

**2020 Oceanview**

**EL 52181, 51188, 51189, 52127, 53914 and 53699**

**UAV Magnetometer Survey**

**Cape Breton County**

**NTS: 11F 16D**

**Perry MacKinnon, P.Ge**

**January 2, 2021**

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**Appendix I: 2020 Axiom Exploration UAV Magnetometer Survey Report**

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## SUMMARY

The Oceanview area consists of a number of showings including French Road, Copper Lake, MacIntyres Lake, MacLeods Lake, and Blue Mountain. This report concerns an airborne magnetometer survey over all of these areas. The 109 claims (in 6 licences) are located on, and mostly north of, the Gabarus Highway (Rte 327), approximately 9 kilometers west of Gabarus in Cape Breton County.

Multi-element mineralization was discovered in the Oceanview area in 1876 by Fletcher. The primary interest was for copper, however elevated levels of the elements Co, Bi, Zn, As, Pb, Sn and Ag were determined as well. The wider area is known to have interesting levels of these elements plus molybdenum. The author completed Mobile Metal Ion surveys over the more prospective areas of the claims in 2018-19 that returned anomalous results away from known mineralization. Of particular interest are elevated Co values northwest of the Copper Lake showing/ shaft.

There are no modern airborne magnetometer surveys covering the Oceanview area, and ground geophysics surveys have been extensive but were patchwork efforts for the most part. Drilling of the showings in the Copper Lake area provided values of Co and Bi up to 3% for both elements as well as spotty base metal intercepts.

Lack of exposure has allowed limited geological mapping of parts of the area. The generally accepted theory that, due to the array of anomalous elements an underlying felsic intrusion may be responsible, has remained unproven. A UAV survey was proposed to aid in geological interpretation and potentially identify drill targets. Appended to this report, the survey has provided a number of intriguing magnetic features, many of which are not associated with known mineralization. Ground checking of these is being followed up, and drill targets are being identified.

## INTRODUCTION

The area of the present survey lies within the Early Cambrian MacCodrum and Canoe Lake Formations which are described as consisting of shallow marine siltstone, shale and mudstone. To the author, the rocks in the immediate area of the historic Copper Lake shaft appear to be more like altered volcanic tuffs however the alteration may mask any primary sedimentary features which may be clearer in the drill core from the area.

Approximately 20 diamond drill holes have tested the general area of the Copper Lake prospect, and several tested the MacLeods Lake and Blue Mountain areas as well (the aforementioned 3 sites are referred to as Oceanview by this author, though this historically also refers also to the area along the coast, just to the east). Several geophysics surveys were also done on the area, including a 2012 chargeability survey (J. O'Sullivan, L. Jensen, 2012) showing several anomalous areas near the historic (Copper Lake) shaft, some of which have not been tested, as well as the MacLeods Lake and Blue Mountain areas.

MMI surveys by the author have provide important geochemistry data in areas where depth of overburden and glaciation have made other exploration techniques ineffective. A UAV survey was selected as the best means to assist with geological interpretation and the selection of drill targets.

The author wishes to acknowledge the financial assistance from the Province of Nova Scotia through the Mineral Resources Development Fund without which this study would not have been completed.

## Location and Access (see Figures 1 and 2)

Licences 53699, 51188, 51189, 52127, 53914 and 52181 are located in Cape Breton County, approximately 9 kilometres west of the village of Gabarus. The area is most easily accessed from Sydney via Route 327, approximately 30 kilometres south of the city. The location is on NTS map sheet 11F 16D, Tracts 33, 34, 35, 39, 40, 56, 57 and 58.

## Licence and Tabulation

Licence 51188 and 51189 were issued on October 5<sup>th</sup>, 2016, Licence 52127 was issued on March 5, 2018, Licence 52181 was issued on April 24<sup>th</sup>, 2018, Licence 53699 was issued on April 15, 2020, Licence 53914 on October 30<sup>th</sup>, 2020, all to 3302051 Nova Scotia Limited.

### NTS: 11 F 16D

#### Licence 53699

Claim	Tract	# of claims
C,F,L,O	35	4
A,B,C,H	38	4
D,E,M	39	<u>3</u>
		<b>11</b>

#### Licence 51188

E,M	34	2
H,J	35	<u>2</u>
<b>Total</b>		<b>4</b>

#### Licence 51189

A,H	15	2
D,E	16	<u>2</u>
<b>Total</b>		<b>4</b>

#### Licence 52127

C,D,F,K,L,N,O,P,Q	34	9
A,B,G,K,P,Q	35	<u>6</u>
<b>Total</b>		<b>15</b>

#### Licence 52181

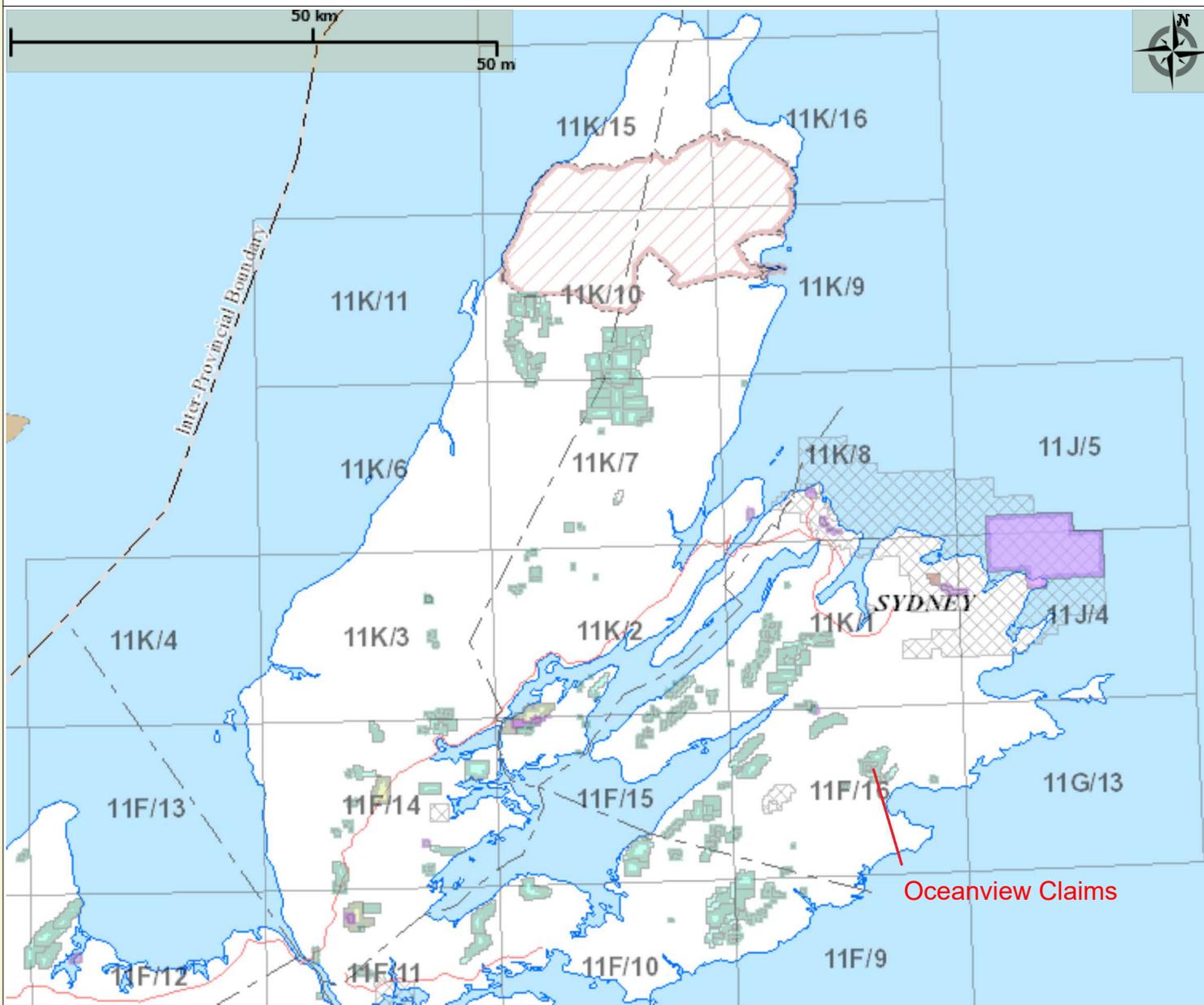
J,O,P,Q	14	4
J,K,L,M,N,O,P,Q	15	8
F,L,M,N	16	4

D,E,F,L,M,N,O,P	33	8
A,B,G,H,J	34	5
A,B,C,F,G,H,J,K,L,N,O,P,Q	39	13
B,C,D,E,F,G,H,J,K,L,M,N,O,P,Q	40	15
E	56	1
A,B,C,D,E,F,G,H,J,K	57	10
A,B,C	58	<u>3</u>
<b>Total</b>		<b>71</b>

**Licence 53914**

B,C,F,G	15	<u>4</u>
<b>Total</b>		<b>4</b>

### Oceanview 2020 UAV Survey FIGURE 1 Location Map



#### Legend

- Exploration Licences Good Standing
- Exploration Licences Other
- Exploration Licences Pending
- Tendered Licence Good Standing
- Mineral Lease Good Standing
- Mineral Lease Pending
- Mineral Lease Terminated
- Mineral Lease Other
- Non-Mineral Registration Good Standing
- DNR Closure
- National Parks and Park Adjuncts

This map is a user generated static output from an Internet mapping site. The information on this map may have come from a variety of government and non-government sources. The DNR accepts no liability for any errors, deficiencies, or faults on this map. This map should not be used for legal or navigation purposes.

