0056

Johns, G. W. (1962). Geology of the Burntbush-Detor Lakes Area, District of Cochrane; Ontario. Geological Survey Report 198, 82p. Accompanied by Map 2453, scale 1:100,000

Kendle, F. R. (2009). Raney Project, Northeastern Ontatio, Report on 2008 Diamond Drill Program for Eastmain Resources Inc. (pg.1-205). Ontario Assessment Files Database: 20000004210

Koing, M. & Caira, N. (1986). Interpretation Report: Input MKVI Electromagnetic/Magnetic Survey for Glen Auden Resources Limited, Raney Township (pg. 1-85). Ontario Assessment Files Database: 32E05NE0065

Lepeltier, C. (1969). A simplified statistical treatment of geochemical data by graphical representation. Economic Geology, 64, 538-550.

Mountjoy, J. E. (1987). Airborne Magnetic and MKVI Input Survey on the St, Laurent Claims of Abagold Resources Inc., St Laurent Township, Larder Lake Mining Division, Ontario (pg. 1-19).

Ontario Assessment Files Database: 32E05NE0066

Mountjoy, J. E. (1987). Geomagnetic Survey on the St, Laurent Claims of Orsina Resources Ltd., St Laurent Township, Larder Lake Mining Division, Ontario (pg. 1-33). Ontario Assessment Files Database: 32E05NE0063

Mountjoy, J. E. (1987). Induced Polarization Survey on a Portion of the St, Laurent Claims for Orsina Resources Ltd., St Laurent Township, Larder Lake Mining Division, Ontario (pg. 1-77). Ontario Assessment Files Database: 32E05NE0062

Ontario Geological Survey (2001). Geological Compilation of the Abitibi Greenstone Belt – Digital data, Ontario Geological Survey MR D 143, scale 1:250,000

Prospecting Geophysics Limited. (1971). Report on Geophysical Surveys on the Property of Asarco Exploration Ltd., Raney Township (pg. 1-25). Ontario Assessment Files Database: 32E05SE0007

R.S. Gray. (1966). Diamond Drill Report on R.S. Grey's Raney Property, Larder Lake Mining Division, Raney Townships (pg.1-194). Ontario Assessment Files Database: 32E05SE0004

R.S. Middleton Exploration Services Inc. (1988). Interpretation Report on the Geophysical Surveys on the St, Laurent Township (Chimp Grid) Property for Tarzan Gold Incorporated (pg1-149). Ontario Assessment Files Database: 32E05NE057

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. .

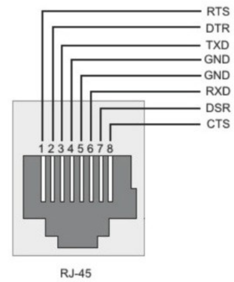


Figure 3: Serial Port Pinout

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.

