ARCHER, CATHRO & ASSOCIATES (1981) LIMITED
1016 - 510 West Hastings Street
Vancouver, B.C. V6B1L8
Telephone: 604-688-2568 Fax: 604-688-2578

ASSESSMENT REPORT

describing

HELICOPTER-BORNE MAGNETIC AND RADIOMETRIC SURVEYS

Surveys completed March 29 – April 1, 2015

at the

AIRSTRIP PROPERTY

AS 1-32 YC93748 - YC93779

NTS 115I/05
Latitude 62°26'N, Longitude 137°40'W

located in the

Whitehorse Mining District
Yukon Territory

prepared by

Archer, Cathro & Associates (1981) Limited

For

STRATEGIC METALS LTD.
By

H. Burrell, B.Sc., P.Geo.

April 2015

CONTENTS

APPENDICES

Statement of Expenditures
AS 1-32 Mineral Claims
April 10, 2015

Contract Geophysical Survey (including management)

Precision GeoSurveys Inc.	$8,964.27

APPENDIX I

PHYSICAL COPY OF GEOPHYSICAL SURVEY REPORT

Precision GeoSurveys

AIRBORNE GEOPHYSICAL SURVEY REPORT

Airstrip Survey Block
Prepared for Archer, Cathro & Associates (1981) Limited

Jenny Poon, P.Geo.
Precision GeoSurveys Inc.
www.precisiongeosurveys.com
520-355 Burrard St., Vancouver, BC
Canada V6C 2G8
604-484-9402

April 2015

Table of Contents

List of Figures

List of Tables

1.0 Introduction

This report outlines the geophysical survey operations and data processing procedures taken during the high resolution airborne magnetic and radiometric survey flown at the Airstrip survey block for Archer, Cathro & Associates (1981) Limited. The survey area is 85.2 km northwest of Carmacks, Yukon and covers 7.9 km^2, including a 100 m buffer zone around the perimeter of the claim block (Figure 1). The geophysical calibration flight was flown on March 29, 2015 and the survey was started on March 31, 2015 and completed on April 01, 2015.

