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2022 Airborne Magnetic Survey of the Sackville Property

Aldina, Adrian Marks and Sackville Townships, Ontario

NTS Map NTS 52

August 2, 2022

Jared Beebe, P. Geo.

Exploration Manager, Mistango River Resources

Table of Contents

Summary:

In the spring of 2022 Mistango River Resources contracted Novatem, of Mont-Saint-Hilaire, QC to fly an airborne magnetics survey of the Sackville Claim Block (figures 1 & 2). The survey was flown on July 23 to July 27, 2022, a total of four days. The reason for the survey was to find the source of the VMS erratics found in 1997. Previous ground geophysical surveys had not found the source of the mineralization on the southern portion of the property. The survey was flown using UTM, NAD83 datum, zone 16N.

Introduction:

The Sackville Property was discovered in May of 1996 by Steve and Mick Stares when they found three large size VMS type mineralized glacial erratics 60 kilometers west of Thunder Bay, Ontario. The erratic's had grades ranging from 38.6% Zn to 0.29 % Zn and Copper values ranging from 0.00% to .26 Cu. The Boomer boulder weighted 10 tonnes and the Calvert boulder weighted 15 tonnes, the weight of the Stares Boulder hasn't been given in any of the reports. The Calvert boulder is at Lakeview Colege in Thunder Bay. The published direction of the ice flow is ≈190̊ and almost all the claims are north of the boulders. All of the work done to date aside from three geophysical surveys has also been to the north of the boulders. The boulders were in the southernmost claims, so the airborne geophysical surveys covered those claims as well. There have been several trenching, soil sampling and drilling programs on the property since 1997, but with inconclusive results.

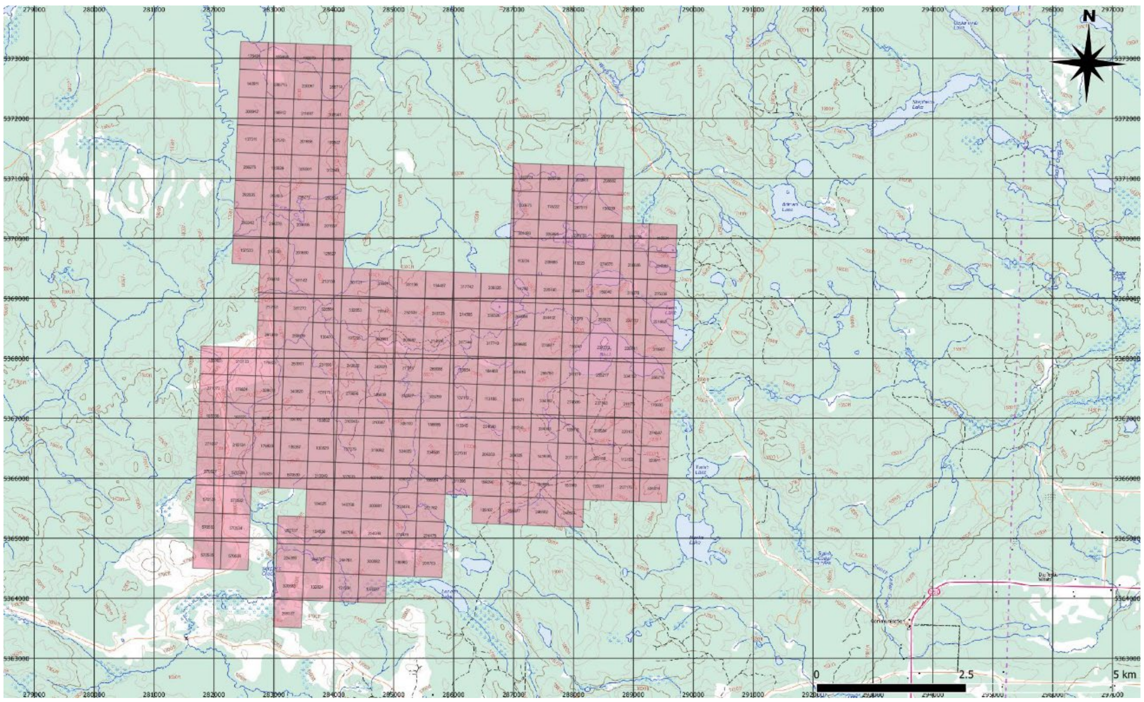

Figure 1. Sackville Claims

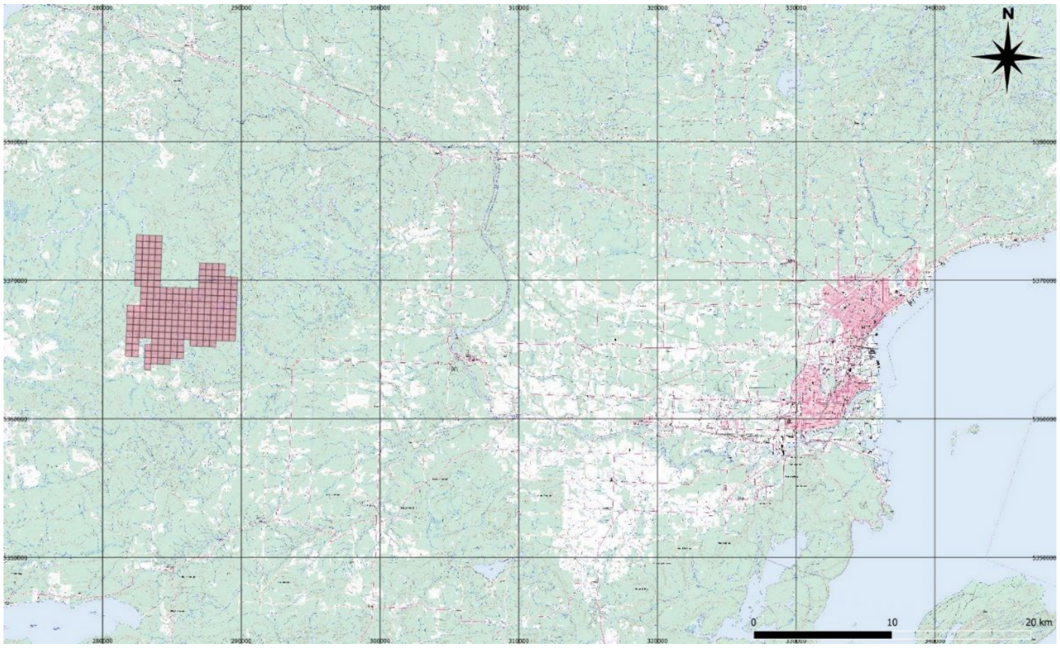

Figure 2. Sackville Claims and Thunder Bay

Location:

The Sackville claims are located 60 kilometers west of the town of Thunder Bay, Ontario in the Aldina, Aldina, Marks and Sackville townships with the approximate center of the claim block being in NTS Map NTS 52 A at UTM coordinates 5367597N and 284556E (Zone 16, NAD 83) or Latitude 48° 25’ N Longitude 89° 55’ W. All season, gravel road access is available via Boreal Road. This traverses west from secondary highway 590 to Km 10.5, Aldina East Road (63 km from Kakabeka Falls,ON) and beyond. Aldina West Road, a seasonal (winter-plowing required) sandy road which provides generally good vehicle access to a ski-doo trail which provides access to the eastern side of the grid. The Boreal Road- Hwy 590 intersection is 13 km west and(then) south of the Hwy 590-TransCanada Highway 11-17 intersection. Kakabeka Falls,Ontario only 2 km to the south of this turn (on Highway 11-17) is the closest town.