**Scale: 1:1,000,000**  
Jan 1 2021 R.P. MacKinnon



# Oceanview KML File

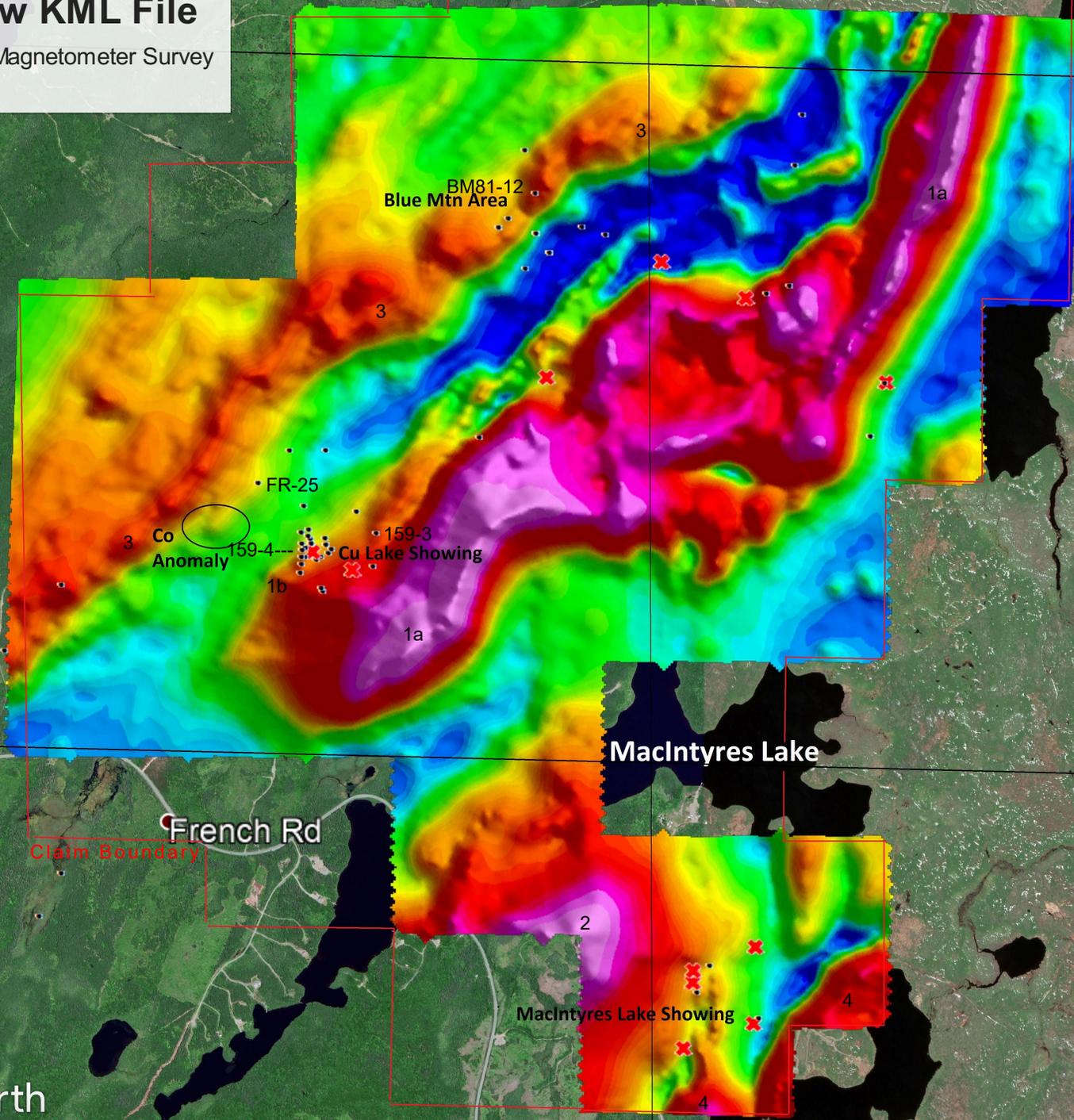
Total Field UAV Magnetometer Survey

FIGURE 3

## Legend

- Drill Holes
- ✖ Occurrence
- Claims

10.



MacIntyres Lake

French Rd

MacIntyres Lake Showing

Oceanview

Google Earth



718 000

2 km

5087000

**WORK PERFORMED** (taken from Axiom report, Appendix I)

From August 28th to September 7th, 2020 Axiom Exploration Group Ltd. ('Axiom') carried out an unmanned aerial vehicle (UAV) magnetic geophysical survey over the Oceanview Project near Gabarus, Cape Breton. The survey consisted of 274.64 line-kms with a traverse line spacing of 50 m and tie line spacing of 500 m.

The UAV system consists of a single GSMP-35UC high precision potassium vapor magnetometer slung from a DJI M600 Pro UAV platform. The magnetometer was towed with a 16.4' cable to ensure adequate separation between the UAV and the magnetometer.

Quality control and quality assurance were completed daily during the acquisition phase to ensure all field data collected was at a high standard. Final processing and leveling were completed post acquisition

Final deliverables from the survey include:

- All raw UAV magnetic data including base station data
- A final leveled dataset
- Map products including:
  - Total Magnetic Intensity (TMI) Map
  - Residual Magnetic Intensity (RMI) Map
  - Analytic Signal (AS) Map
  - First Vertical Derivative (VD1) Map
- Line Path Map with Base Stations Locations

The survey report describes the procedures for data acquisition, processing, equipment used, final image presentation and the specifications for the digital data set.

The author has provided an interpretation of the results of the survey based on the area geology and previous exploration efforts, including the results of an MMI survey completed by the author in 2018.

## INTERPRETATION of RESULTS

In general, the regional geological trend in the area of Copper Lake and wider area is about 45-50 degrees azimuth, though government and other mapping efforts show significant faulting in a northwest direction, which terminates some units in the north of MacIntyres Lake and Copper Lake areas.

The survey area includes many types of terrane, occasional swampy areas (rare), drumlins, rocky hillsides and flats. Much of the area was clear-cut, both recent and several years old. Lack of outcrop significantly limits geological interpretation.

The Oceanview region has long been explored with the belief that the polymetallic nature of the mineralization in the area is due to an underlying felsic intrusive providing porphyry style (several occur within an eight kilometre radius) mineralization (Cu, Mo, Sn) and a heat source causing low grade host rock mineralization to concentrate in certain locales. The presence of the aforementioned minerals, as well as a wide range of anomalous granophile and rare earth mineralization (as returned in the 2018-19 MMI surveys) leaves little room for any other explanation.

Of particular importance in exploring this area is that the glacial transport direction is (reportedly) not the common (throughout the Province) NW to SE direction, but studies show several directions, but mainly toward the north and northeast, though the last direction in the area northwest of Gabarus Bay is interpreted to be southeast.

The present airborne magnetometer survey, and derived results, as presented in Figure 3 and Appendix I, confirms the regional geological trend at 50 degrees azimuth. The results are dominated by a large anomaly starting in the south just southeast of Copper Lake and continuing northeast and trending past the coverage in the Blue Mountain area. At its ends, the anomaly is less than 150 metres wide in the north and approximately 350 meters wide (VD1 version) adjacent to Copper Lake in the south. In between the anomaly has a bulbous, augen-like centre approximately 1500 meters wide. Along its length this anomaly has linear, weaker and stronger magnetic trends.

The Copper Lake area (often referred to as French Road) has had the most attention from exploration companies due to the high grade (but spotty) copper found in the late 1800's. The resulting shaft (now filled) was approximately 26 metres deep and had some lateral development as well. No actual mining and processing of ore material is recorded.

The shaft area is just 300 metres northeast of Copper Lake. Considerable, mineralized material may still be seen lying about. Another area of mineralization occurs approximately 53 metres northwest of the shaft, where a sulphide bearing grab sample produced a value of over 0.4% Co (Forgeron, 1988).

Extending west from near the south end of the main magnetic anomaly is 250 meter long apophyses (Feature 1b, Figure 3) that is immediately south of the surface mineralization at Copper Lake. This feature is intimately associated with the main anomaly and it has smaller trends away (primarily to the SW) from it as well but, also of interest, is that it points toward the area of the cobalt in soil anomaly, though the area in between is not anomalous.

The second most apparent magnetic trend parallels the main one about one km to the west (Feature 3, Figure 3). It is somewhat weaker but still a strong feature which runs off the survey to the NE and SW. In the south it coincides with some linear ground and airborne EM anomalies in that area. Several diamond drill holes were put down near this anomaly in the north central, Blue Mountain area. The MMI cobalt anomaly coincides with a weaker yet anomaly just east (toward the Copper Lake shaft region) that extends for about 1 km, starting near the Co anomaly and running north.

The third most apparent anomaly occurs in the south of the survey, southwest of MacIntyres Lake (Feature 2, Figure 3). It has a roughly bullseye form and runs off the survey to the southwest. This is the area of numerous copper rich float samples (the author had one assay of 8% Cu) for which no source has been found. This also coincides with anomalous Cu values in a limited MMI survey there. Most of the float samples found were located just south of a what appears to be a large drumlin at this site, just southeast of the anomaly.

Figure 3 is a Google Earth compilation of the Total Magnetic Intensity (TMI) magnetometer results, mineral occurrence database site showings and drill holes. Obvious is the fact that a large portion of the drill holes are not in magnetically anomalous areas. Several are on the periphery of the main anomaly. One drill hole is located approximately 250 meters along strike from the MMI cobalt anomaly (hole FR-25).

Hole 159-3 which intersected two mineralized zones, the lower of which returned 1-3% Bi and 0.1-0.3 Co over 6 meters. This hole is located approximately 255 meters NE of the Copper Lake showings and well away from the magnetic anomalies. Hole 159-4 is reported to have intercepted 1-3% Co and 0.15% Bi over 1.7 meters and is also located in weak magnetism near the Copper Lake showings just north and near the end of the magnetic apophyses mentioned above.

In the Blue Mountain area, 6 of the 9 holes drilled were in magnetic lows, 2 on the periphery of the secondary anomaly, and one was put down in the anomaly. This hole (BM81-12) encountered widespread anomalous base metal values with a high of 3 meters of 1.45% Zn and 1% Pb. There was no significant Co or Bi.

In the south MacIntyres Lake area, the site of high grade copper bearing float, three holes were also drilled (on weak EM anomalies near the float) in an area of magnetic low, approximately 250 metres southeast of the main MacIntyres Lake magnetic anomaly. A strong, curvilinear magnetic trend also occurs along the far southeastern extent of the survey.

## **CONCLUSIONS and RECOMMENDATIONS**

The 2020 UAV magnetometer survey at Oceanview has provided a number of anomalous magnetic trends which provides additional information into the geological interpretation. Of particular interest is that there is little or no drill testing of magnetically anomalous terrane in several areas, and particularly in the area of the Co soil anomaly, and the SW MacIntyres Lake mineral occurrence (Cu float). The area of mineralization at the Copper Lake shaft is just off the fringe of an east-west aligned apophyses extending from the strongest magnetic anomaly in the survey.

600 meters of diamond drilling is recommended at the following sites:

- MacIntyres Lake S: a single 150 meter hole to test the strong magnetic and EM anomaly
- Co Anomaly: a single 150 meter hole to test the centre of the soil and magnetic anomaly
- Copper Lake: 2 drill holes at 150 meters each, verification holes on 159-3 and 159-4.

**BIBLIOGRAPHY**

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**MacKinnon, RP; 2018 Copper Lake EL 51188 and 51189 Mobile Metal Ion Survey, NTS 11F16D Cape Breton County**

**O'Sullivan, J., Jenson, L; 3228463 NS Limited, Licence 07211 Oceanview Prospect, Cape Breton, Nova Scotia; Diamond Drilling Report, Copper Shaft Area, April, 2012.**

**St. Joseph Explorations Limited; McIntyre Lake Property, French Road, Cape Breton County, Magnetometer and EM Survey, 1977**

## Authors Certificate

**I, Perry MacKinnon, do hereby certify that:**

**I am a self employed consulting geologist.**

**My mailing address is:**

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**Skir Dhu, NS**

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**I am a graduate of Acadia University, NS  
BSc Geology, 1982**

**Since graduation I have been employed for one year as a mine geologist, four years as a full time surface exploration geologist, a period of time as a part time consultant geologist, and more recently and presently, a full time consultant geologist.**

**I have acquired P.Geo. status in the Province of Nova Scotia in 2009 and New Brunswick in 2011.**

**The information contained in this report is based on a 2020 UAV magnetometer survey by Axiom Exploration Group, my research, and interpretations.**

**Dated: January 2, 2021, Skir Dhu, Nova Scotia**

**Perry MacKinnon, P.Geo.**

## **APPENDIX I**

### **Axiom Exploration Group UAV Magnetometer Survey Report**

**UAV MAGNETIC SURVEY  
OCEANVIEW PROPERTY  
NOVA SCOTIA, CANADA**

PREPARED FOR:  
**PERRY MACKINNON**  
PROJECT NUMBER: #20.5032.PM

PREPARED BY:  
**AXIOM EXPLORATION GROUP LTD.**  
SUITE 101 - 3239 FAITHFULL AVENUE  
SASKATOON, SK, CANADA



Project #20.5032.PM

SEPTEMBER 22, 2020

PETER DUECK, MBA., P.GEO.  
CHASE WOOD, M.Sc., G.I.T.  
TANYA COETZEE, B.Sc., G.I.T.



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## 1. INTRODUCTION

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From August 28<sup>th</sup> to September 7<sup>th</sup>, 2020 Axiom Exploration Group Ltd. ('Axiom') carried out an unmanned aerial vehicle (UAV) magnetic geophysical survey over the Oceanview Project near Gabarus, Cape Bretton. The survey consisted of 274.64 line-kms with a traverse line spacing of 50 m and tie line spacing of 500 m.

The UAV system consists of a single GSMP-35UC high precision potassium vapor magnetometer slung from a DJI M600 Pro UAV platform. The magnetometer was towed with a 16.4' cable to ensure adequate separation between the UAV and the magnetometer.