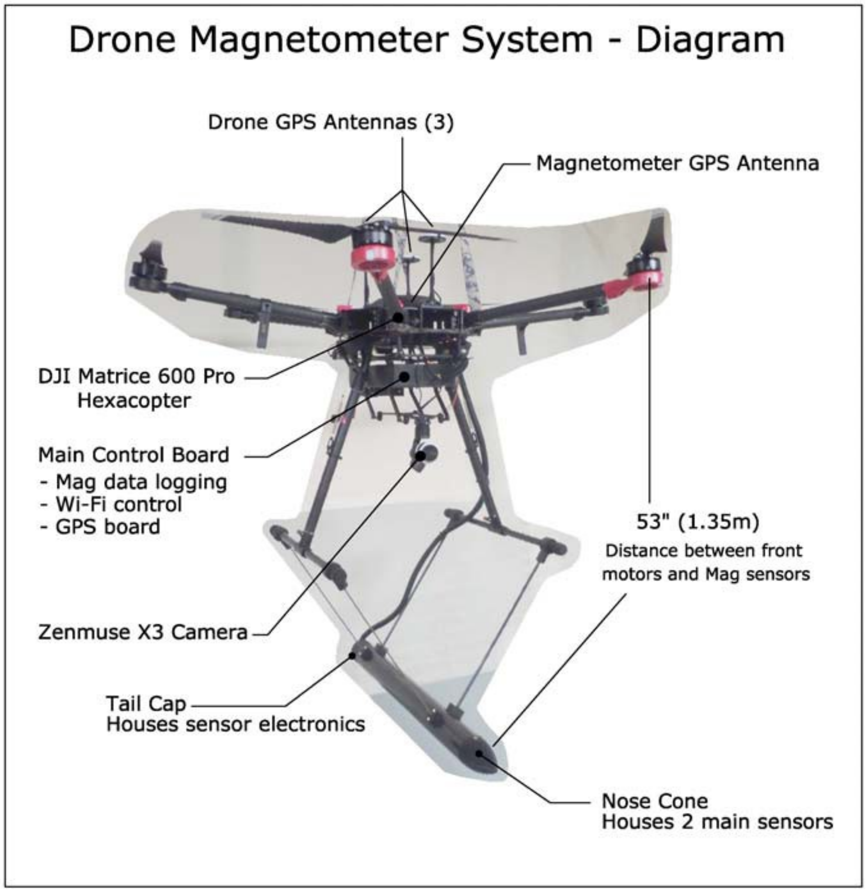
12) **Ethernet port with Power over Ethernet Compatibility**: The Tiva microcontroller contains a fully integrated Ethernet MAC and PHY. In addition, the Ethernet port can power the Development Kit via Power over Ethernet (PoE) using an Ethernet power injector.

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.



Description and Location of components

The Geometrics MFAM magnetometer “main board” is attached directly below the central body of the DJI Matrice 600 Pro hexacopter drone. This box contains a small, Texas Instruments computer that collects and stores magnetometer readings on a micro-SD card. It also houses a 66 channel Adafruit GPS module, which operates independent of the (3) internal drone GPS modules. The Adafruit GPS collects and stores “GPS readings” (Lat / Long / Altitude / Time). The GPS readings are assigned to each mag reading, as the drone navigates along grid lines. A Wi-Fi module is attached to the Texas Instruments computer, which allows the operator to start and stop the magnetometer at a distance.

The Geometrics MFAM magnetometer operates using 2 separate mag sensors, attached to a “sensor module” with a flexible circuit board. The sensor module and 2 sensors are housed in a carbon graphite tube, which is mounted (suspended) 53 inches (1.35m) below the 2 front motors of the drone.

Magnetic shielding (mu-metal) is installed at 6 locations around the drone body, to provide additional shielding between drone components and the 2 mag sensors.

The magnetometer GPS antenna (for the internal Adafruit GPS) is mounted on top the drone body, to allow for clear signal. The vertical distance between this antenna and the 2 mag sensors, is 1.20m. This value is considered when reporting “mean terrain clearance”, by subtracting 1.2m from the elevation assigned to each mag reading.

Appendix II

Geometrics G856AX
Proton procession magnetometer specifications

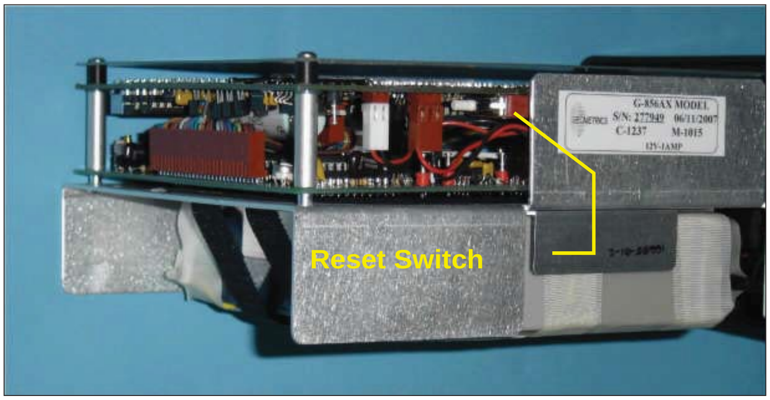


Figure 23. Internal reset switch.