Claims:

Legacy Claim Id	Township / Area	Tenure ID	Tenure Type	Anniversary Date
4219074	SACKVILLE	337270	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	328554	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	268639	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	261849	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	231190	Single Cell Mining Claim	2022-06-10

4219074	SACKVILLE	213151	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	213150	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	201680	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	176310	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	161142	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	137532	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	130470	Single Cell Mining Claim	2022-06-10
4219074	SACKVILLE	125527	Single Cell Mining Claim	2022-06-10
4219075	SACKVILLE	332653	Single Cell Mining Claim	2022-06-10
4219075	SACKVILLE	331156	Single Cell Mining Claim	2022-06-10
4219075	SACKVILLE	318441	Single Cell Mining Claim	2022-06-10
4219075	SACKVILLE	301101	Single Cell Mining Claim	2022-06-10
4219075	SACKVILLE	263961	Single Cell Mining Claim	2022-06-10
4219075	SACKVILLE	252438	Single Cell Mining Claim	2022-06-10
4219075	SACKVILLE	204697	Single Cell Mining Claim	2022-06-10
4219075	SACKVILLE	197255	Single Cell Mining Claim	2022-06-10
4219075	SACKVILLE	111147	Single Cell Mining Claim	2022-06-10
4262831	ALDINA	300883	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	299337	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	252137	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	244782	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	244781	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	224599	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	184830	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	148769	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	132824	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	132823	Single Cell Mining Claim	2022-06-22
4262831	ALDINA	121334	Single Cell Mining Claim	2022-06-22
4272795	ADRIAN	209328	Single Cell Mining Claim	2022-08-31
4272795	ADRIAN,MARKS	246500	Single Cell Mining Claim	2022-09-07
4281353	MARKS	254477	Single Cell Mining Claim	2022-09-07
4281353	MARKS	246502	Single Cell Mining Claim	2022-09-07
4281353	MARKS	246501	Single Cell Mining Claim	2022-09-07
4281353	MARKS	135107	Single Cell Mining Claim	2022-09-07
4219074	SACKVILLE	251991	Single Cell Mining Claim	2022-09-28
4219074	SACKVILLE	179823	Single Cell Mining Claim	2022-09-28
4219075	SACKVILLE	242822	Single Cell Mining Claim	2022-09-28
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4244451	SACKVILLE	340820	Single Cell Mining Claim	2022-09-28
4244451	SACKVILLE	328412	Single Cell Mining Claim	2022-09-28
4244451	SACKVILLE	271097	Boundary Cell Mining Claim	2022-09-28
4244451	SACKVILLE	271073	Single Cell Mining Claim	2022-09-28

4244451	SACKVILLE	215134	Single Cell Mining Claim	2022-09-28
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4244452	SACKVILLE	130829	Single Cell Mining Claim	2022-09-28
4244452	SACKVILLE	107179	Single Cell Mining Claim	2022-09-28
4244452	SACKVILLE	107178	Single Cell Mining Claim	2022-09-28
4219075	SACKVILLE	271197	Single Cell Mining Claim	2022-10-29
4219075	SACKVILLE	242821	Single Cell Mining Claim	2022-10-29
4244452	SACKVILLE	316092	Single Cell Mining Claim	2022-10-29
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4244453	ADRIAN,SACKVILLE	305099	Single Cell Mining Claim	2022-10-29
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4244453	ADRIAN	209303	Single Cell Mining Claim	2022-10-29
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4244453	ADRIAN	137112	Single Cell Mining Claim	2022-10-29
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4244453	ADRIAN	113185	Single Cell Mining Claim	2022-10-29
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	ALDINA	570534	Single Cell Mining Claim	2023-01-23
	ALDINA	570533	Single Cell Mining Claim	2023-01-23
	ALDINA	570532	Single Cell Mining Claim	2023-01-23
	ALDINA	570531	Single Cell Mining Claim	2023-01-23
	ALDINA,SACKVILLE	570530	Single Cell Mining Claim	2023-01-23
	ALDINA,SACKVILLE	570529	Single Cell Mining Claim	2023-01-23
	ALDINA,SACKVILLE	570528	Single Cell Mining Claim	2023-01-23
	ALDINA,SACKVILLE	570527	Single Cell Mining Claim	2023-01-23

Table 1. Sackville Claims

Geology:

The Sackville claims are located in the Shebandowan Greenstone Belt and the property is typical of a bi-modal mafic/felsic suite with basal tholeiitic mafic volcanics and an upper unit of rhyolite to dacititic composition flows. There are local intrusions of mafic sills and gabbros. And unconformable sediment on top of the volcanics and igneous lithologies (Iliev, 2015, Perry et al., 2010, McClean, 2000). In general, the Sackville claims are considered prospective for VMS type mineralization.

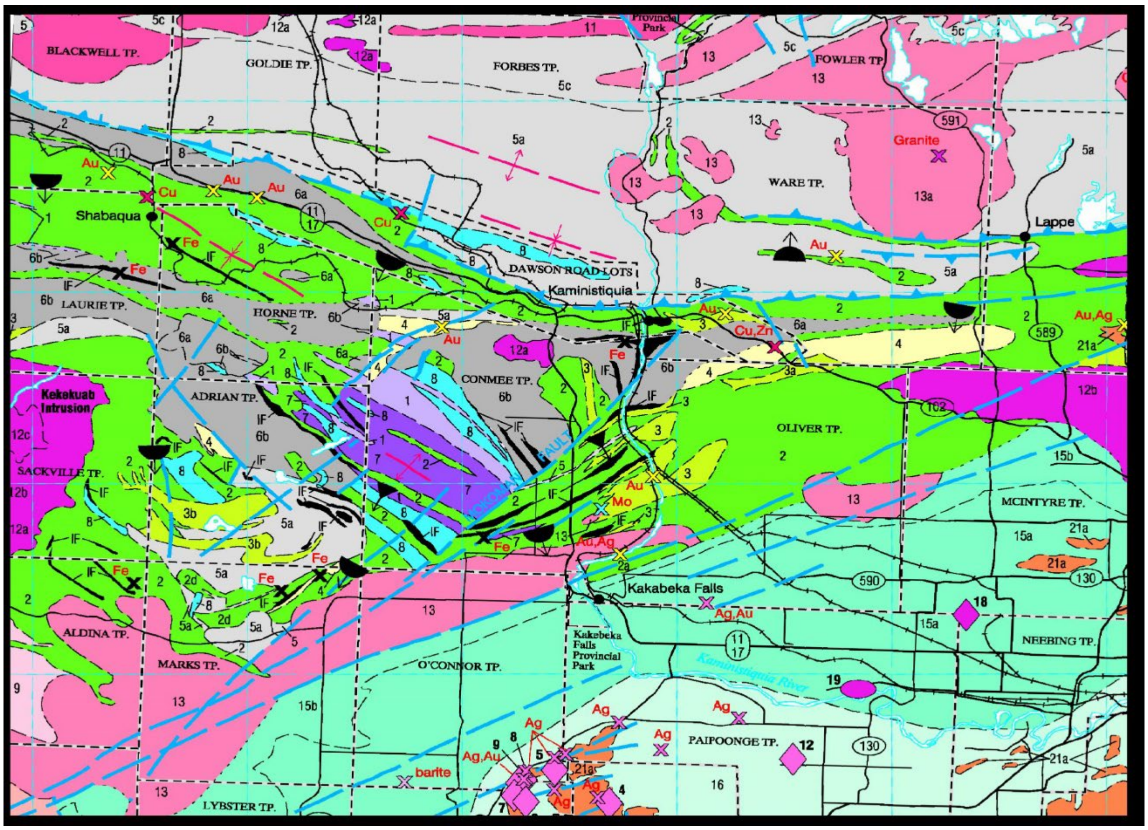

Figure 3, Sackville Geology, Perry and Sharpley, 2010.

Geophysical Survey, 2022:

In 2022, Mistango River Resources decided to fly an airborne magnetic survey over the entire Sackville claim, not just the southern portion where the mineralized glacial erratics were found but on the entire claim block. Previous geophysical work on the southern had been unsuccessful in finding the source of these mineralized boulders.