Quality control and quality assurance were completed daily during the acquisition phase to ensure all field data collected was at a high standard. Final processing and leveling were completed post acquisition

Final deliverables from the survey include:

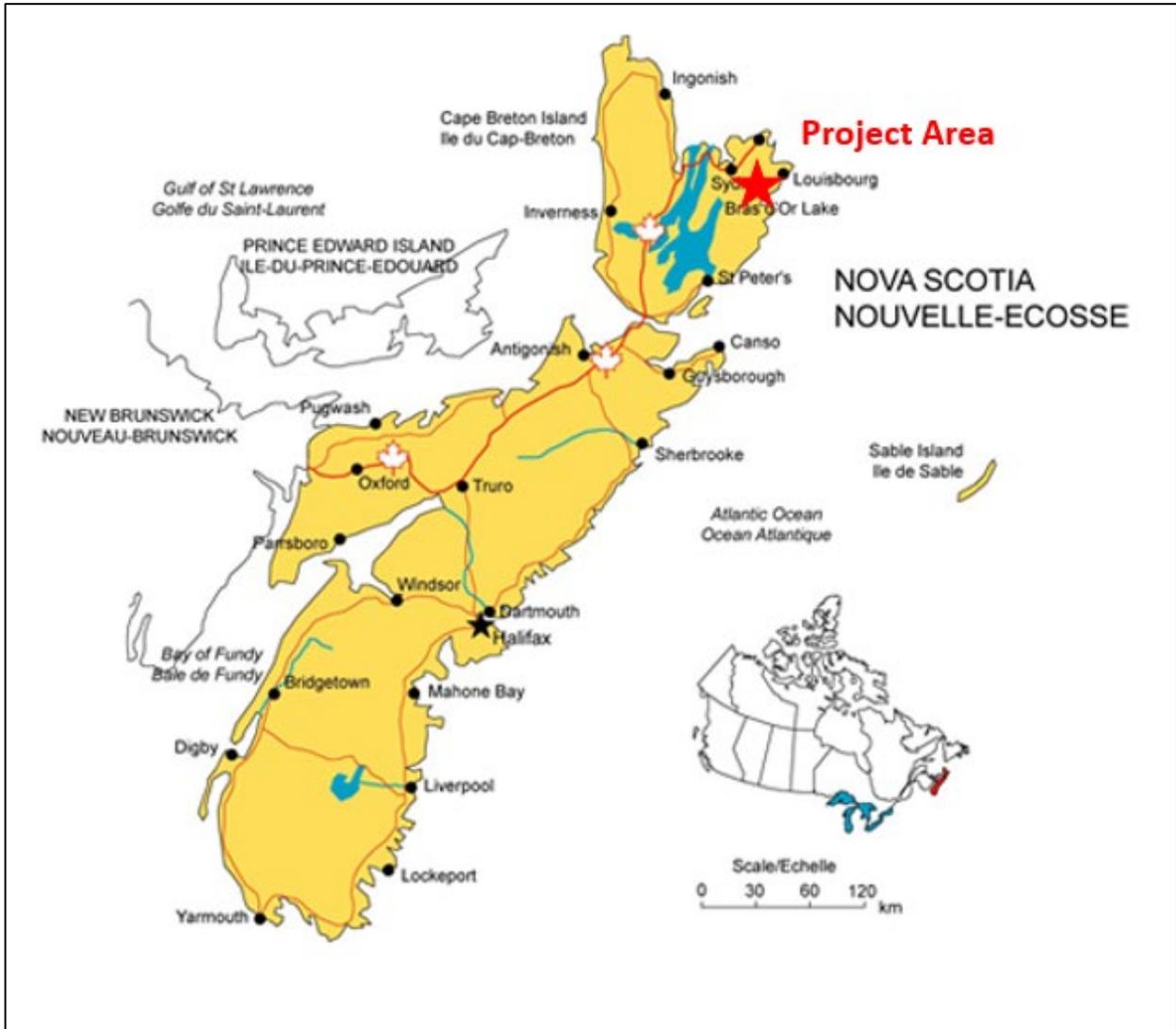
- All raw UAV magnetic data including base station data
- A final leveled dataset
- Map products including:
  - Total Magnetic Intensity (TMI) Map
  - Residual Magnetic Intensity (RMI) Map
  - Analytic Signal (AS) Map
  - First Vertical Derivative (VD1) Map
  - Line Path Map with Base Stations Locations

The survey report describes the procedures for data acquisition, processing, equipment used, final image presentation and the specifications for the digital data set.

## 1.1. LOCATION & ACCESS

The general location area is in the southeastern region of the province of Nova Scotia, Canada (Figure 1). The immediate project area is centered approximately 18 km west of Louisbourg, Nova Scotia. The property was accessed by truck along Highway 327 (Figure 2) as well as secondary roads were used to access the immediate grid.

- NTS Sheet(s): 011F/16



**Figure 1: General Location Area<sup>1</sup>**

<sup>1</sup> © 2000-2009 Her Majesty the Queen in Right of Canada, Natural Resources Canada



**Figure 2: Project Location as shown on Google Earth**

## 2. PROJECT SPECIFICS

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Personnel and support staff that were directly involved in this project including the data processing and QA/QC are listed in Table 1.

**Table 1: Project Personnel & Support Staff**

Pilot In Command (PIC)	Chase Wood
Visual Observer (VO)	Mark Weir
Geophysicist	Peter Dueck
Supporting Staff	Tanya Coetzee

The Oceanview survey was completed over a period of 16 days in late August to early Sept 2020 by Chase Wood and Mark Weir. The crew mobilized on Aug. 26 and arrived on the survey site the morning of Aug. 30<sup>th</sup>. The survey itself was completed over 6 days.

Aug 31- High winds and UAV equipment testing  
 Sept. 1- Survey  
 Sept. 2- Survey  
 Sept. 3- Standby  
 Sept. 4- Survey  
 Sept. 5- Survey

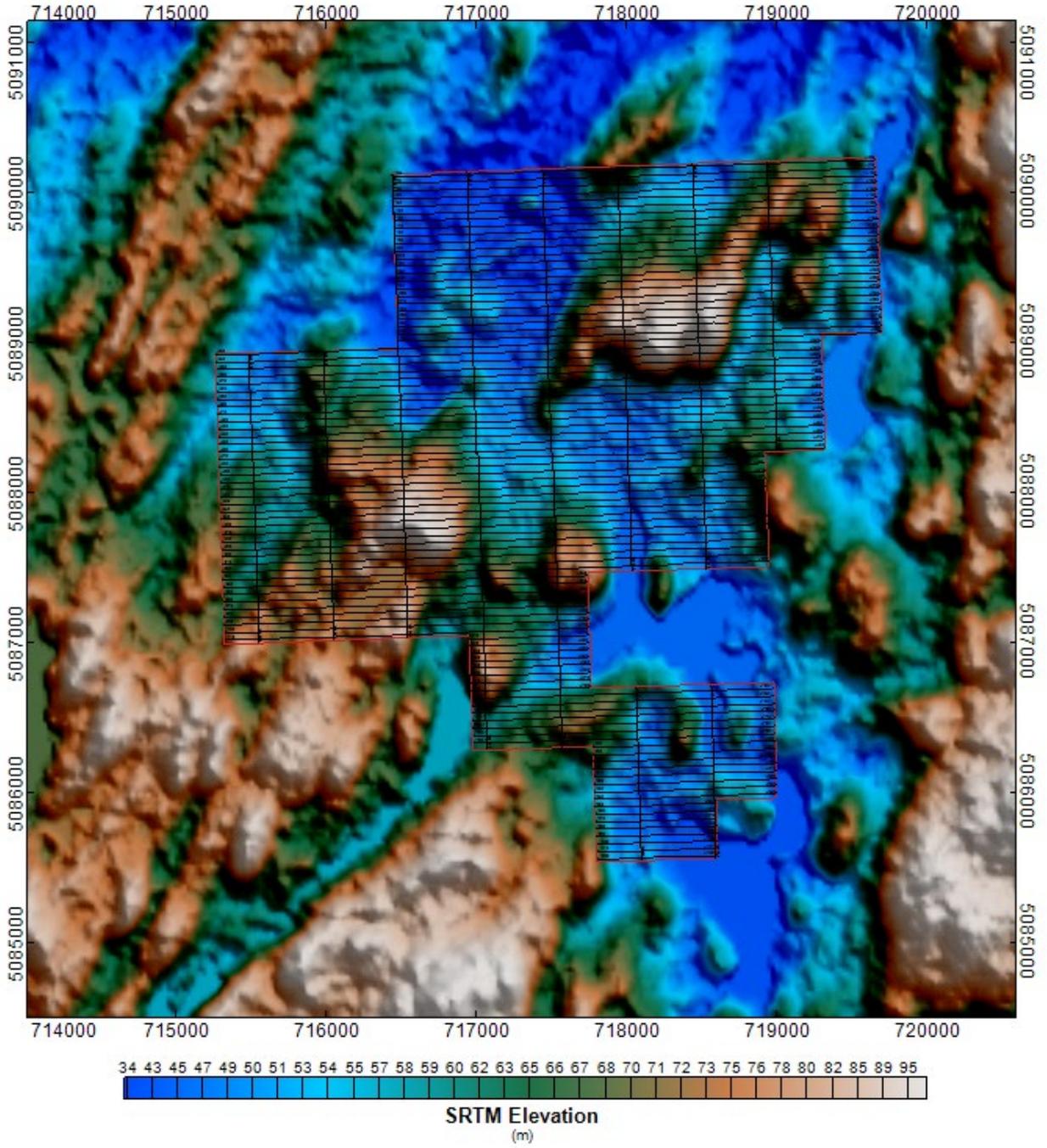
The crew was based out of a RV (recreational camper trailer) parked at Copper Lake. All food and supplies were brought to site and we required one fuel re-supply by the client mid-survey. Strict quarantine protocols put in place by the government of Nova Scotia were followed at all times. In total 9 separate locations were chosen to fly the survey from in order to maintain line of sight and radio link with the UAV in flight. Demobilization and travel back to Saskatoon occurred from Sept. 6 to 10<sup>th</sup> 2020.

### 2.1. TOPOGRAPHICAL RELIEF & CULTURAL FEATURES

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The main portion of the survey area covered by land has minimal topographical relief as shown in [Figure 3](#). For this survey, the Above Ground Level (AGL) mean magnetometer height is 35.45m.

Due to the location and relative isolation of the survey area, no significant cultural noise was seen in the data.



**Figure 3: SRTM Topography (1 Arc-Second) over Survey Area**

## 2.2. SURVEY PARAMETERS

From August 28<sup>th</sup> to September 7<sup>th</sup>, 2020 Axiom Exploration Group Ltd. ('Axiom') carried out an unmanned aerial vehicle (UAV) magnetic geophysical survey over the Oceanview Project near Gabarus, Cape Bretton. The survey consisted of 274.64 line-kms with a traverse line spacing of 50 m and tie line spacing of 500 m.

The UAV system consists of a single GSMP-35UC high precision potassium vapor magnetometer slung from a DJI M600 Pro UAV platform. The magnetometer was towed with a 16.4' cable to ensure adequate separation between the UAV and the magnetometer.

Further survey parameters can be found in Table 2.

**Table 2: Survey Parameters**

Survey Block	Line Type	Line Spacing (m)	Flight Direction (Degrees)	Actual Line-kms Flown
Oceanview	Traverse	50	088° - 268°	250.27
	Tie	500	178° - 358°	24.37
			<b>Total:</b>	<b>274.64</b>

The final survey was defined by the boundary coordinates shown in Table 3.