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 byremnant 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 µT.
- 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 c,!J1

Specifications

• Aircraft	
Diagonal Wheelbase	1133 mm
Dimensions	1668 mm x 1518 mm x 727 mm wren p ropellers, frame arms and GPS mount unfolded (including lancing gear) 437 mm x 402 mm x 553 mm with p ropellers, rame arms and GPS mount folded (excluding landing gear)
Weight (with six TB 47S oatteries)	9.5 kg
Weight (with six T848S banenes)	10 kg
Max Takeoff Weight Recommendeo	15.5 kg
Hovering Accuracy (P-GPSJ	Vet1ical. .,Q.5 m Horrzontal. "' 1.5 m
Max Angular Velocity	Pitch 300°/s. Yaw: 150°/s
Max Pitch Angle	25°
Max Wind Resistance	a mis
Max Ascent Speed	5 m/s
Max Descent Speed	3 m/s
Max Speed	40 mpn / 65 kph \no wino)
Max Service Ceiling Aoove Sea L" 11" 1	2170 propellers: 2500 m, 2195 propell&rs 4500 m
Hovering Time· (with six TB47S banenesJ	o payload : 32 min. 6 kg payload: 16 mrn
Hovering Time· (with six TB48S batteries)	No payload: 38 min, 5.5 kg payload: 18 m,n
Flight Control System	A3Pro
Supported OJI Gimbals	Ronin-MX; ZENMUSE™ 230, Zenmuse X5/X5R Zen111u:;e X3. L"nrnus" 1<I , Zenmuse Z15 Series HD Gimbal: 215-A?, 215-BMPCC . 215-50 Ill, 215-GH
Retractable Landing Gear	Standard
Operating Temperature	14° to 104° F (-10° to 40° CJ
• Remote Controller	
Operating Frequency	920.6 MHz to 928 MHz (Japan); S.725 GHz to o.825 GH", 2.400 GH< to 2 4!:13 GH"
Max Transmission Distanc e	FCC Compliant: 3.1 mi (S km), CE Compliant· 2.2 ,m (3.5 km) (Unobstructed, free ol 1111.:11ereric;.:J
Transmitter Power (EIRP)	10 dBm @9 00M. 13 dBm @5 .SG. 20 dBm@ 2.4G
Video Outp u t Port	HDMI, SDI, USB
Operating Temperature	14° to 104° F (-10° to 40° C)
Battery	6000 m Ah L1Po 2S
• Charger (Model: MC6S600)	
Vol age Output	26.1 V
Rated Power	600W
Single Battery Port Output Pow., r	100W
• Standard Battery (Model:T847S)	
Capacity	4500 mAn
Vol tage	22.2 V
Battery Type	LiPo 6S
Energy	99.9 Wh
Net Weigh t	595g
Operating Ten perature	14• to 104· t- \· 10 " 10 40" C)
Max Charging Power	180W
• Optional Battery (Madel: TB48S)	
Capacity	5700 mAn
Voltag e	22.SV
Battery Type	LiPo 6S
Energy	129.96 Wn
Net Weigh t	680g
Operating Temperature	14° to 104• F 1-10· 10 40" CJ
Max Charging Power	180W

• Hovering 11me rs base<l on flying at 10 meters aoo e sea level 1n a no-wino environment and landing with a 10% battery level.

(E1313 RoHS

Th,, dO"YN:e comp lioa wich f)6tl 15 or the FCC Rul•L OperatJon I.,: bject to U'\O f0Uowin9 two c.ond1ti
(l) Thi:a dovic. may not c 11u H' h ermful int otf,orenco• ., ,c;,
(2) th 11 d4tYtce must occept any interfere nce rec oi.,.d .,n vd · tntcrf'erence lhat m1y c.uH undesired operat,on.