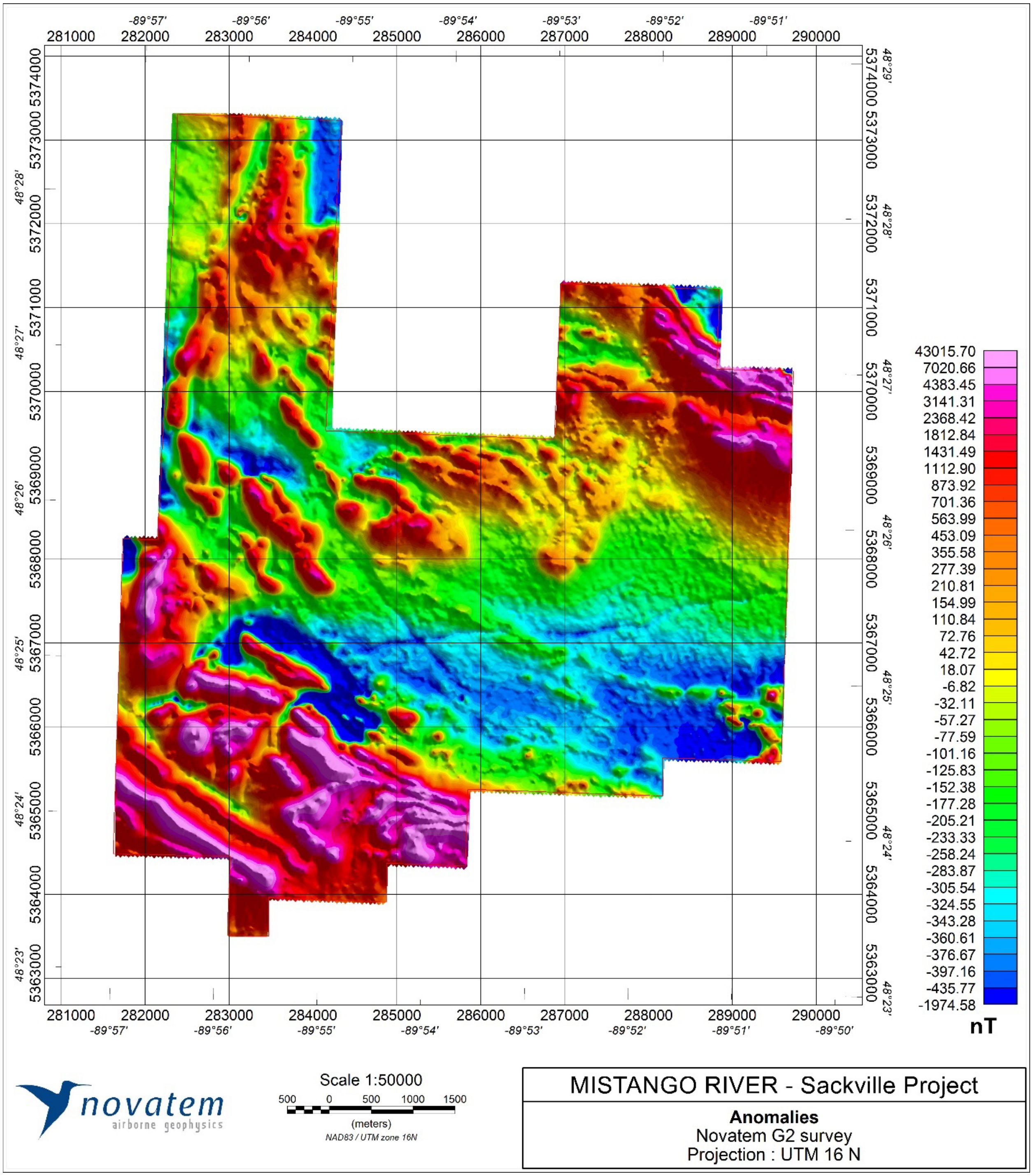

Figure 4, Geophysical Anomalies Sackville Claims

Recommendations:

The new geophysical report is successful in finding prospective new zones to explore for the sources of the VMS type mineralization found in the glacial erratics on the southwest section of the claim block. Therefore, it is recommended to prospect and possibly drill test the magnetic highs found in the northeastern and northwestern portion of the claim block. A first pass survey should be done followed by a systematic geochemical survey, either soils or biogeochemical. If indications are good, this geochemical survey should be followed up by drilling

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Appendix A

TECHNICAL REPORT

NOVATEM G2 VERY HIGH RESOLUTION HELIBORNE MAGNETIC SURVEY ON THE SACKVILLE PROJECT, IN ONTARIO

for

MISTANGO RIVER RESOURCES INC.

Mistango River Resources Inc.

Suite 1 805, 55 University Avenue,

Toronto, Ontario, Canada, M5J 2H7

Project manager : Jared Beebe

E.mail : jbeebe@oregroup.ca

Tél. : +1 416 644 1567

Novatem Inc.

1087 Chemin de la Montagne

Mont-Saint-Hilaire, QC, Canada, J3G 4S6

Project manager : Pascal Mouge

E.mail : mouge@novatem.com

Tel : +1 514 966 8000

Period of the survey: 2022, July

Data and report delivery date: 2022, July, August

SUMMARY

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

Novatem Inc. has been mandated by **Mistango River Resources** to carry out a very high resolution helicopter-borne magnetic survey on the **Sackville** project located about 40 km west of the Thunder Bay city. Novatem carried out the survey from the 2022 July 23th to July 27th. This report describes the completion of the survey which totals 1 079 linear kilometres.

Novatem implemented its very-high resolution helicopter-borne system, using two laser optically pumped sensors providing 1000 measurements per second (1000 Hz) mounted at the front of a Guimbal G2 light helicopter. The instrumentation included:

- A "stinger", mounted at the front of the helicopter, designed and certified by Novatem in Canada;
- A miniaturized magnetometer using two laser optically pumping sensors;
- A multi-frequency GNSS sensor positioning system capable of receiving the GPS, Glonass, Galileo and BeiDou constellations;
- A laser altimeter manufactured by MDL measuring the height of the helicopter above the ground with centimeter precision;
- A compensation system developed by Novatem for very high resolution, using an inertial unit and a three-component fluxgate magnetometer manufactured by Billingsley and high-performance inversion algorithms for the calculation of the coefficients;
- A navigation system developed by Novatem to minimize the deviations at the intersections of the flight lines and tie-lines.

This report describes the operations during the survey, the equipment used, the operating methods for acquisition and data processing.

***Figure 1** : Helicopter in flight*

2. SURVEY SPECIFICATIONS

2.1. SURVEY LOCATION

The **Sackville project** is located in Ontario, about 40 km west of the Thunder Bay city.