**Table 3: Survey Area Coordinates**

NAD 83 UTM Zone 20N				
Easting	Northing		Easting	Northing
715258	5088927		718981	5086737
716473	5088963		719002	5085967
716431	5090128		718593	5085953
719659	5090241		718607	5085565
719702	5089068		717801	5085536
719292	5089061		717766	5086306
719320	5088291		716975	5086285
718917	5088277		716947	5087048
718946	5087507		715315	5086992
717738	5087465		715258	5088934
717759	5086695			

## 2.3. SURVEY EQUIPMENT

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### BASE STATION

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A single GEM's GSM-19 (Overhauser) magnetometers was used for this survey in their "Base" mode of operations. The magnetometer is equipped with a high-resolution (.07m) integrated GPS. The base station was recording at 3 second intervals and was used to do the final diurnal corrections.

Location information for the base station is included in Table 4, instrument specifications are included in Table 5 and a picture of the final setup is included in Figure 4.

**Table 4: Base Station Information**

Base Station	Easting (m)	Northing (m)	Coordinate System
#1 - 8062827	716289	5087505	WGS84 UTM Zone 20T

**Table 5: Base Station Specifications**

<b>Sensitivity</b>	0.022 nT @ 1 reading per sec.	<b>Gradient Tolerance</b>	Over 10,000 nT/m
	0.05 nT @ 1 reading every 4 sec.	<b>Dynamic Range</b>	20,000 to 120,000 nT
<b>Resolution</b>	0.01 nT	<b>Absolute Accuracy</b>	± 0.1 nT @ 1 Hz



Figure 4: Base station setup

## 2.4. UAV MAGNETOMETER SYSTEM

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The UAV system consists of a single GSMP-35UC high precision potassium vapor magnetometer slung from a DJI M600 Pro UAV platform. The magnetometer was towed with a 16.4' cable to ensure adequate separation between the UAV and the magnetometer. Technical specifications of the GSMP-35U are included in Table 6.

**Table 6: GSMP-35U Specifications**

<b>Sensitivity</b>	0.0002 nT @ 1 Hz	<b>Gradient Tolerance</b>	Over 50,000 nT/m
<b>Heading Error</b>	± 0.05 nT	<b>Dynamic Range</b>	15,000 to 120,000 nT
<b>Resolution</b>	0.001 nT	<b>Absolute Accuracy</b>	± 0.1 nT @ 1 Hz

The UAV magnetometer configuration includes a GPS for recording measurement location, laser altimeter for recording measurement height and an Inertial Measurement Unit (IMU) for recording the roll, pitch and yaw of the unit in flight. The sensor was set to record at a rate of 10 Hz.



**Figure 5: UAV Magnetometer System Configuration**

## 2.5. SURVEY AIRCRAFT

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The M600 is a fully integrated aerial platform designed for professional film making and industrial application. The on-board A3 flight controller ensures reliable flight performance while the E2000 Pro propulsion system effectively increases payload. Multiple expansion ports guarantee maximized compatibility with add-on devices. The M600 also integrates the Lightbridge 2 transmission system, bringing live HD view and the ability to communicate directly gimbals such as the Ronin-MX.

The M600 Pro has an extended flight time and a 5km long-range transmission. A comprehensive battery management system means that if any of its six Intelligent Batteries are turned on or off, the rest will follow suit. The battery management system monitors every battery during flight, ensuring safe landing in the event of single battery failure. Compared to traditional non-

intelligent batteries, the M600 Pro’s battery management system simplifies maintenance while enhancing security.

Additional specifications for the M600 Pro are shown below in Table 7.

**Table 7: UAV Specifications**

<b>Aircraft Type</b>	Hexacopter
<b>Dimensions</b>	1668 mm × 1518 mm × 727 mm with propellers, frame arms and GPS mount unfolded (including landing gear)
<b>Hovering Accuracy</b>	Vertical: ±0.5 m, Horizontal: ±1.5 m
<b>Survey Speed</b>	8 m/s (Terrain Dependent)
<b>Flight Control System</b>	A3 Pro
<b>Propulsion System</b>	Motor Model: DJI 6010; Propeller Model: DJI 2170R

### 3. DATA PROCESSING

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In general, all typical magnetic QA/QC and data processing techniques have been applied to the data. All post-field data processing was carried out using Geosoft Oasis Montaj and Microsoft Excel software/ programming languages. Presentation of final maps used QGIS and/or Geosoft’s Oasis Montaj. Results were gridded using minimum curvature method and a grid cell size of approximately 1/3 of flight line spacing.

The geophysical images accompanying this report are positioned using the WGS 1984 Datum. The survey geodetic GPS positions have been projected to map using the Universal Transverse Mercator (UTM) projection.

The magnetic data was first quality checked in the field and any points lacking sufficient georeferenced data or which were excessively noisy were removed. The resulting data was processed as mosaics throughout the survey area as data was collected daily. A combination of all data formed the finalized results including lines that were re-flown due to weak, noisy, or insufficient magnetic signal. The corrected profile data were interpolated into a grid using the minimum curvature technique with a grid size of approximately 1/3 of flight line spacing. All final maps have a normalized color interval.

The base station readings were initially processed and filtered to remove sudden spikes. The filtered data were then used for diurnal correction. This correction removes all time-varying magnetic errors related to the diurnal variation of the earth’s magnetic field.

Lag error results when the survey positioning system location is significantly different from the physical sensor location. A lag correction simply adjusts the time base of the physical readings to match the positioning data. Because the GPS is located directly on the UAV, only a minor lag correction needs to be applied (typically 1-2 fiducials).

Heading errors are related to the magnetic field of the survey platform, which varies as a function of survey direction. A heading correction corrects data for systematic shifts in the data that change with the survey direction. Due to the low heading error of the GSMP-35U

magnetometers, heading biases were negligible. For this reason, no heading correction needed to be applied

After finishing interpolation, initial processing may subject the data to a non-linear filter with a wavelength limit of 3-4 fiducials and tolerance of 0.001. This filter removes extra high frequency features which mostly occur because the sensor is in the dead zone. This usually occurs due to sudden changes in sensor orientation, effect of ferro-metallic objects, or the influence of weather conditions on the sensor. This filter smooths out noise and high frequency features. This filtering is only applied if required.

After leveling the data using the tie lines, to mitigate the corrugation effect associated with gaps between the data lines, the data was micro-leveled. This task was done by applying a high pass butterworth filter with the threshold of four times the line spacing followed by a directional cosine filter perpendicular to the line direction. The resulted noise channel was then subtracted from the leveled values to microlevel the data. All levelling was undertaken using Geosoft's Oasis Montaj software. The finalized result of the leveling and micro-leveling processes is the final deliverable that should be used for any interpretation or integration techniques moving forward.

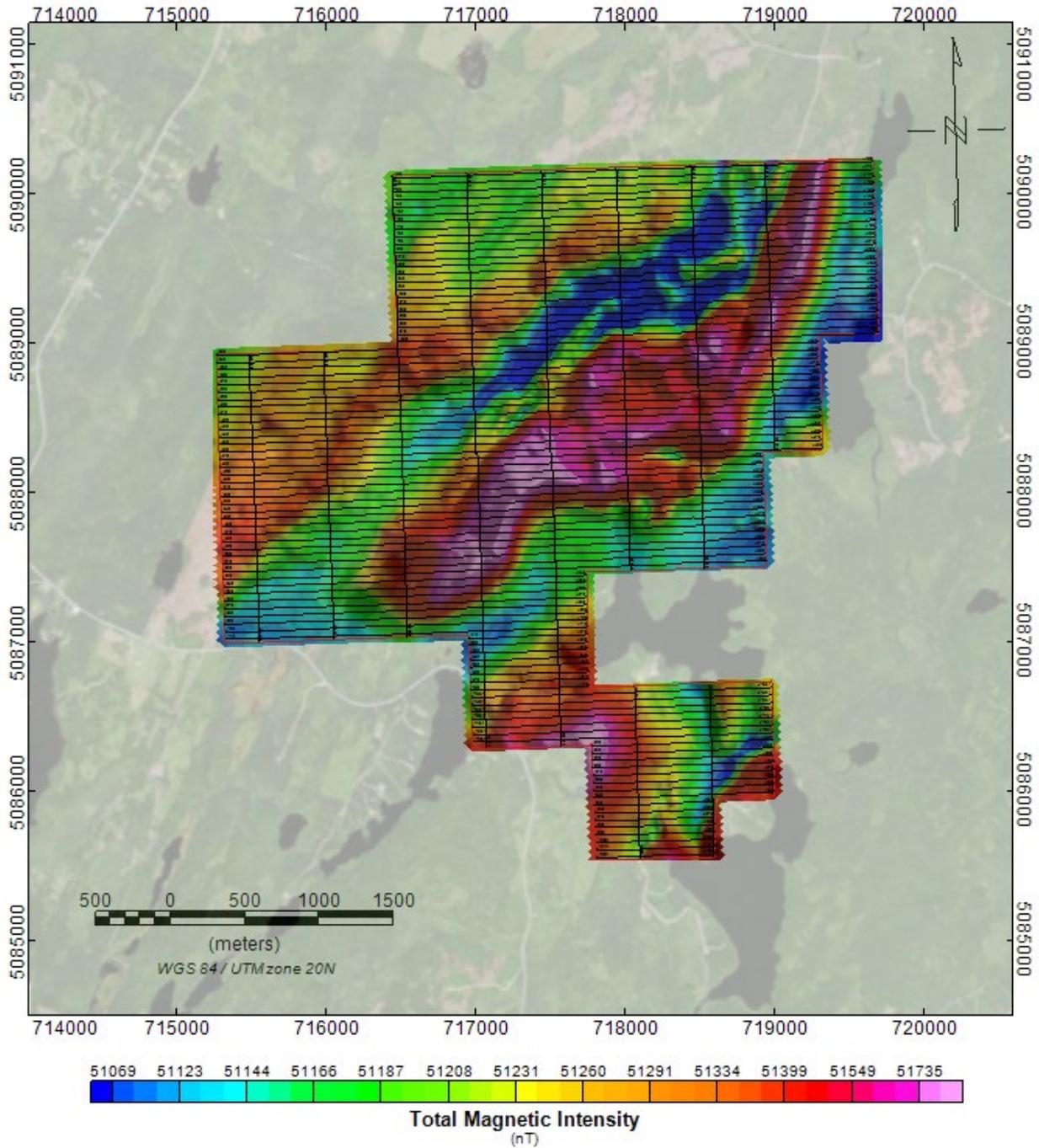
## **4. MAGNETIC MAPS & DERIVED DATA PRODUCTS**

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### **4.1. TOTAL MAGNETIC FIELD**

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Based on the flight lines of the drone, the total magnetic field map grid was created by interpolating the filtered magnetic data. The Total Magnetic Field (TMF) data collected in flight was profiled on screen along with a fourth difference channel calculated from the TMF. Spikes were removed manually where indicated by the fourth difference. The purpose of this map is to highlight geological structures by their magnetic signature or their magnetic contrast with their surroundings.