HDMI

OJI tncorpotalos HOM'· tttehno y.
The t•rms HOMI •n<f HOMI High,Dof,r111.on l"lh.ltunud1• lnt et"fac;e. gincf th HC>Mf logo are tro1d ark.s or rog is te , .o tr•cl • morks of HOMI U«n!Mng LLC ,n the Unit States and other tOUntr ei

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

* This conten t is subject to change wi hout prior notice

MATRICE™is a trademark or OJI
Copyright @ 2016 OJI All Rights Reserved.
Designed by OJI. Printed m China

Drone Operation and Ground Control Methods

The DJI Matrice 600 Pro drone is programmed to fly an automated flight path (the survey grid lines and tie lines), using software that is available and ready to use on a wide variety of drones. Zen Geomap uses UgCS software, Drone Deploy and Pix4D software;

- Drone Deploy and Pix4D, on simple grids that do not require advanced control with regards to following complex terrain (example – flying in relatively flat ground, using Google Earth or other simple elevation model).
- UgCS, in rugged terrain, where we obtain a detailed 3D terrain model (DEM or DTM) using photogrammetric drone prior to magnetic survey. In this case we upload our own, custom DEM into UgCS software and the DJI M600 drone will follow the terrain at a fixed offset.

Using a Drape

The automated flight path will always use (follow) a "drape" in one form or another.

- On simple grids in flat terrain, the drape is generated as an offset of a simple DEM, such as Google Earth or other coarse elevation model such as DEMs available on-line through USGS.
- In complex terrain, the drape is generated as an offset of our own, custom DEM.

All of our piloting software is capable of following a drape at a fixed offset. We typically program the drone to fly 50m above coarse DEMs, such as Google Earth, or USGS. When a custom DEM is available, we typically fly 25-30m above DEM.

The actual / final "height above terrain" (or mean terrain clearance), is determined in the field by our crews. They visually inspect and look for obstacles such as hills, trees, buildings and towers.

The height above terrain (or mean terrain clearance) is included in the logistical and assessment reports we prepare for our clients.

Ground Control Methods

The DJI M600 drone uses a combination of 3 separate GPS receivers and 3 separate barometers. This system developed by DJI is called the A3 Controller.

The A3 controller is designed to maintain a stable altitude, relative to the take-off point. Over a 5 year period (2014 to current), we have found the A3 controller to be reliable to sub-metre accuracy, when it comes to maintaining stable altitude over a typical 20 to 30 minute flight.

Based on this long-term record, we rely on the A3 controller to navigate the drone at a pre-programmed, fixed offset above DEM. Over the same 5 year period, we have observed consistent and accurate agreement between the A3 GPS locations and the Adafruit (Magnetometer) GPS locations. When plotted in plan view, the A3 GPS tracks have always agreed with the Adafruit tracks to approximately 1 metre accuracy.

The author if this report has been an active surveyor since 1990 and is familiar with real-time (RTK) GPS and post-processed GPS methods.

Appendix V

Quality Control / Tests and Calibrations / Processing Steps

Quality Control

Throughout the data acquisition phase, data are monitored closely for quality control and error-checking on all channels. Output from the Geometrics MFAM magnetometer includes a wide range of error codes, which are written to the raw data file to help diagnose problems when they occur in the field.

All data are checked on a daily basis, as field data are transferred to Zen Geomap offices in Timmins or North Bay, Ontario. When errors or problems occur, the field crew is instructed to re-fly problem areas.

Tests and Calibrations

The following tests and calibrations are carried-out on all magnetometer equipment and sensors employed by Zen Geomap Inc.;