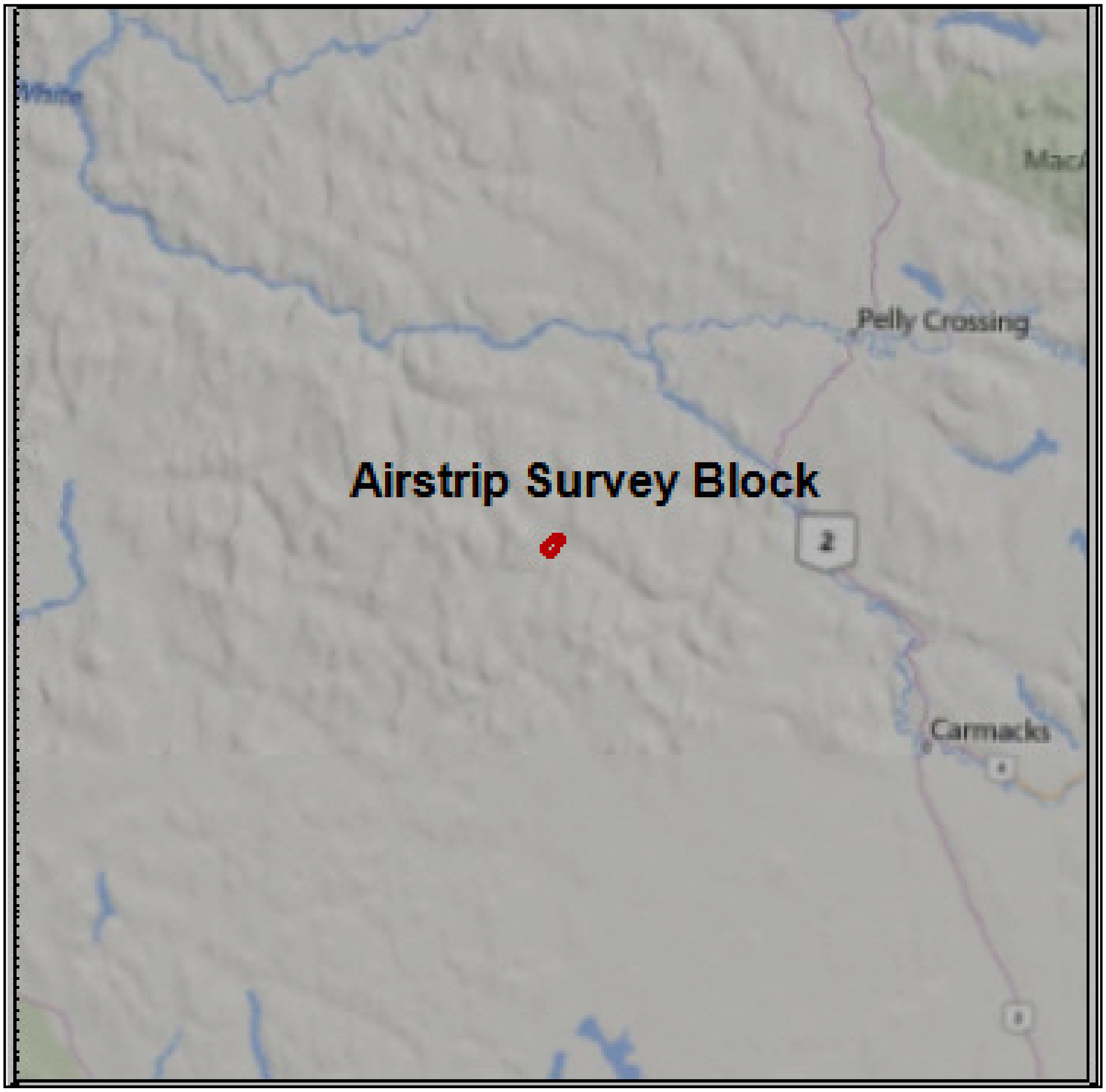


Figure 1: Airstrip survey block location map.

1.1 Survey Area

Airstrip survey block is located approximately 44.0 km southwest of the Minto airstrip, Yukon and is immediately west of the Klondike highway (Figure 2). The Airstrip survey block covers an irregular area of 2.0 km by 3.8 km. The survey plan included 21 survey lines and 5 tie lines at 100 and 900 m spacing respectively for a total of 91 line km.

Figure 2: The Airstrip survey block; boundary outline of the 100 m buffer zone in yellow and the survey block boundary in brown.

The survey was flown at 100 meter spacing at a 035°/215° heading; the tie lines were flown at 900 meter spacing at a heading of 125°/305° (Figures 3 and 4).

Figure 3: Plan View – Airstrip survey block with actual survey and tie lines displayed in red, the 100 m buffer zone outline in yellow, and the block boundary in brown.