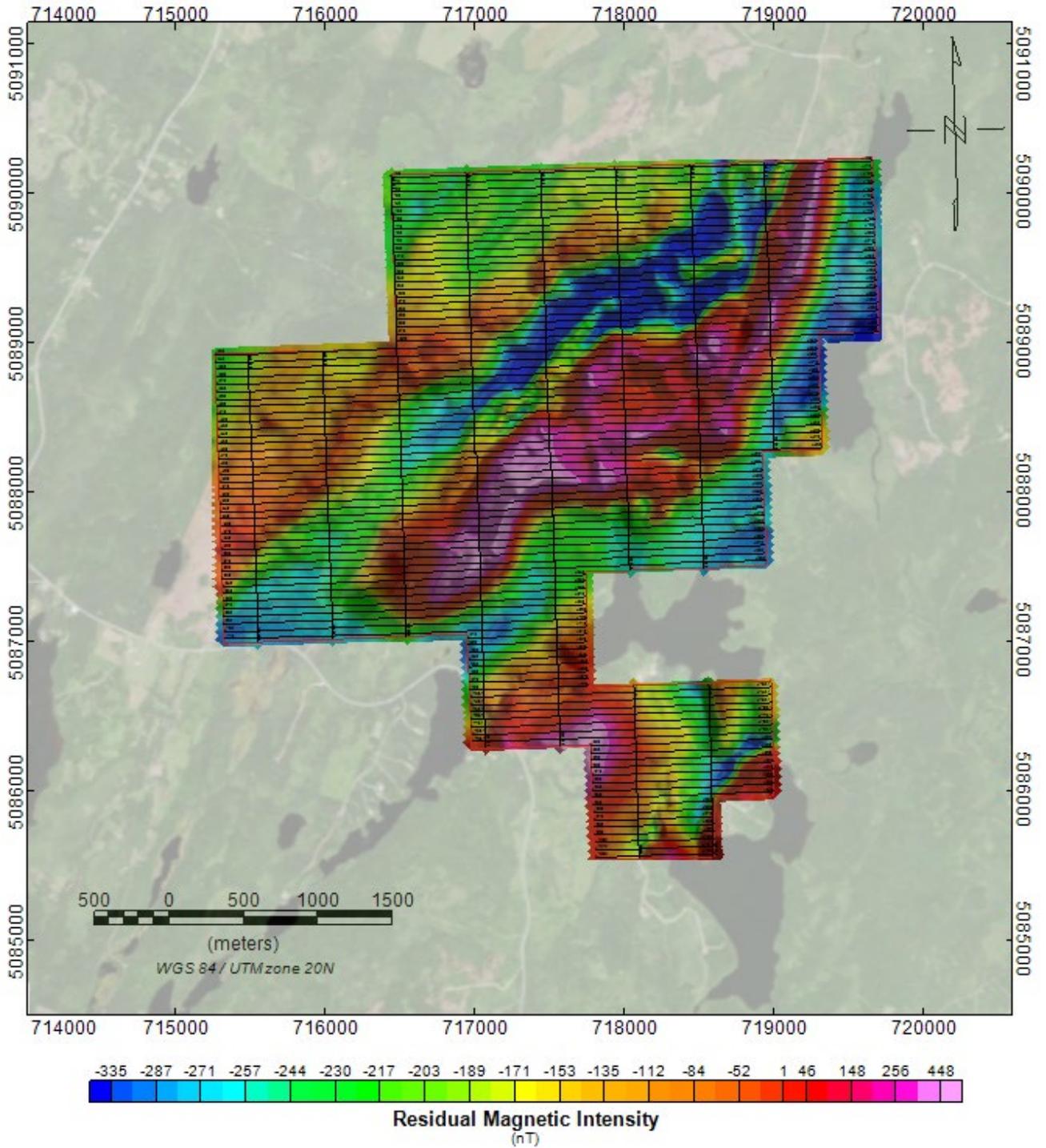


**Figure 6: Total Magnetic Intensity (TMI)**

## 4.2. RESIDUAL MAGNETIC INTENSITY

The residual magnetic intensity (RMI) was calculated from the total magnetic field, the diurnal, and the regional magnetic field. The total magnetic field was measured, the diurnal was measured from the ground station and the regional magnetic field was calculated from the International Geomagnetic Reference Field (IGRF 2015). The IGRF is the empirical representation of Earth’s magnetic field as a function of time, and in the absence of any crustal

or external sources. The model employs the spherical harmonics expansion of the scalar potential in geocentric coordinates. The IGRF model coefficients are based on all available data sources including geomagnetic measurements from observatories, ships, aircrafts and satellites.



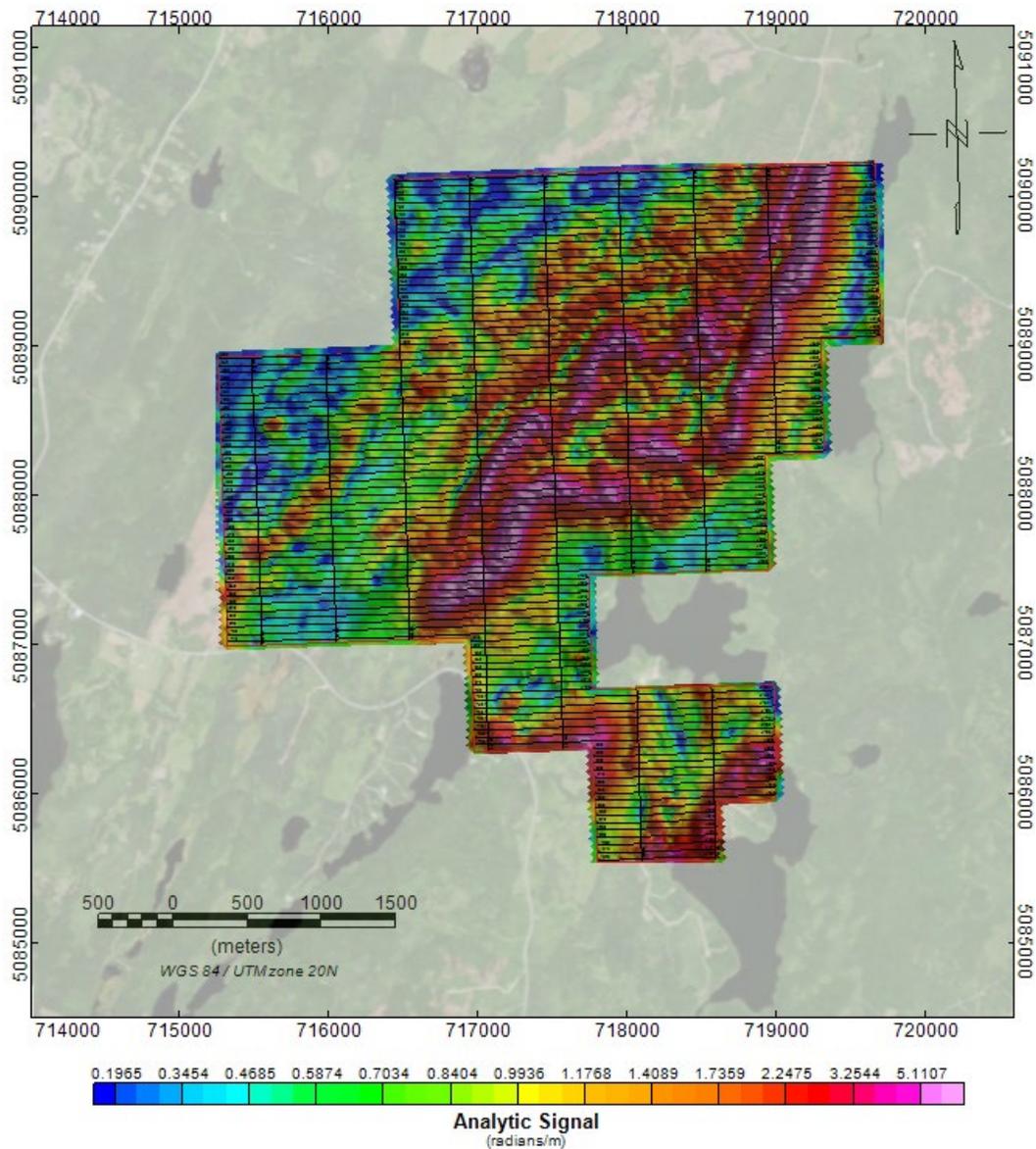
**Figure 7: Residual Magnetic Intensity (RMI)**

### 4.3. ANALYTIC SIGNAL

The analytic signal is the square root of the sum of the squares of the derivatives in the x, y, and z directions:

$$\text{Analytical Signal} = \sqrt{dx * dx + dy * dy + dz * dz}$$

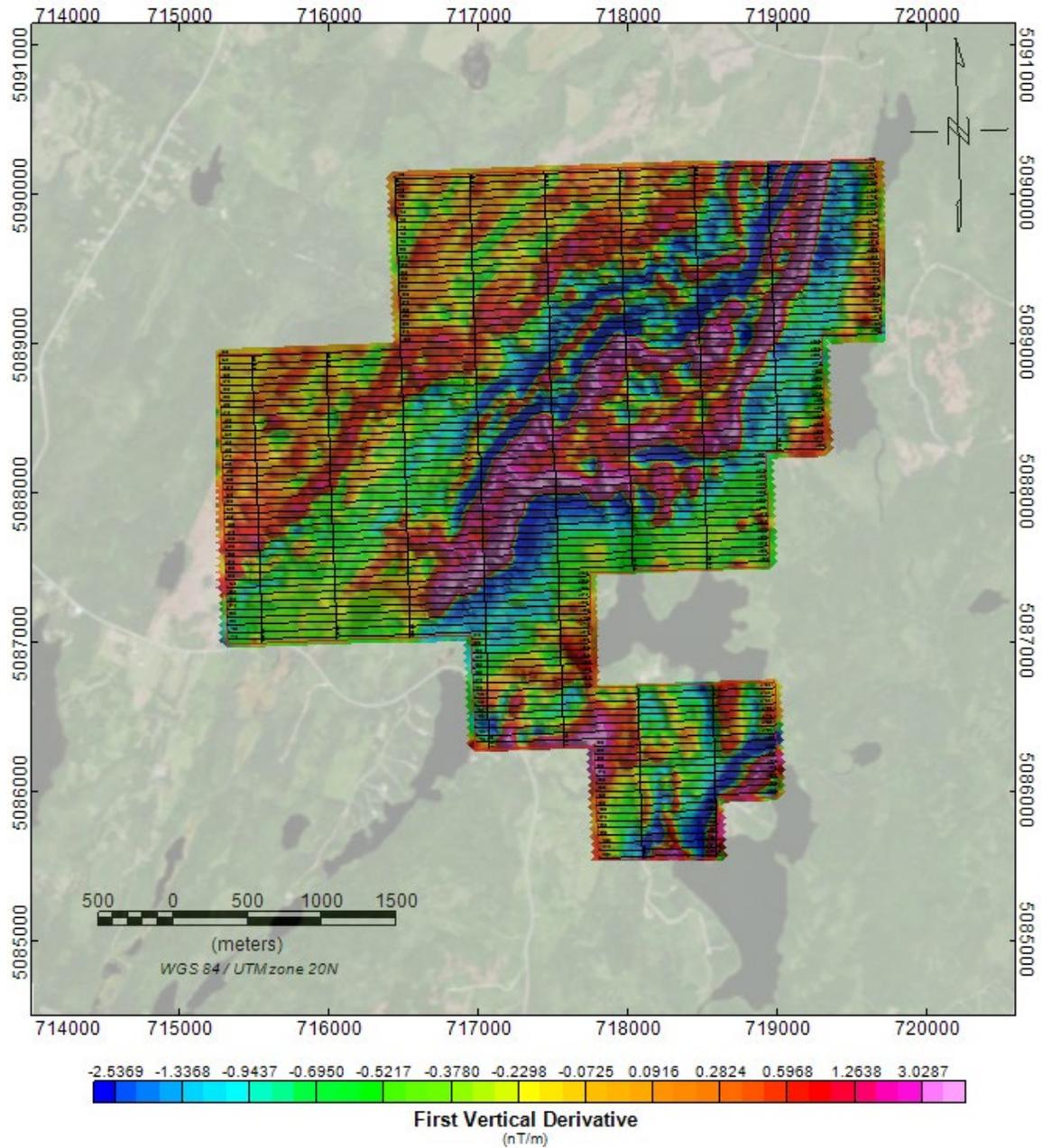
Mapped highs in the calculated analytic signal of the magnetic parameter locate the anomalous source body edges and corners (e.g. contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independently of the direction of the induced and/or remnant magnetizations. The analytic signal is also useful in locating the edges of magnetic source bodies, particularly where remnant magnetic signals and/or low magnetic latitude complicates interpretation.