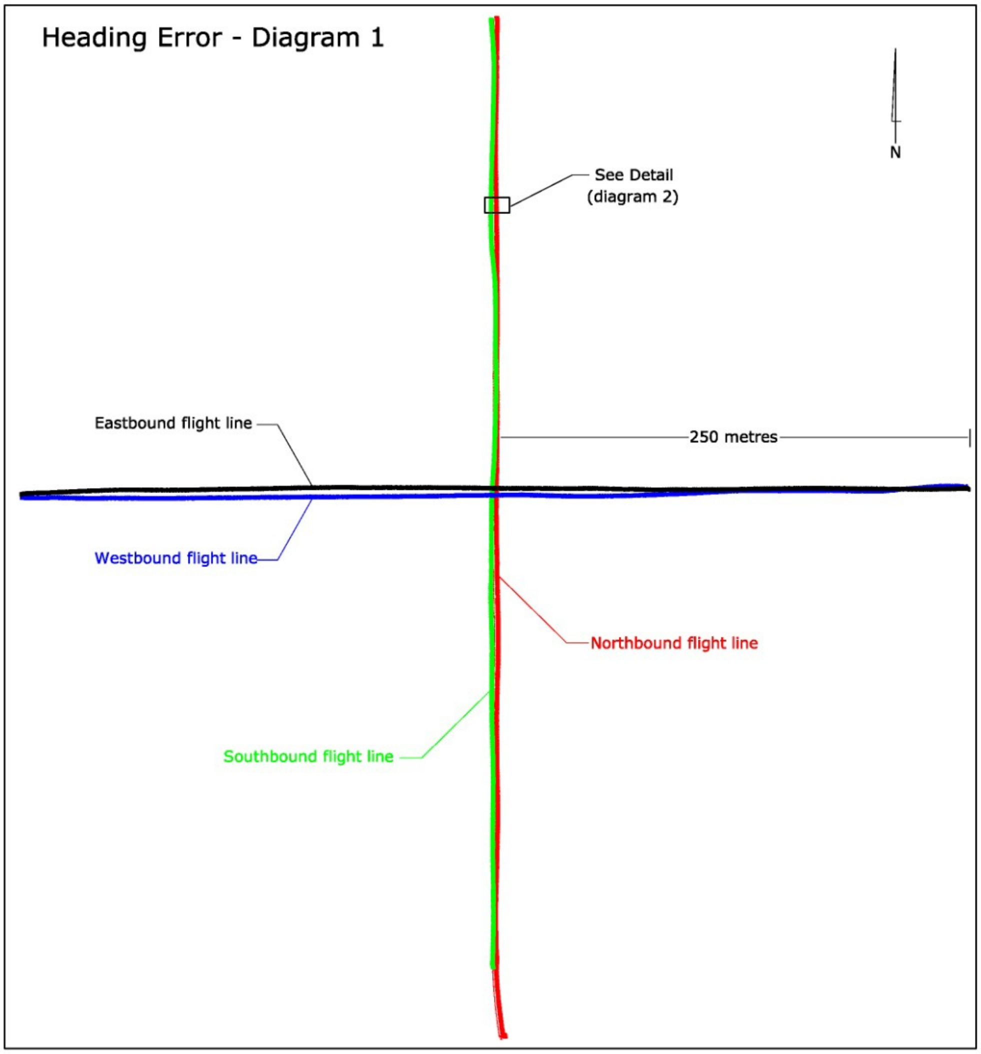
Heading Error

Upon receipt of a new magnetometer (or after significant repair or modification to any system component), a test flight is carried-out to determine heading error.