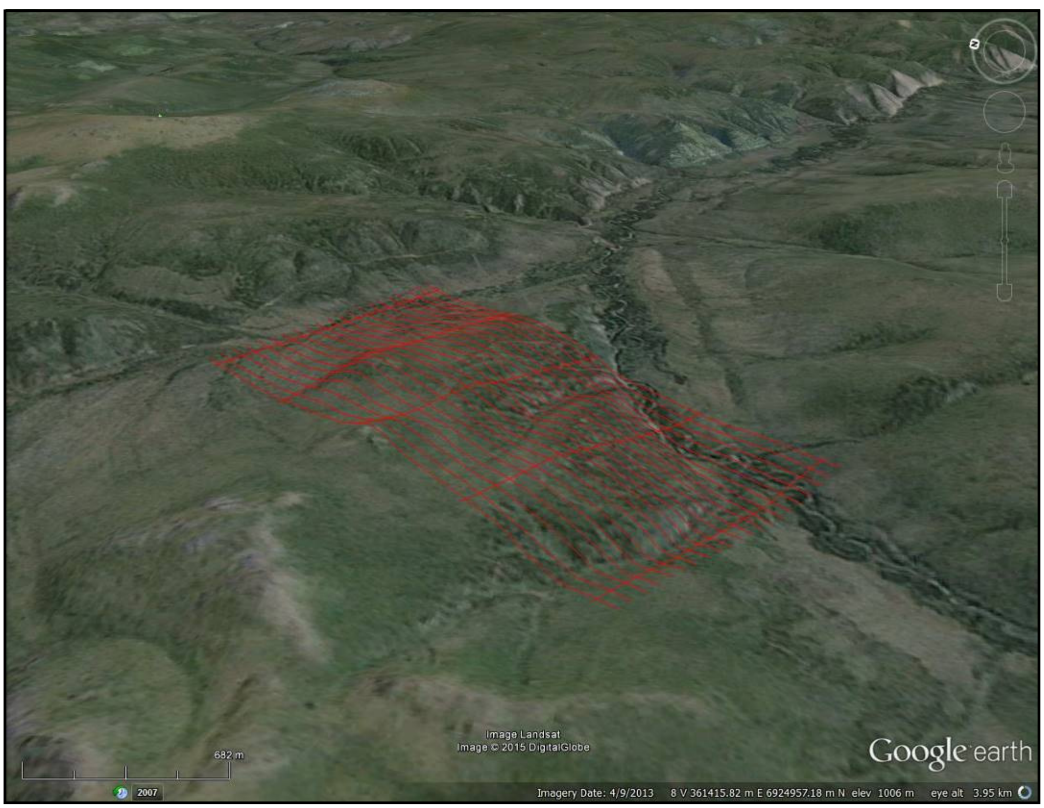


Figure 4: Terrain View – Airstrip survey block with actual survey and tie lines displayed in red.

1.2 Survey Specifications

The geodetic system used for this survey is WGS 84 and the area is contained in zone 8N. A total of 91 line km was flown (Figure 5). The survey data acquisition specifications and coordinates for the survey are specified as follows (Tables 1 and 2).