**Figure 8: Analytic Signal (AS)**

#### 4.4. FIRST VERTICAL DERIVATIVE

The first order vertical derivative quantifies the rate of change of the magnetic field as a function of elevation. It is an approximation of the vertical magnetic gradient, which could be directly measured with separate magnetometers vertically spaced apart. The purpose of this type of filter is to eliminate the long wavelength signatures and make sharp features more detectable, such as the edges of magnetic bodies. This filter also increases the noise level, which limits the use of higher order derivatives ( $n=2$  for example). The vertical derivative is used to delineate the contacts between large-scale magnetic domains because its value is zero over vertical contacts.



**Figure 9: First Vertical Derivative (VD1)**

## 5. DELIVERABLES

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### 5.1. DATABASE

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All data is typically delivered in either Geosoft Database ('GDB') or simple formats such as .txt or csv. The data deliverables are client specific to best suit their needs and software requirements. Regardless of software, a database is supplied to the client with the following channel descriptions:

**Table 8: Database Channel Descriptions**

Parameter	Description	Unit
time	Gnss time stamp	hhmmss.ss
latitude	Latitude (WGS84)	decimal degrees
longitude	Longitude (WGS84)	decimal degrees
utmE	UTM easting (WGS84)	meters
utmN	UTM northing (WGS84)	meters
sat	Number of locked satellites	Integer
zone	UTM Zone	-
Yaw	IMU yaw reading	Degrees
Pitch	IMU pitch reading	Degrees
Roll	IMU roll reading	Degrees
Base	Raw Base Station Readings	nT
Base_Filt	Low Pass Filtered Base Station	nT
Dist	Distance Between Subsequent Readings	m
IGRF	The total magnetic field corrected by International Geomagnetic Reference Field at GPS altitude	nT
Inc	Inclination of the total field based on International Geomagnetic Reference Field at GPS altitude	Deg
Dec	Declination of the total field based on International Geomagnetic Reference Field at GPS altitude	Deg
nT_Raw	Magnetic field readings (Raw)	nT
nT_Corr	Magnetic field readings (Diurnally Corrected)	nT
nT_Final	Final leveled and micro-leveled data	nT
RMI	Residual Magnetic Intensity Values	nT
AS	Analytic Signal	Radians/m
VD1	1st Vertical derivative	nT/m

## 5.2. MAPS (APPENDIX A)

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All maps are presented in the coordinate / projection system WGS84 Datum, UTM Zone 13U. A list of maps provided are as follows:

- Total Magnetic Intensity (TMI) Map
- Residual Magnetic Intensity (RMI) Map
- Analytic Signal (AS) Map
- First Vertical Derivative (VD1) Map
- Line Path Map with Base Stations Locations

## 6. CONCLUSIONS

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Axiom Exploration successfully completed a unmanned aerial vehicle magnetic survey in the Oceanview project area for Perry Mackinnon. The survey consisted of a total of 274.64 line-kms flown.

Ultimately, the magnetic data collected was very successful in delineating and defining targets for further investigations. It should be noted that all geophysical interpretations need to be vetted with geology and other relevant information for optimal results.

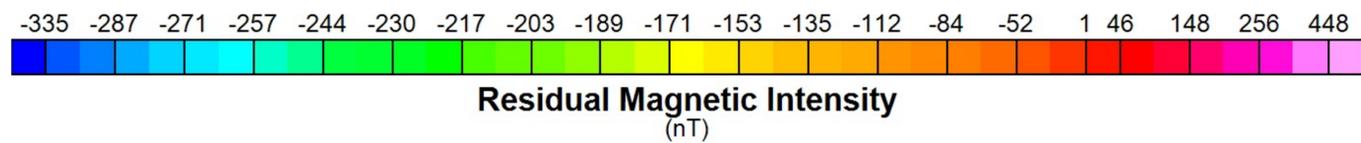
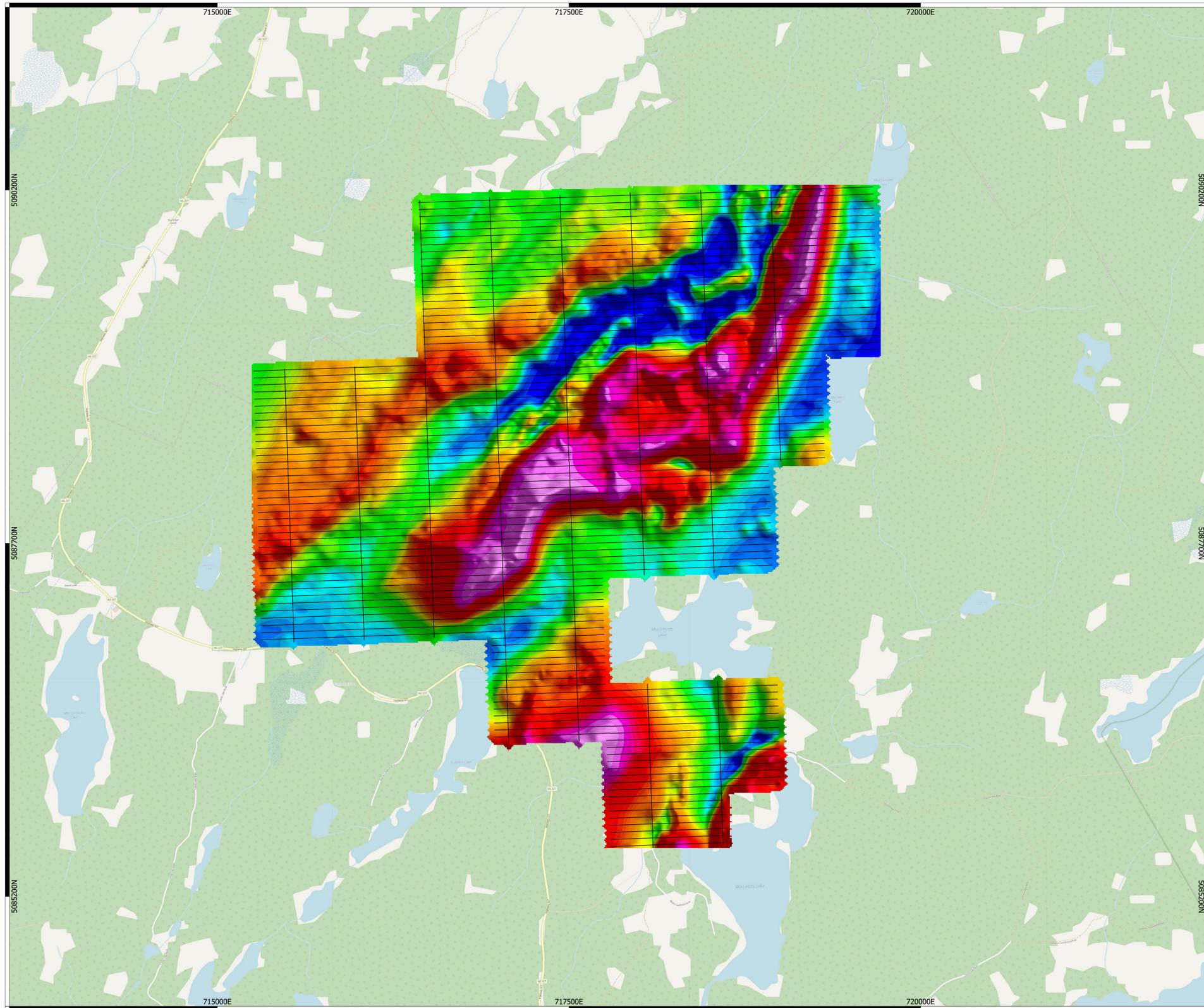
Respectfully submitted,

A handwritten signature in black ink, appearing to read "P. Dueck". The signature is fluid and cursive, with a horizontal line underneath it.

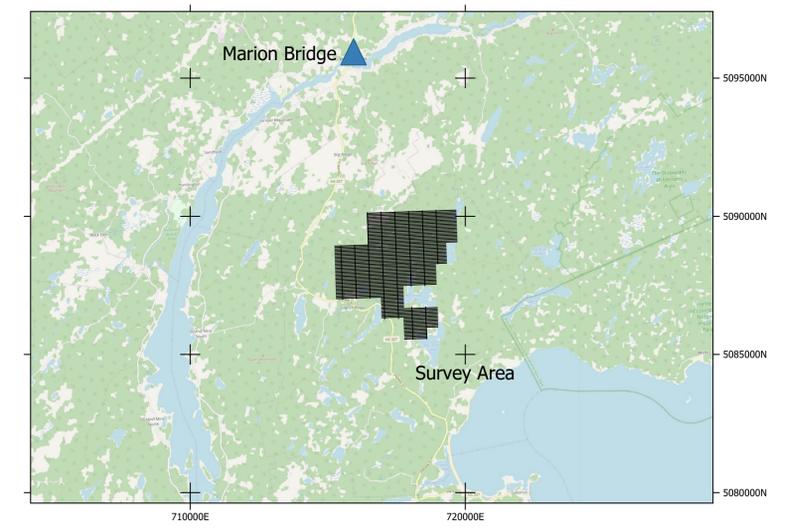
**Peter Dueck, P.Geo.**

CBO and Principal Geophysicist  
Axiom Exploration

## **Appendix 1: Final Map Products**



**Project Area**



**NOTES:**

- SURVEY**  
 -Date of Survey: September 1st to September 5th, 2020  
 -Projection: WGS84 UTM Zone 20N  
 -Survey Type: UAV Based using DJI M600  
 -Survey Line Spacing and Direction: 50m @ 088-268  
 -Tie Line Spacing and Direction: 500m @ 178-358

- INSTRUMENTS**  
 -Base Magnetometer: GEM GSM-19  
 -UAV Magnetometer: GEM Systems GSMP-35U

- MAPS**  
 - Topographic data was derived from CanVec from Natural Resources Canada (NRCAN)

- LEGEND**
- Flight Lines
  - Road
  - ++++ Railway
  - Trail
  - Watercourse
  - Waterbodies