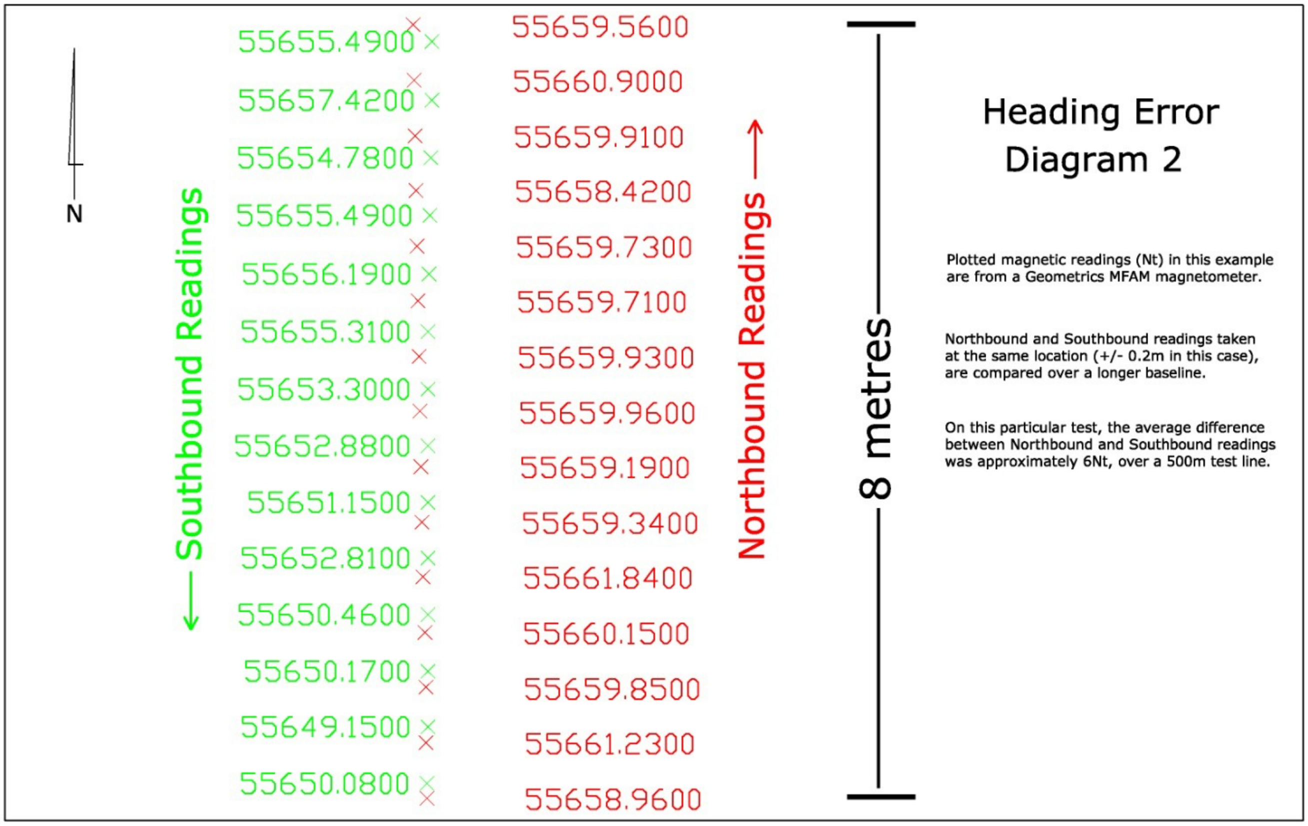
A cross-pattern is flown as shown in ***Diagram 1***, with 500 metre N-S and E-W lines.
Magnetic readings are collected along the same lines, flown in opposite directions.

Northbound and Southbound readings at the same location (+/- 0.2m in this example) are compared.
Eastbound and Westbound readings undergo the same process.

(See: Heading Error – ***Diagram 2***).



Example test flight by Zen Geomap, August, 2019



Example – Geometrics MFAM readings, August, 2019

The difference between Northbound and Southbound readings, averaged over a 500m baseline is calculated. The resulting value (6 Nt in above example), is used to apply a correction for heading error during processing.