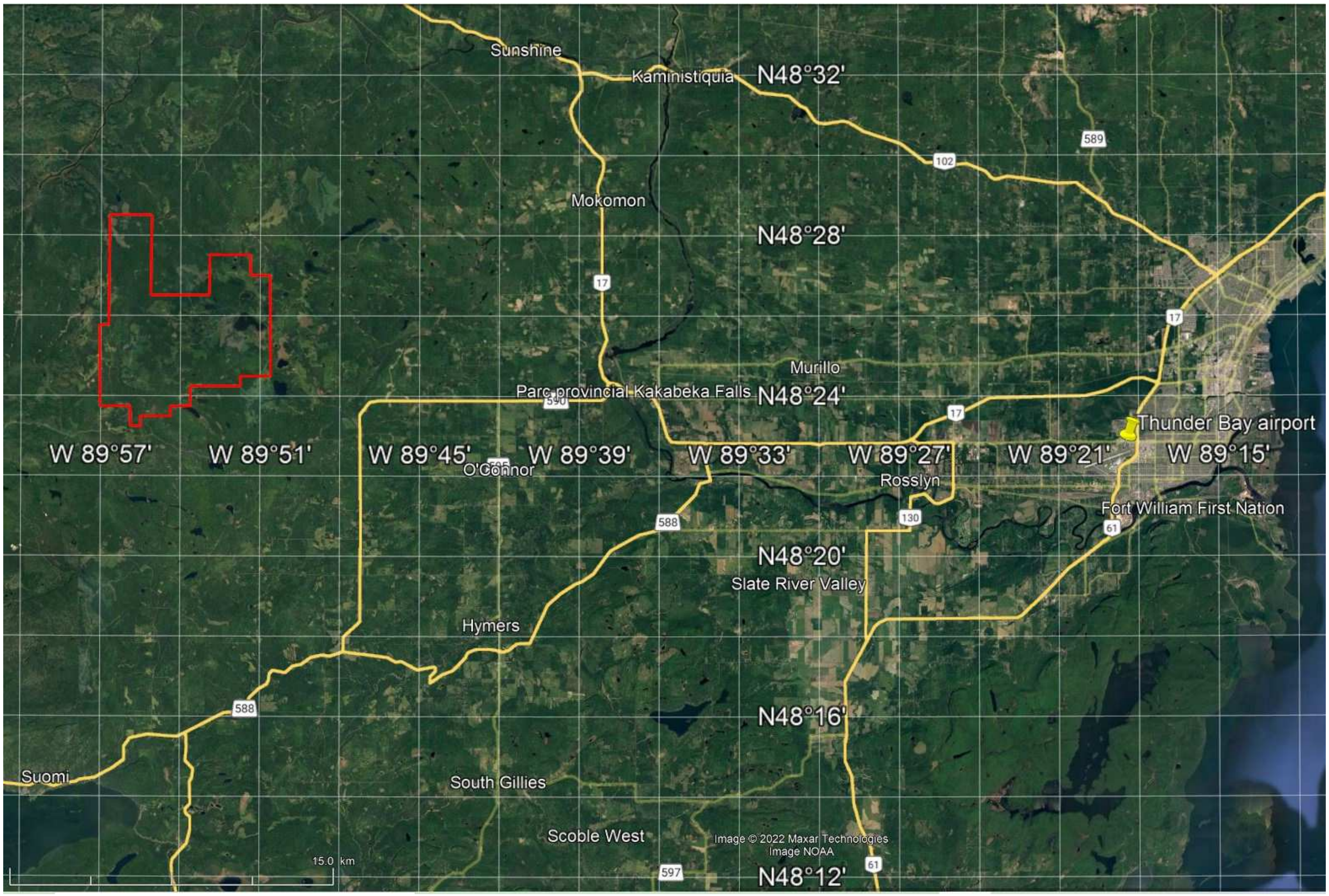


*Figure 2 : Location of the **Sackville** project*
(outline of the claims in red)

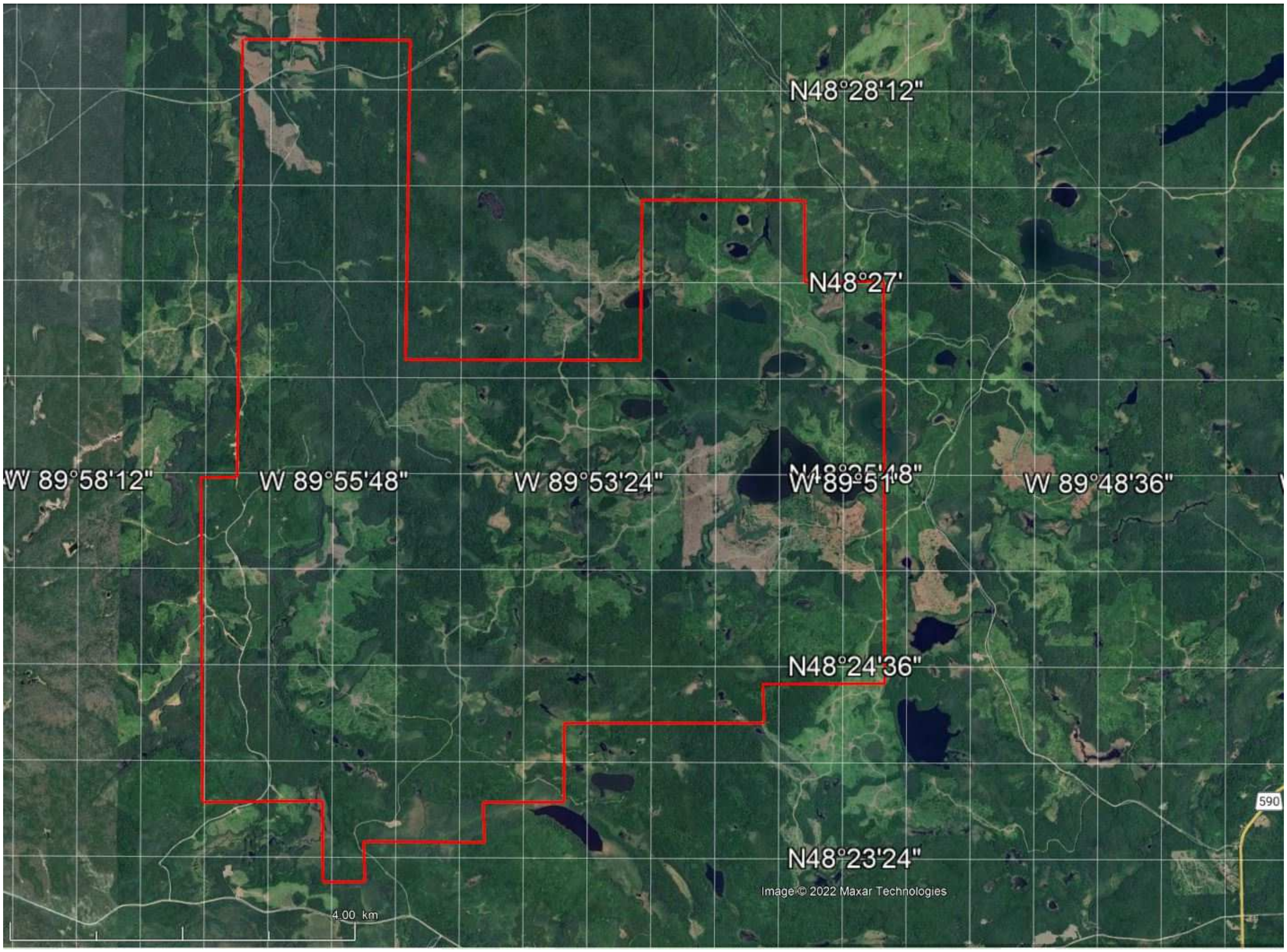


Figure 3 : *Zoom on the location of the* ***Sackville project***

2.2. SURVEY AREA

The extent of the project is summarized here using the perimeter and area, measured in geographic coordinates, converted from UTM coordinates provided by Mistango River Resources:

Block	*Perimeter*	*Area*
Sackville *project*	38,0 km	48,4 km^2 = 4 842 hectares

Table 1 : *Perimeter and area of the block*

2.3. DATA ACQUISITION PARAMETERS

2.3.1. SPACING AND ORIENTATION OF FLIGHT LINES

The flight parameters used for the project are summarized in the following table.

Project	*Flight Lines Azimuth*	*Control Lines Azimut*	*Flight Line Spacing*	*Control Line Spacing*	*Sensor Height Above Ground*
***Sackville** project*	N0	N90	50 m	500 m	Drape as low as possible

***Table 2 :** Flight parameters used*

2.3.2. FLIGHT HEIGHT ABOVE THE WATER AND GROUND

The survey was carried out following a drape surface 15 m above the ground. The Ground Clearance ranges from 14 m to 66 m which reflects fairly strong topographic variations. The median of the Ground Clearance measured on the final data is thus 30 m.

2.3.3. SPEED

The average speed of the helicopter, measured over the entire survey, was 75 kts (138 km/h).

The pilot tried to follow the specs to the best of his ability. These parameters may have varied temporarily, depending on local flight conditions (mainly vegetation, topography and air currents).

2.3.4. TOLERANCES ON NAVIGATION

The maximum deviation, measured in the horizontal plane is about 5 m. However, these values may have been locally exceeded depending on the vegetation, homes, power lines, etc.

2.3.5. TOLERANCE ON THE NOISE LEVEL OF THE MEASUREMENTS

The noise level of the raw magnetic data, measured on the standard deviation of the normalized fourth difference of the compensated magnetic field is approximately 0.001 nT for the entire survey.

2.3.6. TOLERANCE ON TEMPORAL VARIATIONS OF THE MAGNETIC FIELD (DIURNAL AND SPHERICAL)

The maximum deviation at the base station over time variations of the magnetic field has always been less than 1 nT peak to peak over a one minute period and 0.5 nT peak to peak over a 15 second period. The measurements were made continuously, at the rate of one measurement per second, with an extension of at least one hour of measurement before and after each flight.

2.4. MILEAGE

The following table gives the mileage measured on the completed flight path (measured on the projected plane coordinates).

Block	*Sackville project*
Lines km	974.2
Tie-lines km	105.4
Total	**1 079.6**

Table 3 : *Measured mileage of flown lines, in UTM rectangular coordinates*

2.5. FLIGHT LINES

The following figure presents the lines flown projected in the UTM 16N projection system.