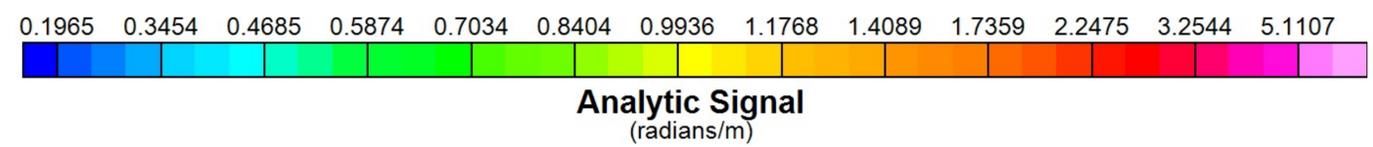
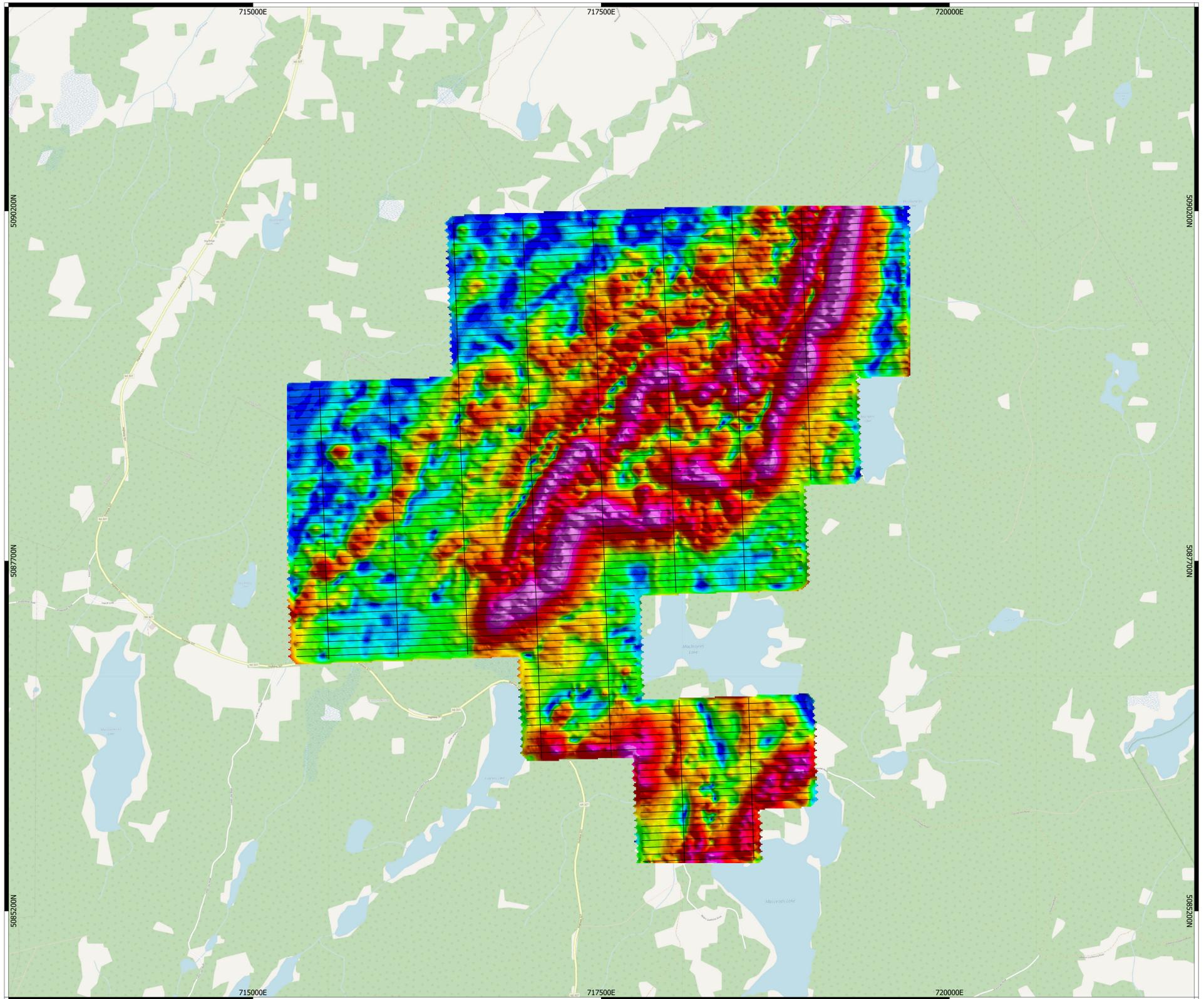


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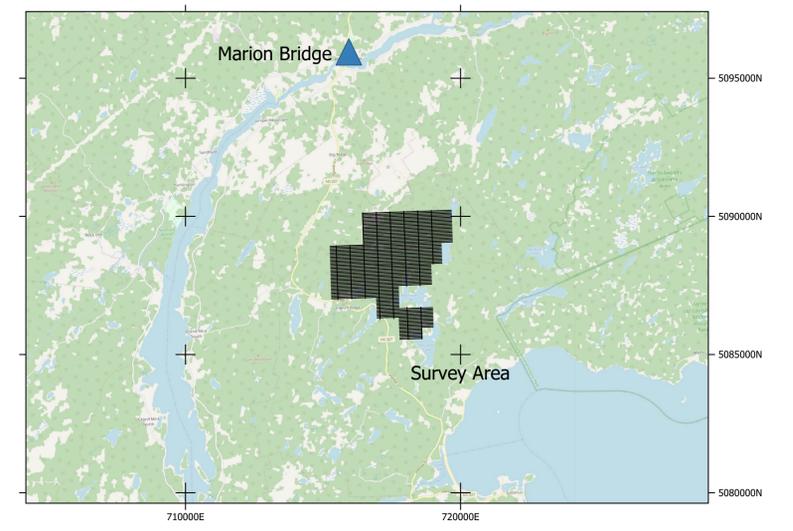
**UAV Magnetic Survey**  
**Residual Magnetic Intensity (RMI)**

Perry MacKinnon  
 Oceanview Project  
 Nova Scotia, Canada

Flown and Processed by:  
 Axiom Group  
 Date: September 14, 2020  
 Job Number: 20.5032.PM



**Project Area**



**NOTES:**

- SURVEY**
- Date of Survey: September 1st to September 5th, 2020
  - Projection: WGS84 UTM Zone 20N
  - Survey Type: UAV Based using DJI M600
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  - UAV Magnetometer: GEM Systems GSMP-35U

- MAPS**
- Topographic data was derived from CanVec from Natural Resources Canada (NRCAN)

**LEGEND**

- Flight Lines
- Road
- ++++ Railway
- Trail
- Watercourse
- Waterbodies

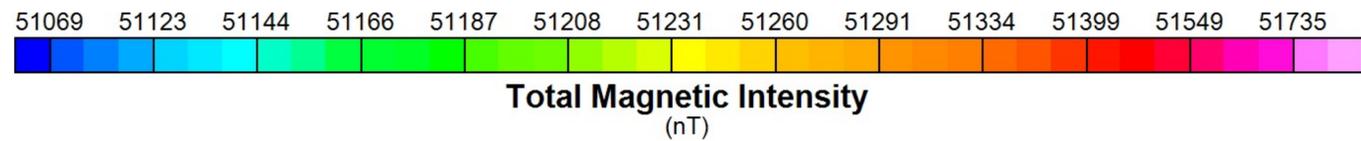
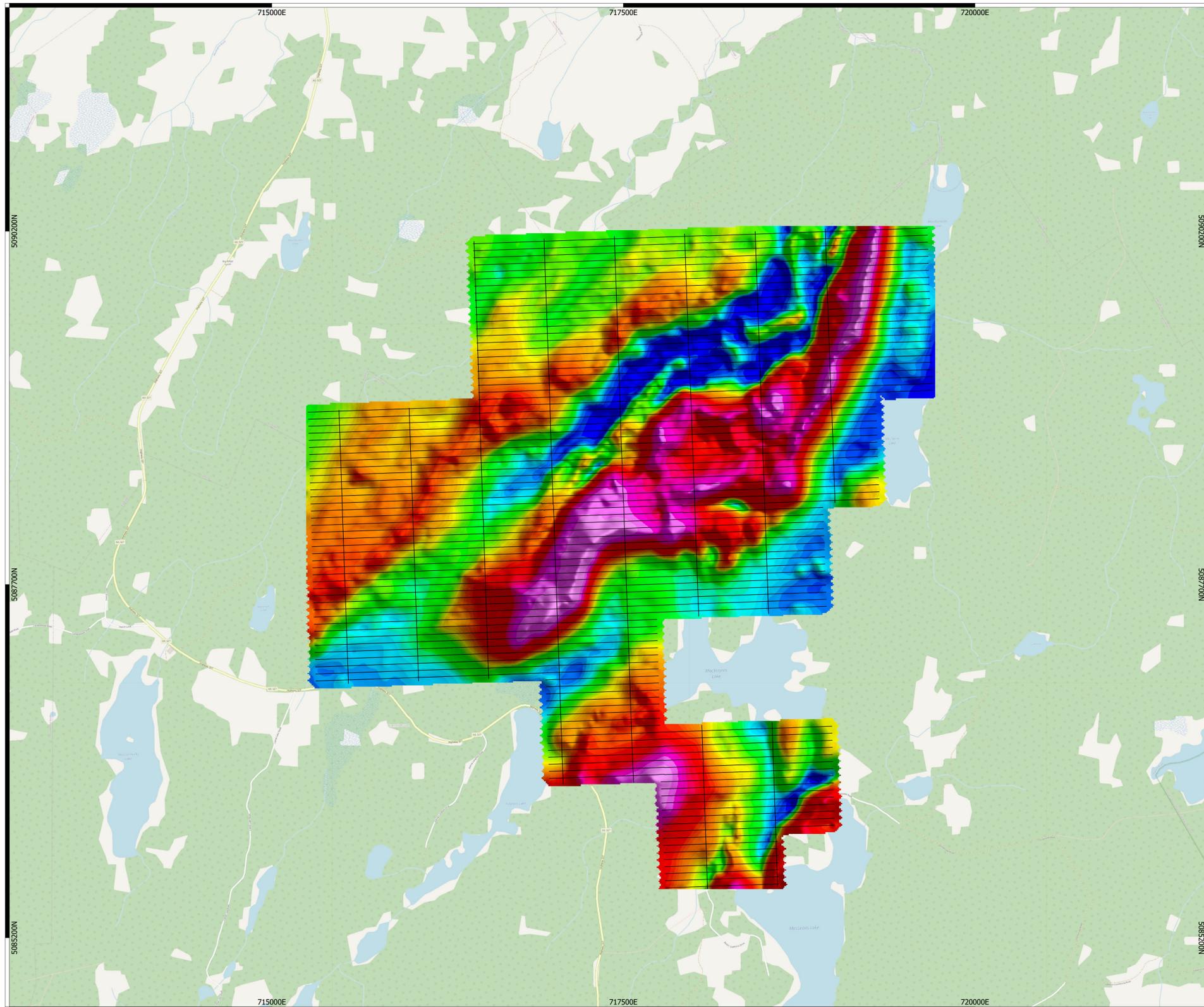


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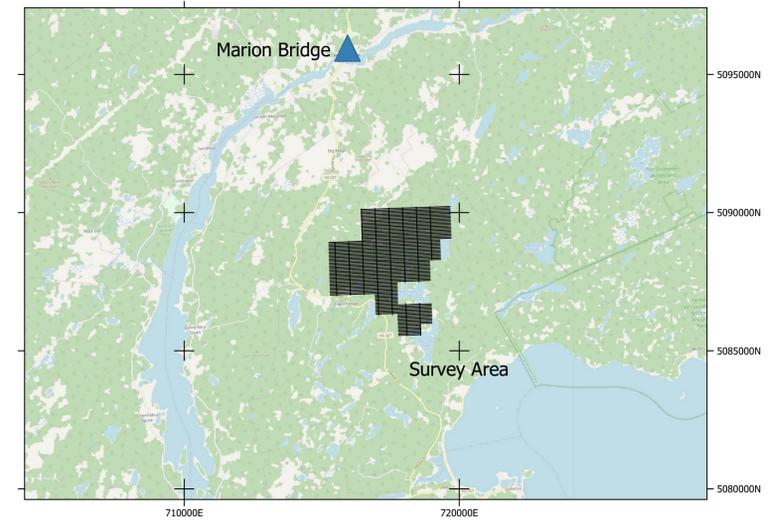
**UAV Magnetic Survey  
Analytical Signal (AS)**

Perry MacKinnon  
Oceanview Project  
Nova Scotia, Canada

Flown and Processed by:  
Axiom Group  
Date: September 14, 2020  
Job Number: 20.5032.PM



**Project Area**



**NOTES:**

**SURVEY**

- Date of Survey: September 1st to September 5th, 2020
- Projection: WGS84 UTM Zone 20N
- Survey Type: UAV Based using DJI M600
- Survey Line Spacing and Direction: 50m @ 088-268
- Tie Line Spacing and Direction: 500m @ 178-358

**INSTRUMENTS**

- Base Magnetometer: GEM GSM-19
- UAV Magnetometer: GEM Systems GSMP-35U

**MAPS**

- Topographic data was derived from CanVec from Natural Resources Canada (NRCAN)