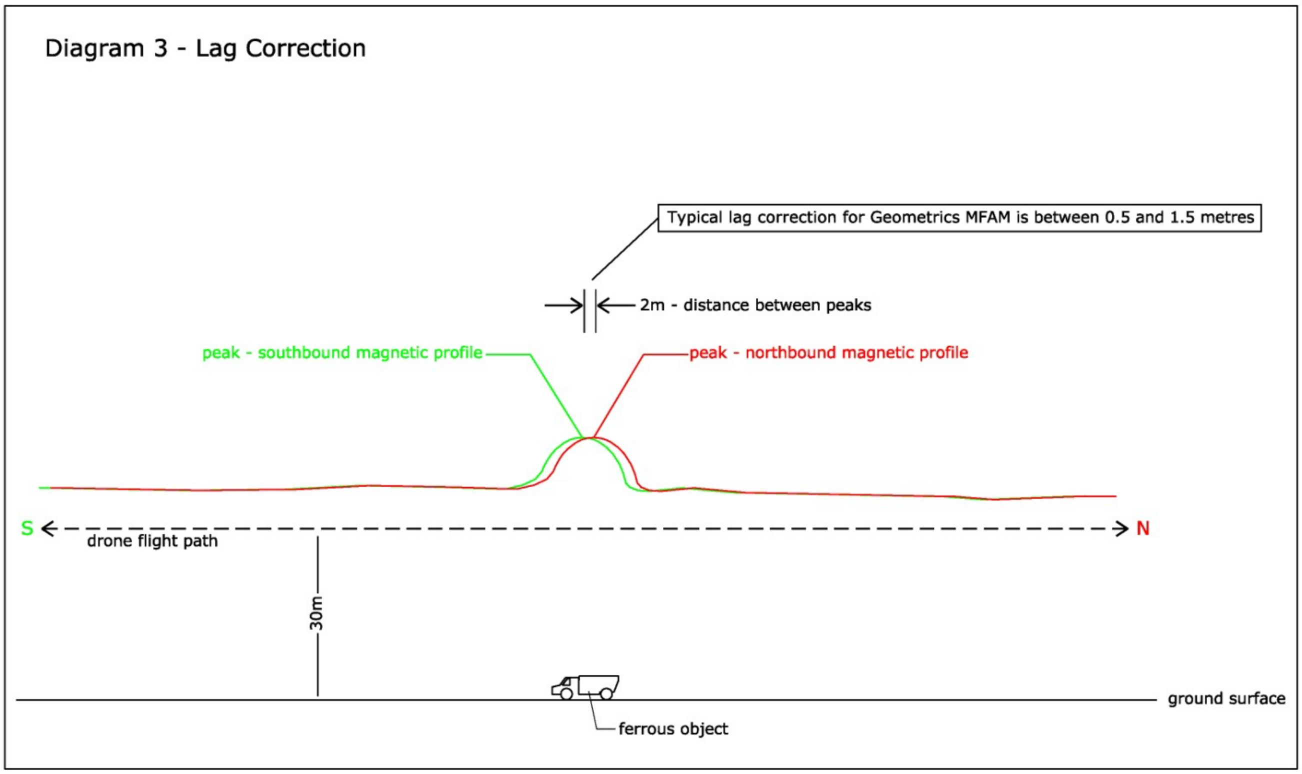
Each mag sensor will produce a unique result, however we typically apply a correction of 3Nt or less, to adjacent flight lines.

Lag Correction

Tests are performed to determine lag correction, by flying the drone magnetometer in opposite directions over top a ferrous object. Suitable objects include steel bridges, vehicles or heavy equipment.

Diagram 3 shows a typical flight test to determine lag correction.

A Geometrics MFAM magnetometer will typically have a lag error between 0.5 and 1.5 metres. Each mag sensor will produce a unique value. We typically apply a correction of 1m or less, to the location of magnetic readings on adjacent lines.



Diurnal Correction

A Geometrics G856AX proton procession magnetometer is operated as a base station on all projects, to provide diurnal monitoring of the local magnetic field variations. Adjustment may be applied to the raw MFAM readings, when variations exceed 10 or more Nt over the course of any flight. However, we typically re-fly grid lines, if the magnetic field variation is excessive.

The location (UTM coordinate) of the base station is included in the report body.

Processing Steps

Diurnal is examined for flights covering tie lines.
If magnetic field variation is excessive during tie line flights, all readings across tie lines are corrected using the base station data.

Tie lines provide a framework for leveling grid lines.
Readings on grid lines (once corrected for heading error and lag), are translated to conform to the tie lines. This process involves adjusting individual grid line segments, based on tie line intersections.

Unlike conventional airborne survey, such as fixed-wing or helicopter, a drone will take-off and land multiple times during the course of a survey. The resulting ferry lines are removed from the overall dataset prior to processing. Zen Geomap has developed import templates that run in Geosoft Oasis Montaj, to accomplish this task.