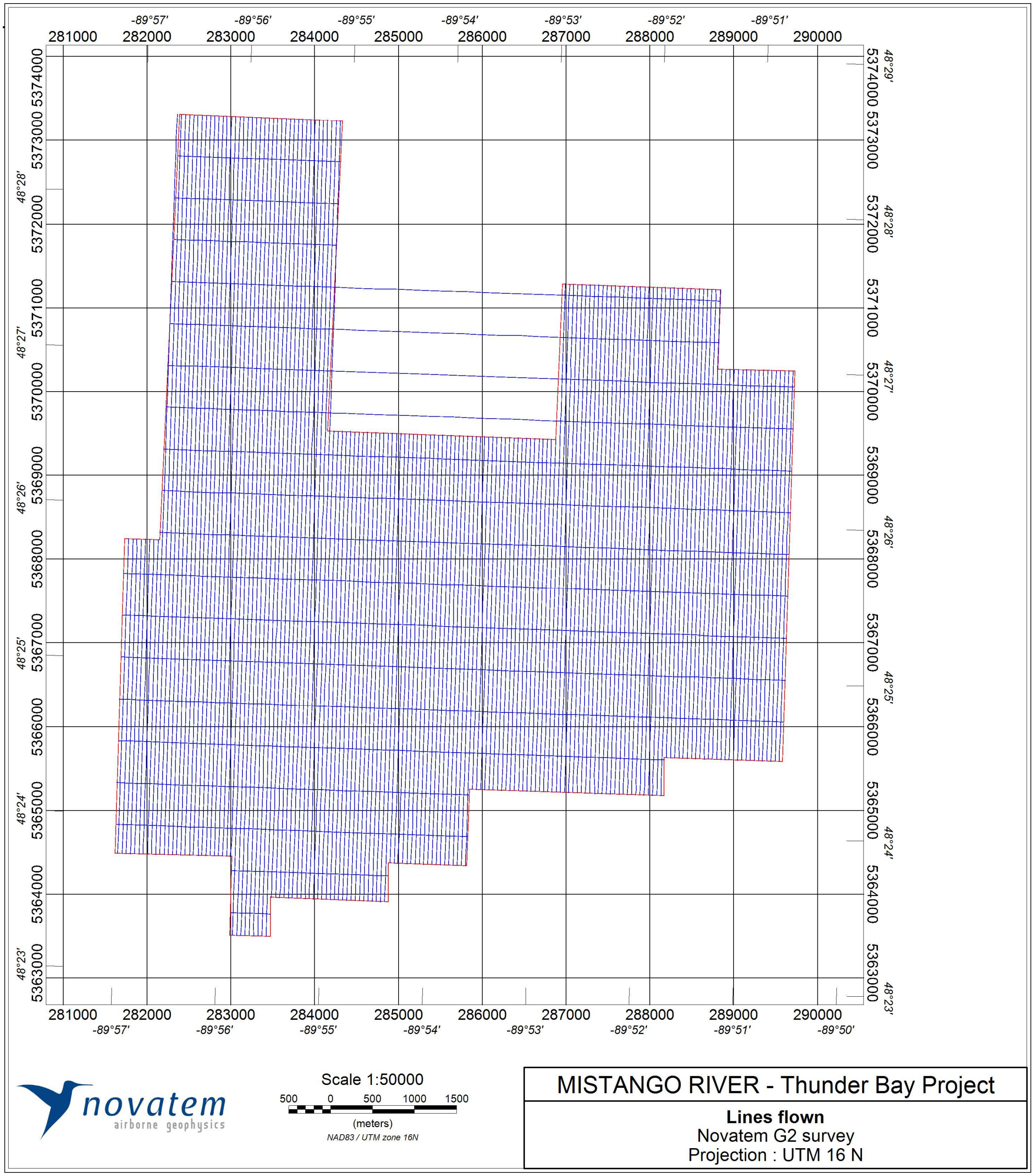


Figure 4 : *Lines flown*

3. TESTS AND CALIBRATIONS

All instruments, including spare ones, were tested and calibrated prior to mobilization. The configuration was then tested at the location of the survey. The following tests were completed before the start of the work.

3.1. TESTS AND CALIBRATIONS OF MAGNETIC MEASUREMENT INSTRUMENTS

3.1.1. Static test of magnetic stations and GPS positioning

Ground and flight magnetometers recordings were made for at least 20 minutes. Magnetic data was recorded simultaneously by the base station magnetometers and the onboard magnetometers in the helicopter, while the helicopter was stationary on the ground, and the station was close to the helicopter.

3.1.2. Dynamic testing of embedded systems

The helicopter flew a single line for at least 50 km and the data was compared to ensure that all systems produced similar results. This comparison line was taken at the start of the survey and repeated each time modifications were made to the helicopter.

3.1.3 Calibration of on-board magnetometers (Morewood test)

The on-board magnetometer calibration was performed at the new CGC calibration base in Morewood, Ontario, at the start and end of operations.

This calibration included in particular a measurement of the heading error. The helicopter made at least two passes in each direction north, south, east and west.

The results of these tests are archived in the same graphic format as that used during the production of the survey, and in the digital format intended to archive the data. The same precision (two decimal places) is used for both presentations. The test results, as well as the video coverage of the flight path, were validated before going to the survey area.

The total magnetic field values recorded at the Ottawa Observatory (Ontario) were used as a reference during the duration of these calibration flights.

3.1.4. Electronic navigation test (done with the Morewood test)

Simultaneously, an electronic navigation test was carried out. The quality of the DGPS positioning measurements of the on-board system was validated by comparison of the measurements overflown above a measurement point established on the ground.

3.1.5. Parallax test

The time synchronization and recording systems were checked before operations began by flying over an intense, isolated magnetic source (a metal hangar) in opposite directions and at the nominal height of the survey. This delay, if observed, would then be corrected during data processing. No delay was observed here.

3.1.6. Calibrating the altimeter

The laser altimeter used for this survey does not require any calibration other than that carried out in the laboratory before leaving for the survey. The heights above the ground provided by the instrument are therefore absolute measurements, requiring no other processing than the separation of the two pulses, reflected respectively by the ground and by the tops of trees.

3.1.7. Helicopter magnetic disturbance calibration flights at high altitude (FOM)

The helicopter's FOM was flown as the weather conditions were favorable, at high altitude, over an area of low magnetic gradient. The FOM included 3 rolls of ± 10 °; 3 pitches of ± 5 °; 3 yaws of ± 5 ° in each direction of the survey flight lines (N0, N90, N180, N270). Each maneuver was performed over a period of at least 45 seconds.

4. LOGISTICS

4.1. GEOPHYSICAL AND LOGISTICS SERVICES

Novatem Inc. took charge of the following elements of the project:

- Obtaining flight authorizations
- Provision of qualified personnel necessary for the smooth running of the survey until its completion
- Supply of the necessary technical equipment as well as spare parts to carry out the survey as soon as possible
- Supply of the helicopter and fuel
- Provision of board and lodging for employees
- Maintenance and supervision of the proper functioning of the helicopter
- Preliminary processing and quality control of geophysical data on the site
- Preparation and supply of preliminary and final products

4.2. BASE OF OPERATION AND PROJECT ORGANIZATION

The helicopter completed all of its flights from the Thunder Bay airport.

A base of operations has been set up at the airport. This base was equipped with an internet connection. A telephone link was available throughout the survey with the project manager on one hand and by radio telecommunication with the pilot on the other. The helicopter was also equipped with a **Spidertracks** communication and tracking system. Data was uploaded to the Novatem server at the end of each day for quality checks.

4.3. HUMAN RESOURCES ASSIGNED TO GEOPHYSICAL WORK

The following personnel were assigned to preprocessing, quality control and final processing of the geophysical data:

Project manager: Pascal Mouge, Geo., Ph. D. Member of the Ordre des Géologues du Québec.

Responsible for data acquisition and quality controls in the field: Pascal Mouge, Geo., Ph. D. Member of the Ordre des Géologues du Québec.

Field Equipment Manager: Morten Skovgaard, M.Sc.

Field operator: Pascal Mouge, Geo., Ph. D. Member of the Ordre des Géologues du Québec.

4.4. HUMAN RESOURCES ASSIGNED TO THE HELICOPTER

The pilot who worked on this project holds a valid commercial license for Guimbal G2 helicopters, issued by Transport Canada.

Each instrument was scanned in real time using quality indices: if the value of one of these indices fell below the specifications, the corresponding indicator changed from green to red on the pilot's screen, who immediately stopped its flight and returned to his base. No incident occurred during this project.