**LEGEND**

- Flight Lines
- Road
- ++++ Railway
- Trail
- Watercourse
- Waterbodies

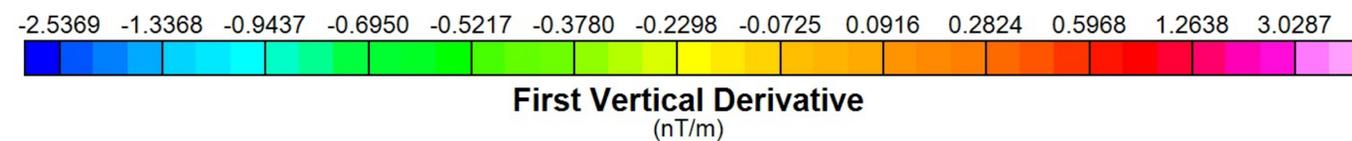
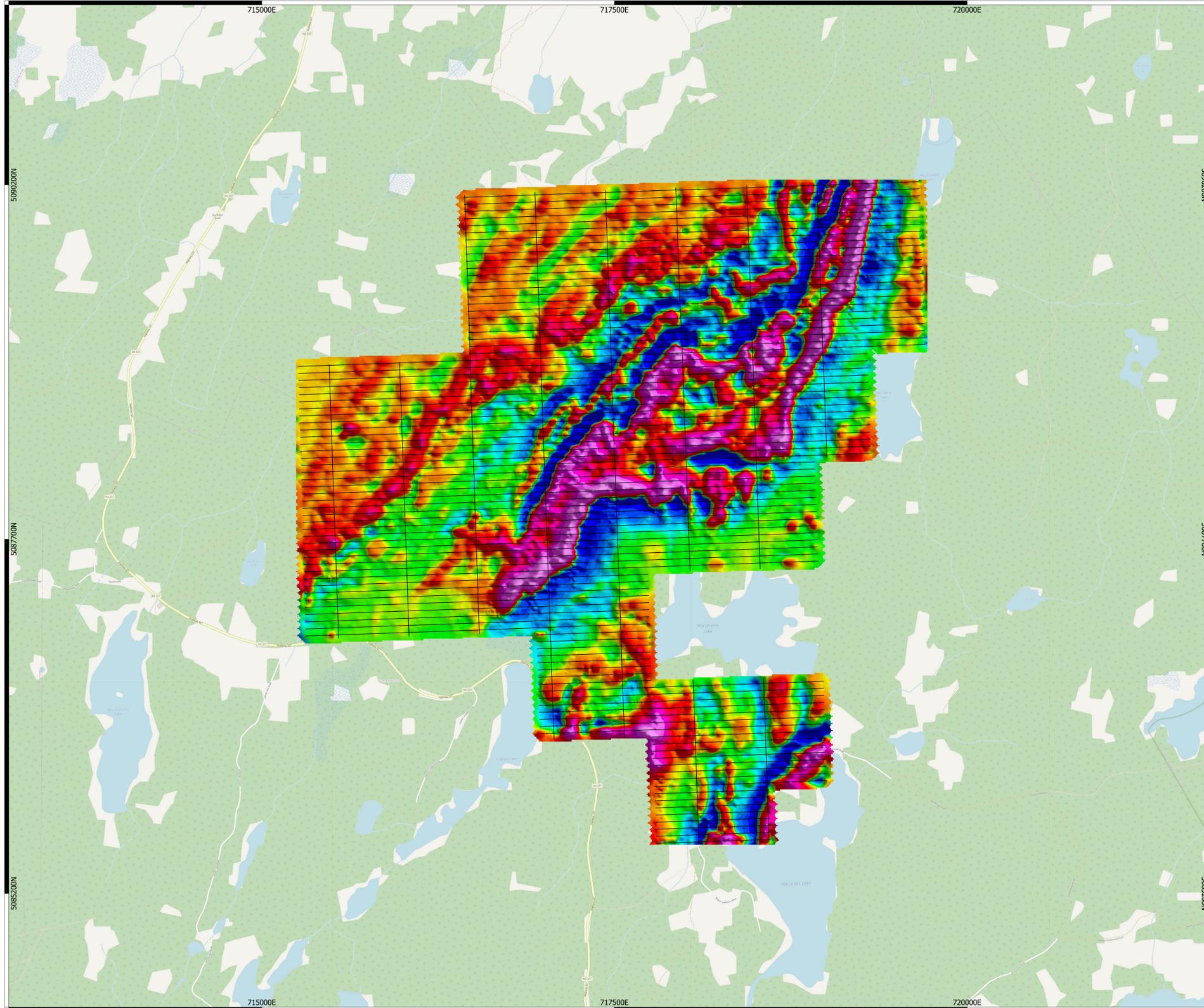


**Scale 1 : 15,000**

**UAV Magnetic Survey  
Total Magnetic Intensity (TMI)**

Perry MacKinnon  
Oceanview Project  
Nova Scotia, Canada

Flown and Processed by:  
Axiom Group  
Date: September 14, 2020  
Job Number: 20.5032.PM



**Project Area**



**NOTES:**

**SURVEY**

- Date of Survey: September 1st to September 5th, 2020
- Projection: WGS84 UTM Zone 20N
- Survey Type: UAV Based using DJI M600
- Survey Line Spacing and Direction: 50m @ 088-268
- Tie Line Spacing and Direction: 500m @ 178-358

**INSTRUMENTS**

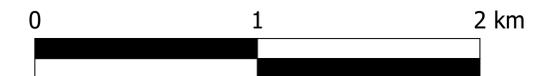
- Base Magnetometer: GEM GSM-19
- UAV Magnetometer: GEM Systems GSMP-35U

**MAPS**

- Topographic data was derived from CanVec from Natural Resources Canada (NRCAN)

**LEGEND**

- Flight Lines
- Road
- ++++ Railway
- Trail
- Watercourse
- Waterbodies

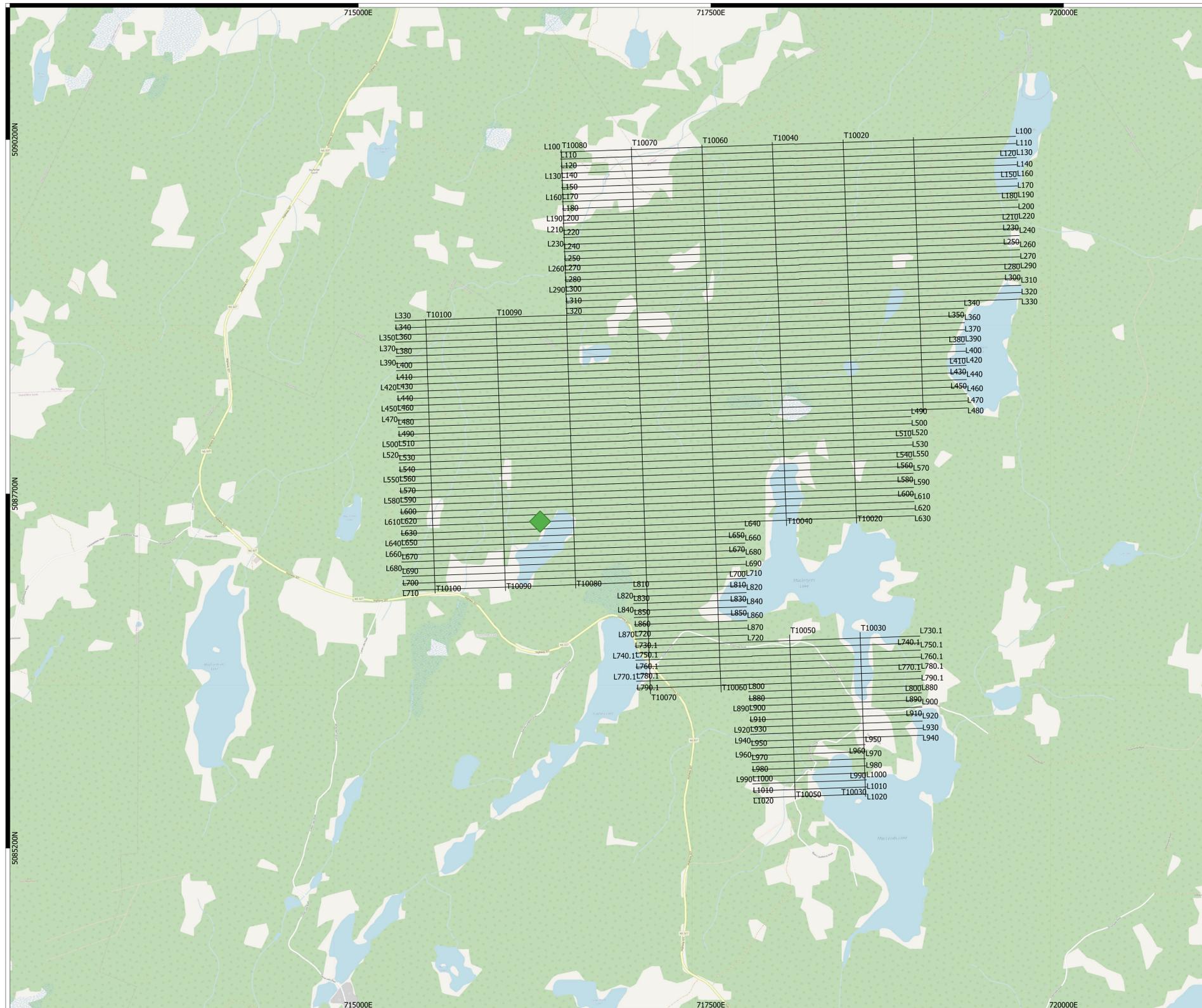


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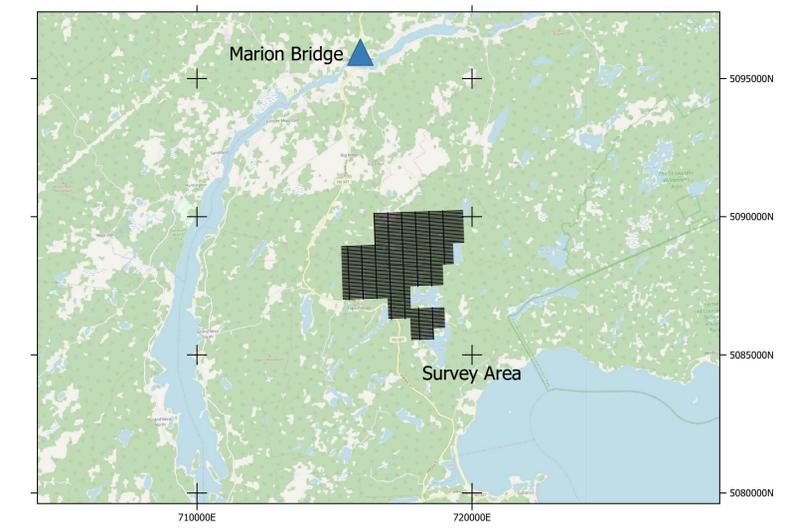
**UAV Magnetic Survey**  
**First Vertical Derivative (VD1)**

Perry MacKinnon  
Oceanview Project  
Nova Scotia, Canada

Flown and Processed by:  
Axiom Group  
Date: September 14, 2020  
Job Number: 20.5032.PM



**Project Area**



**NOTES:**

- SURVEY**
- Date of Survey: September 1st to September 5th, 2020
  - Projection: WGS84 UTM Zone 20N
  - Survey Type: UAV Based using DJI M600
  - Survey Line Spacing and Direction: 50m @ 088-268
  - Tie Line Spacing and Direction: 500m @ 178-358

- INSTRUMENTS**
- Base Magnetometer: GEM GSM-19
  - UAV Magnetometer: GEM Systems GSMP-35U

- MAPS**
- Topographic data was derived from CanVec from Natural Resources Canada (NRCAN)

Base Station 1:  
 Northing: 5087505 m ; Easting 716289 m

**LEGEND**

- Base Station Location
- Flight Lines
- Road
- Railway
- Trail
- Watercourse
- Waterbodies



**Scale 1 : 15,000**

**UAV Magnetic Survey  
 Flight Paths**

Perry MacKinnon  
 Oceanview Project  
 Nova Scotia, Canada

Flown and Processed by:  
 Axiom Group  
 Date: September 14, 2020  
 Job Number: 20.5032.PM