Geometrics MFAM data is not directly compatible with industry-standard software such as Geosoft.
Zen Geomap has developed software (Python code) to convert raw MFAM data into a format compatible with Geosoft and other industry-standard geophysical software. The raw data from MFAM is processed through Python, prior to initial processing.

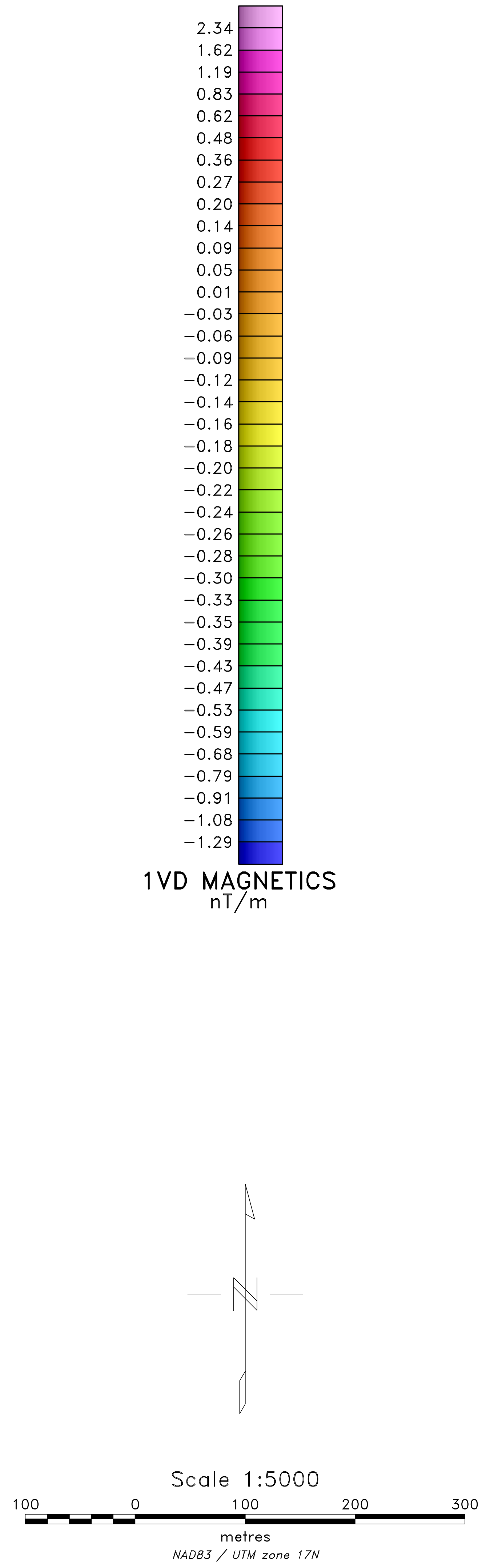
The Python code developed by Zen Geomap has been adopted by Geometrics, as the standard conversion software for drone-mounted MFAM. Geometrics has been the industry leader for airborne magnetometer equipment since 1969

ROCKRIDGE RESOURCES LTD.

RAINEY GOLD PROJECT
DRONE MAGNETIC SURVEY – TMI CONTOURS
JULY 18–23, 2020

RANEY TOWNSHIP – PORCUPINE MINING DIVISION
CLAIMS: POSTED ON MAP
CONTOUR INTERVAL = 5, 25 nT
INSTRUMENT: GEOMETRICS MFAM SENSOR – M600 DRONE

SURVEYED BY: FERA UAV LTD.



LINE KILOMETRES SURVEYED: 58.9

ROCKRIDGE RESOURCES LTD.

RANEY GOLD PROJECT
DRONE MAGNETIC SURVEY – CALCULATED 1VD MAGNETICS
JULY 18–23, 2020

RANEY TOWNSHIP – PORCUPINE MINING DIVISION
CLAIMS: POSTED ON MAP
CONTOUR INTERVAL = .1, .5 nT/m
INSTRUMENT: GEOMETRICS MFAM SENSOR – M600 DRONE

SURVEYED BY: FERA UAV LTD.