The list of pilots for this project was as follows:

- Jean-François Tremblay, Captain for Heli Tremblant Inc.

4.5. WORK SCHEDULE

Novatem carried out the survey from the 2022 July 23th to July 27th. Preliminary data was produced in the field as the work progressed. All phases of the survey, in particular planning and production flights, were coordinated with the **Mistango River Resources** Project Manager.

5. INSTRUMENTATION

5.1. HELICOPTER

A ***Guimbal G2*** helicopter was used to complete this project. The helicopter was equipped with a magnetometer ("stinger") designed by Novatem, validated by an STC issued by Transport Canada.

NOVATEM's Supplemental Type Certificate	
Approval to	*NOVATEM Inc.*
STC Number	*SH20-14*
Approval Date	*May 01, 2020*
Issue Date	*May 01, 2020*
Fleet Eligibility List	
Aircraft Type or Model	*Hélicoptères Guimbal Cabri G2*
Canadian type Certificate or Equivalent	*H-113 (S/N 2 and subsequent)*
Type Design change	*Stinger installation – Structural Provisions*

Table 4 : *Novatem's Supplemental Type Certificate*

It is important to mention that Novatem benefited for these developments from the support of the Guimbal company and of its founder in particular (Bruno Guimbal) who personally ensured the supervision.

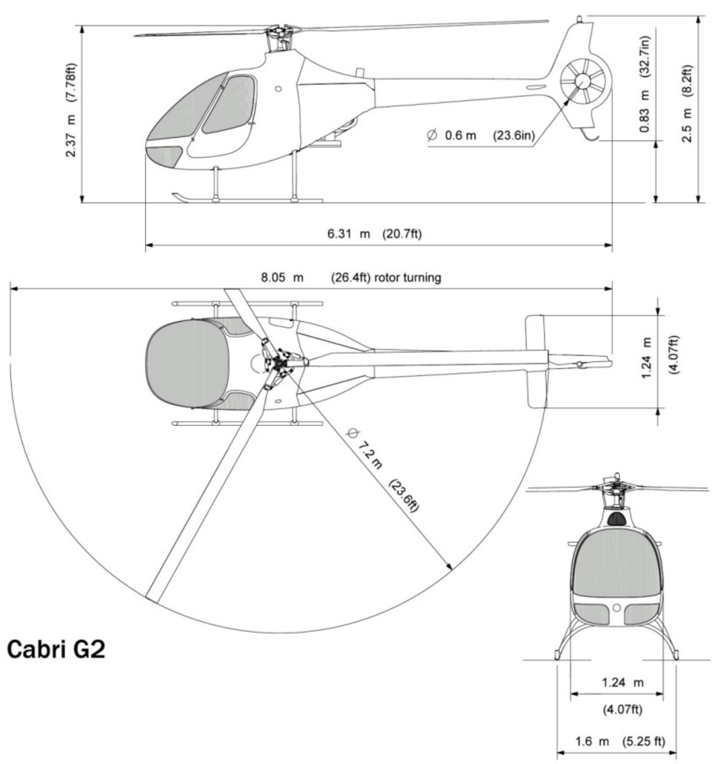


Figure 5 : *Dimensions of the G2 helicopter*

The geophysical measurement equipment mounted on board of the helicopter for this campaign mainly included:

- Two very high resolution laser optically pumped scalar magnetic sensors, mounted at the front of the magnetometer stinger;

- A real-time multi-frequency GNSS and RTK sensor positioning system capable of receiving the GPS, Glonass, Galileo and BeiDou constellations;

- A very high resolution fluxgate vector magnetic sensor, manufactured by Billingsley, also mounted on the end of the magnetometer pole;

- An attitude angle measurement system (Inertial Measurement Unit), manufactured by Microstrain, for magnetic compensation;

- A "draped" acquisition and navigation system (SAMM) developed by Novatem, making it possible to follow a continuous flight surface, calculated in advance, and therefore to minimize deviations at intersections of lines and tie-lines;

- A compensation system developed by Novatem for very high resolution using jointly the components provided by the fluxgate vector magnetometer, the angles measured by the attitude center, and inversion algorithms optimized for the calculation of the coefficients.

Prior to the start of operations, the equipment was tested on the ground to ensure that the acquisition parameters were within contract specifications. Throughout the project, quality checks were carried out on the data on a daily basis.

5.2. MAGNETOMETERS

5.2.1. MINIATURIZED SCALAR MAGNETOMETER

The magnetometer boom ('stinger') was equipped with two classified scalar vapor laser optical pumping (non-radioactive) sensors, measuring the total field with a sensitivity of 0.005 nT / √Hz.

Specifications	
Maximum sampling	1000 Hz
Precision	0.1 nT
Sensitivity	0.005 nT/√Hz
Resolution	0.001nT
Operation	20 000 à 100 000 nT
'Heading error' maximum	5 nT
Sensor dimensions	2 x (23,5 x 34 x 24,2) mm
Sensor volume	15 cm^3
Dimensions of electronics	120 x 22 x 53 mm
Volume	200 cm^3
Power consumption	5 W
Dead zone	one only, polar ± 25°

***Table 5** : In flight magnetometer specifications*

The magnetometer comprises two sensors that can be arranged parallel to each other for greater sensitivity or perpendicular to each other in order to eliminate the dead zone specific to the optically pumped sensors.

5.2.2. VECTORIAL MAGNETOMETER

A vectorial magnetic sensor manufactured by Billingsley, measuring the three components of the total magnetic field was mounted on the end of the magnetometer pole. This latest generation of fluxgate magnetometer is the most efficient of the existing vector magnetometers.

Specifications	
Samplig rate	125 Hz
Axis orthogonality	Better than 0.2 degree
Accuracy	0.1 nT
Sensibility	< 0.3 nT
Resolution	0.1nT
Range	> 65 000 nT
'Heading error'	± 1 nT

***Table 6** : Fluxgate Vector Magnetometer specifications*

5.3. MULTI-BAND GNSS POSITIONING SYSTEM IN FLIGHT

A real-time multi-frequency GNSS positioning system was used for flight positioning. This receiver uses GPS, Glonass, Galileo and BeiDou constellations.

Specifications	
Sampling rate	10 Hz
Precision	1 cm
Precision with RTK corrections	1 mm
GNSS bands	L1A/A, L1OF, B1I, E1B/C, L2OF, L2C, B2I, E5b
RTK	Oui
Antenna	ANN-MB multi-band
Time precision	20 ns
Temperatures	-40°C à +85 °C

Table 7 : *Positioning system specifications*

5.4. MAGNETIC BASE STATION

A GEM GSM19 magnetic base station, equipped with an acquisition card and a GPS antenna, recorded the variations of the external magnetic field during the entire period of the survey. The station was left fixed throughout the duration of the works (reference station). The station was equipped with a battery resistant to very low temperatures.

Specifications	
Sampling rate	1 Hz
Accuracy	0.2 nT
Resolution	0.01 nT

Table 8 *: Magnetometer base station specifications*

5.5. NAVIGATION AND DATA ACQUISITION SYSTEM

A navigation and data acquisition system (*SAMM*, *Système d'Acquisition de Mesures Magnétiques*) developed by Novatem, specifically for very high resolution helicopter-borne geophysical surveys, was used. The pilot has in front of him all the information necessary to follow his flight lines and his draped surface. The system also provides the pilot with flags on the quality of the measurements: if at least one of these alarm turns red, the pilot immediately ceases his flight and returns to his base.

***Figure 6** : Acquisition and navigation system (SAMM) installed in the helicopter*

The helicopter was also tracked in real time both from the operational base and from the Synergy Aviation base using a Spidertracks satellite positioning system.

All data were synchronized in real time with the PPS signal of the GNSS receiver. The following data were recorded:

- Line number
- GNSS time
- Fiduce
- GNSS quality factors (HDOP, etc.)
- Latitude, longitude, GNSS altitude (WGS84)
- Laser height
- Attitude angles (roll, pitch, yaw)
- Components of the magnetic field (X, Y, Z) measured by the fluxgate
- Total magnetic field measurements by the Laser cesium sensors (M1, M2)

The measurements of the ground station were integrated during the preliminary processing.

5.6. IMU ('INERTIAL MEASUREMENT UNIT')

A Microstrain Inertial Measurements Unit was used to measure the attitude angles (roll, pitch and yaw) required to correct the magnetic gradients. The three attitude angles were measured with a very high sampling speed (between 100 and 600Hz) and then reduced at the same rate as the other measurements (10Hz).

Specifications	
Sampling	10 Hz (600Hz max)
Accuracy (Roll, Picth, Yaw)	0.001 degree

Table 9 *: IMU specifications*

5.7. BAROMETRIC PROBE

The helicopter was fitted with a temperature and pressure probe manufactured by Honeywell having a resolution of 0.1°C and 0.1 mbar, respectively.

5.8. LASER ALTIMETER

The helicopter was equipped with a laser altimeter manufactured by MDL, digitally interfaced with the acquisition system and the inertial positioning system. This altimeter was placed directly under the frame of the device for optimum vertical positioning. The absolute precision of the model used is 1cm. It does not require any calibration.

Specifications	
Sampling rate	10 Hz (100 Hz max)
Accuracy	1 cm
Resolution	1 mm
Color	904 nm (IR)
Divergence	0.3º

Table 10 : *Laser altimeter specifications*

5.9. COMPUTERS

Two computers (Apple and Dell) dedicated to field measurements were used for data quality analysis, navigation plotting and raw measurements as well as for archiving immediately after flights. Quality control was done daily and the progress and production report was updated with the latest data. At the end of the checks, the preliminary grids were recalculated and then a plot was produced at the compilation scale in order to ensure the quality of the magnetic and positioning data.

5.10. SPARE PARTS

A normal set of spare parts and instrumentation necessary for the proper functioning and verification of the devices was available in the field. A complete set of spare parts was available at Novatem's facilities in Mont-Saint-Hilaire.

6. DATA QUALITY CONTROLS

During the survey, data quality control was performed by the Head of Field Operations. Data quality controls were built into the normal acquisition process and began with the establishment of flight paths and end with the delivery of finished products to the customer.

Before the survey, the checks serve to ensure in particular that:

- The specifications are appropriate for the targets considered
- Specifications are safe for personnel and equipment
- Navigation is safe given the topography and local weather conditions
- Equipment and instruments comply with the specifications (including software)
- Spare parts and instrumentation are in sufficient quantity to carry out the survey within the expected deadlines
- Maintenance tools and spare parts for the helicopter are available
- Aircraft maintenance will be done in safe conditions and as soon as possible

In flight, the data were analyzed in real time. The pilot was informed by flags of the proper functioning of instruments so that he can suspend his flight and return to base if necessary, where the appropriate modifications can be made.

6.1. FLIGHT SPECIFICATION CHECK

After each flight, the raw data is inspected to ensure, on the one hand, the quality of the data and, on the other hand, that all the expected data is present, then saved on an independent and secure medium. For each flight, the following treatments are carried out on the field:

- Reconstruction of the trajectory of the aircraft
- Control of the flight path compared to the theoretical path
- Determination of lines to fly
- Checking the raw data of the reference DGPS station

The checks are then carried out as a priority, to ensure:

- The spacing between the measurement points (helicopter speed)
- The deviation on either side of the flight lines
- The deviation of the flight lines at altitude
- Continuity of profiles
- The level of data noise

In particular, it is ensured that each flight line intersects at least two control lines and that any sections meet at a low angle, without discontinuity.

All digital data is merged into a Geosoft format file. The profiles are then edited to ensure that all the expected data is present and that its quality meets demand. The data is finally archived, processed and then delivered to a database compatible with the client's software (Geosoft).

7. DATA PROCESSING

7.1. DIFFERENTIAL POSITIONING CORRECTIONS

The successive positions provided by the GNSS and RTK system in geographical coordinates are first converted to rectangular UTM coordinates during preprocessing in order to carry out navigation control.

At the end of the survey, the first phase of processing is to calculate the differential corrections using data from the reference station or local stations when available.

Differential GNSS corrections are calculated using Novatel's Waypoint software. The helicopter's positions were recalculated using data from the GPS base station. In addition, precise ephemeris and clock data was downloaded for the entire survey period to improve the accuracy of the recalculated position data.

7.2. MAGNETIC DATA PROCESSING

7.2.1. SUMMARY OF MAGNETIC DATA PROCESSING

The data measured in flight are edited daily and then archived in a Geosoft Oasis Montaj database. The profiles are then drawn and checked. The magnetic measurements are then corrected for disturbances due to the helicopter (compensation) using vector information supplied by the Fluxgate and inertial information supplied by the IMU. The compensated measurements are then corrected for variations in the external magnetic field (mainly diurnal variations and pulsations) using measurements from the magnetometric base station. The residual intrinsic directional error of each magnetometer ("heading error") is very precisely recalculated and subtracted from the measurements for each direction of flight. Finally, an iterative leveling procedure is applied, first on the control lines, then on the regular lines, in order to eliminate the residual errors caused mainly by the variations in height of the helicopter.

7.2.2. COMPENSATION

The helicopter's magnetic noises (induced, permanent magnetization and eddy currents) are estimated from a model whose coefficients are calculated using a calibration flight, along a precise and reproducible geometry (FOM), carried out in clear weather without wind at very high altitude, far from the magnetic disturbances generated by the earth's crust. The coefficients are calculated by inversion, based on the physical model of the helicopter's magnetic disturbances. This model is a linear combination of 18 terms, constructed from the direction cosines of the orientation angles between the helicopter and the earth's magnetic field. The inversion is done on each of the 4 cardinal directions used for the survey (the 2 directions of the lines, plus the two directions of the tie-lines). The coefficients are then used to reconstruct the helicopter's magnetic disturbance field using the attitude angles provided by the inertial unit and the Fluxgate magnetometer.

7.2.3. CORRECTION OF TEMPORAL VARIATIONS (DIURNAL)

The data measured at the base station (1Hz) were edited then archived in an ASCII file, then linearly interpolated at the instants of the acquisition in flight (10Hz). Since the base station is fixed and far from any artificial parasitic variations, the variations recorded are assumed to be temporal variations due to solar activity (diurnal variation, pulsations, etc.).

The magnetic constant of the place, estimated with the average of all the recordings over the entire duration of the project, serves as a reference level. This constant is then subtracted from all of the ground station measurements to obtain the variations due to the external magnetic field.

7.2.4. Correction of instrumental delay (lag)

Residual positioning errors, mainly caused by the "time delay" (lag) between the moment the position is measured and the one where it is assigned to the magnetometer can cause a systematic shift in each direction of flight. As the GNSS antenna is located very close to the magnetic sensors (38 cm), this delay is insignificant, ie. less than a fiduce (less than 0.1s).

7.2.5. Levelling

A leveling procedure, based on the differences observed at the intersection of lines and tie lines, was applied, first on the tie-lines and then on the lines. This procedure is then recursively repeated until the convergence of the levelling. This 'final' field thus obtained represents the Intensity of the Total Magnetic Field.

7.2.6. IGRF

The IGRF-13 coefficients, i.e. the coefficients of 13^{th} generation of the International Geomagnetic Reference Field (IGRF) model have been used for the calculation of the main magnetic field.

7.2.7. Anomalies and Reduction to the pole

Anomalies of the total magnetic field intensity were calculated by subtracting the IGRF2020 model, extrapolated to the average survey altitude (541 m) and the average survey date (2022/06/03), from the leveled total magnetic field intensity (TMI). The reduction to the pole was then calculated on the anomalies using the inclination and declination obtained from the IGRF2020 model, i.e.:

- Dec = - 3.2 degrees
- Inc = 73.5 degrees

The same direction of magnetization was used for the main field and for the inductive field. In other words, it was assumed that all anomalies were the result of induced magnetization.

7.2.8. Derivative Maps

All the derivative maps (Gradients, Tilt derivative, Analytical Signal, Reduction To the Pole) were calculated in the Fourier space using the LEMM proprietary program from NOVATEM.

8. FINAL DATA

8.1. PRODUCTS DELIVERED

The final products delivered are summarized in the following table:

Produits	Nom du produit	Données
Database of processed measurements, in the Geosoft *.gdb format	- Sackville.gdb	Final data
Grids of processed and derivative measurements, in Geosoft *.grd format	- TMI.grd - Anomalies.grd - RTP.grd - VG1.grd - VG2.grd - Analytic_Signal.grd - TILT.grd	- Total Magnetic Field Intensity (TMI) - Anomalies of the TMI - Reduction of Anomalies To the Pole - 1th vertical derivative (GV1) - 2nd vertical derivative (GV2) - Analytic Signal - Tilt derivative
Maps of processed and derivative measurements, in jpeg format	- TMI.jpg - Anomalies.jpg - RTP.grd - VG1.grd - VG2.grd - Analytic_Signal.jpg - TILT.jpg	- Total Magnetic Field Intensity (TMI) - Anomalies of the TMI - Reduction of Anomalies To the Pole - 1th vertical derivative (GV1) - 2nd vertical derivative (GV2) - Analytic Signal - Tilt derivative
Maps of processed and derivative measurements, in Geotiff format	- TMI.tif - Anomalies.tif - RTP.tif - VG1.grd - VG2.grd - Analytic_Signal.tif - TILT.tif	- Total Magnetic Field Intensity (TMI) - Anomalies of the TMI - Reduction of Anomalies To the Pole - 1th vertical derivative (GV1) - 2nd vertical derivative (GV2) - Analytic Signal - Tilt derivative
Report (pdf file)		Logistics, processing and products documentation

***Table 11** : Delivered products*

8.2. MAGNETIC DATA BASE

The data were archived in Geosoft Oasis Montaj format (* .gdb file).

The channels in the database are as follows:

	Nom du champ	Description	Unité
1	DATE	Local date	AAAA/MM/JJ
2	TIME_UTC	UTC time	HH :MM :SS.SS
3	TIME_GPS	GPS time	s
4	DATETIME	Date and decimal hour	s
5	LON	Longitude GPS NAD83	Decimal degre
6	LAT	Latitude GPS NAD83	Decimal degre
7	X	X UTM 18N, NAD83	m
8	Y	Y UTM 18N, NAD83	m
9	SPEED_KTS	Ground speed	kts
10	COG	Course Over Ground (direction cardinale)	Decimal degre
11	HDOP	Horizontal Dilution Of Precision	
12	nSAT	Number of Satellites used in the calculation of positioning	
13	ALT	GNSS Altitude	m ASL
14	H_GEOID	Geoid Height	m
15	GC	Laser Ground Clearance, ie Height above the ground	m
16	DEM	Digital Elevation Model (ALT - GC)	m
17	DRAPE	Drape Surface	m
18	TMI	Intensity of the Compensated total magnetic field for (corrected for the magnetic noise due to the manoeuvres of the helicopter and for the external magnetic field)	nT
19	RTP	Reduction To the Pole	nT
20	IGRF	Main magnetic field at the survey time and location, calculated using the last IGRF2020 model	nT
21	INC	Inclination of the main magnetic field using the last IGRF2020 model	nT
22	DEC	Declination of the main magnetic field using the last IGRF2020 model	nT
23	Anomalies	Anomalies of the Total Magnetic Field Intensity (TMI – IGRF)	nT
25	VG1	First Vertical Gradient (First Derivative of ANO)	nT / m
26	VG2	Second Vertical Gradient (Second Derivative of ANO)	nT / m2
27	AS	Analytic Signal	nT / m
28	TILT	Phase (Tilt Derivative) = Arctan (vertical gradient / horizontal gradient)	radian

***Table 12** : Content of the magnetic database*

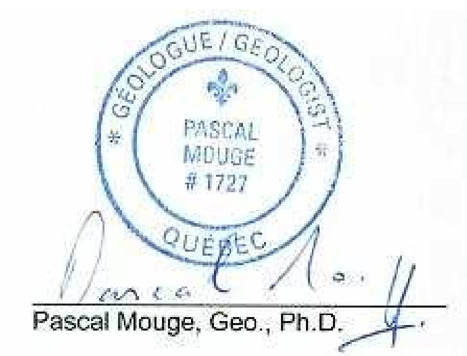
9. REFERENCES

Client	
Project	SACKVILLE project
Adress	**Mistango River Resources Inc.** Suite 1 805, 55 University Avenue, Toronto, Ontario, Canada, M5J 2H7
Project manager	Jared Beebe
E.mail	jbeebe@oregroup.ca
Phone number	+1 416 644 1567
Novatem	
Contract	C22171
Adress	1087 Chemin de la Montagne Mont-Saint-Hilaire, Québec, Canada, J3G 4S6
Project manager	Pascal Mouge
E.mail	mouge@novatem.com
Phone number	+1 514 966 8000
Project	
Location	about 40 km west of the Thunder Bay city in Ontario
Method	NOVATEM G2 - Very high resolution helicopter borne magnetic survey
Date of flights	2022 July 23th to July 27th
Date of data and report delivery	2022 August 08th
Project manager, data quality manager and controller	Pascal Mouge, Ph.D., Géo.numéro 1727
Responsible for the acquisition and equipment in the field	Morten Skovgaard, M.Sc.
Helicopter pilot	Jean-François Tremblay, Commandant

10. ATTESTATION OF QUALIFICATION

I, the undersigned Pascal Mouge, certify that:

- I am a member in good standing of the Order of Geologists of Quebec
- I have a doctorate in geophysics, issued by the Institut de Physique du Globe de Paris
- I am working in the field of geophysics since 1985
- I am currently President of the company Novatem
- I have supervised and actively contributed to the work described in this report and declare that it was carried out according to industry rules and practices.



Pascal Mouge, Ph.D., Géo. numéro 1727

APPENDICES

APPENDICE A : GEODESIC PARAMETERS USED IN PROJECTIONS

The following table summarizes the geodesic parameters used for the plane projection. These settings have been applied to all coordinate transformations.

Local reference system	WGS84
Ellipsoïd	WGS84
Projection	UTM
Zone	16 N
Lat0, Lon0 (natural origin)	0, - 87
Coordinates of X origin (False easting)	500 000
Coordinates of Y origin (False northing)	0
Scale factor of natural origin	0.9996
Major axis radius	6 378 137
Inverse flattening	298.25772
Prime meridian	0

Table 13 *: Geodetic parameters used in plane projections*

APPENDICE B : GRID PARAMETERS

The following table summarizes the grid parameters:

Type	DOUBLE
Separation between two points along the X axis, in m	5
Separation between two points along the Y axis, in m	5
Number of points along the X axis	1 614
Number of points along the Y axis	1 964
Grid origin (min X, min Y), in m	X = 281 645 Y = 5 363 500
Plane coordinate system	WGS 84 / UTM zone 16 N
Grid rotation angle	0

Table 14 *: Grid parameters*

Statement of Qualifications

1. I, Jared Beebe, have been a practicing economic geologist since February of 1987 and have over thirty-five years of minerals exploration experience.

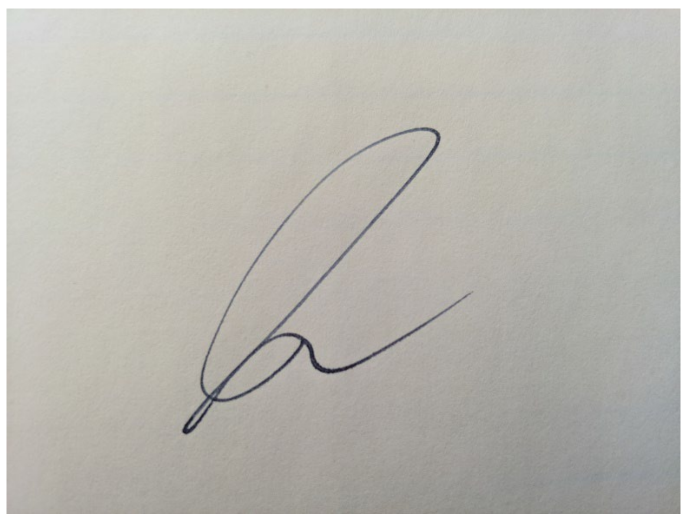
2. I graduated from Metropolitan State College in December of 1981 with a B. S. in Applied Sciences with a geology emphasis.

3. I have been associated with Mistango River Resources in the position of Exploration Manager since September 2021.

4. I am a member in good standing of I' Ord re des Geologues du Quebec since September of 2006, my membership number is 1010.

5. I am registered as a temporary geologist in PGO of Ontario and my APGO membership number is 3525.

6. Dated this day of August 22, 2022



Jared Beebe, P. Geo.