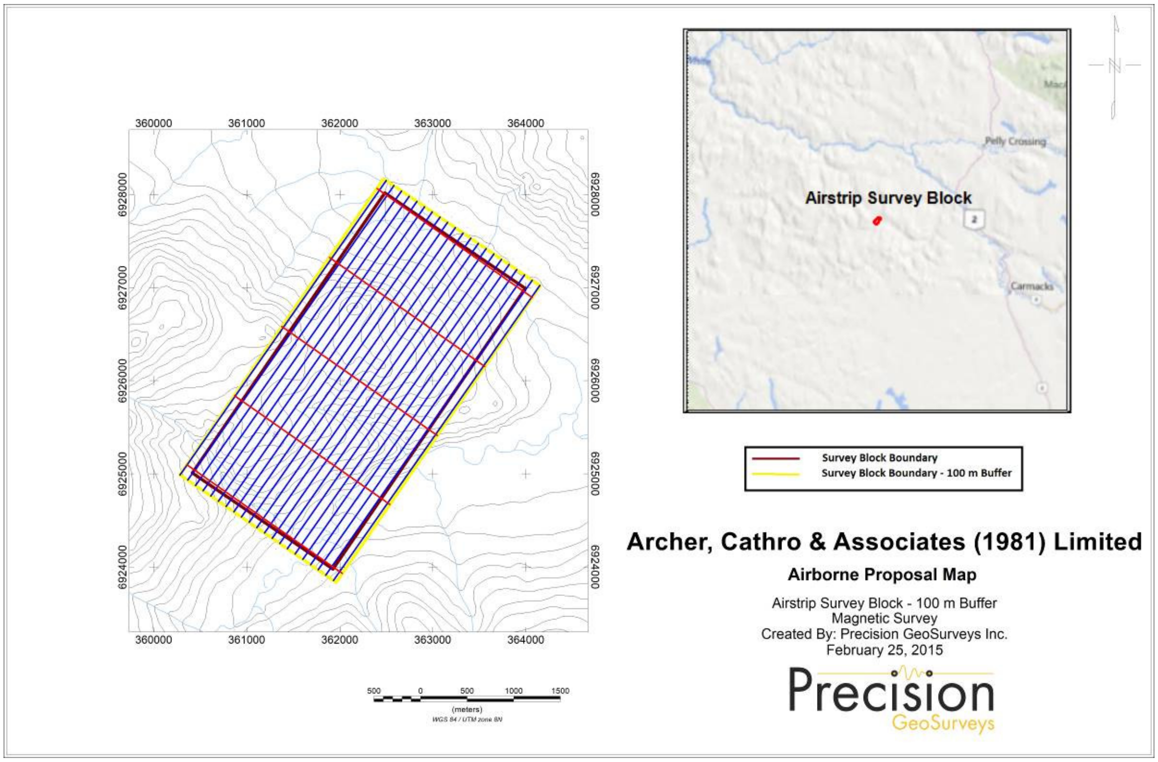


Figure 5: Survey map of Airstrip survey area with 100 m buffer zone showing proposed survey and tie lines. The survey block boundary outline in brown and the 100 m buffer zone outline in yellow.

Block Name (with 100 m Buffer)	Area (km^2)	Line Type	Planned No. of Lines	Planned Line Spacing (m)	Line Orientation	Nominal Survey Height (m)	Actual Survey Height (m)	Total Planned Line km	Total Actual Flown (km)
Airstrip	7.9	Survey	21	100	035°/215°	35	36	81	81
		Tie	5	900	125°/305°	35	35	10	10
		Total:	**26**					**91**	**91**

Table 1: Airstrip survey area flight line specifications.

Longitude	Latitude	Easting	Northing	N/S	E/W
137.66653298	62.45914077	362469	6928169	N	W
137.63303606	62.44945761	364152	6927020	N	W
137.67295439	62.42009159	361958	6923835	N	W
137.70633904	62.42982097	360280	6924990	N	W

Table 2: Airstrip survey block with 100 m buffer zone polygon coordinates using WGS 84 in zone 8N.

2.0 Geophysical Data

Geophysical data are collected in a variety of ways and are used to aid in determination of geology, mineral deposits, oil and gas deposits, geotechnical investigations, contaminated land sites and UXO detection.

For the purposes of this survey, airborne magnetic and radiometric data were collected to serve in the exploration for potential gold deposit.

2.1 Magnetic Data

Magnetic surveying is probably the most common airborne survey type to be conducted for both mineral and hydrocarbon exploration. Aeromagnetic surveys measure and record the total intensity of the magnetic field at the magnetometer sensor, which is a combination of the desired magnetic field generated in the Earth as well as tiny variations due to the temporal effects of the constantly varying solar wind and the magnetic field of the survey aircraft. By subtracting the solar, regional, and aircraft effects, the resulting aeromagnetic map shows the spatial distribution and relative abundance of magnetic minerals (most commonly the iron oxide mineral magnetite) in the upper levels of the Earth's crust. The type of survey specifications, instrumentation, and interpretation procedures depend on the objectives of the survey. Typically magnetic surveys are performed for:

1. Geological Mapping - to aid in mapping lithology, structure and alteration.
2. Depth to Basement Mapping - for exploration in sedimentary basins or mineralization associated with the basement surface.

2.2 Radiometric Data

Radiometric surveys detect and map natural radioactive emanations, called gamma rays, from rocks and soils. All detectable gamma radiation from earth materials come from the natural decay products of three primary elements; uranium (U), thorium (Th), and potassium (K). The purpose of radiometric surveys is to determine either the absolute or relative amounts of U, Th, and K in surface rocks and soils which are then useful in mapping lithology, alteration, and structure.

The presence of vegetation (trees, thick bushes) and/or soil can significantly attenuate gamma radiation signals than compared to the radiation signals measured over bare outcrop. The presence of standing water (lakes, marshes, swamps) and/or snow can also effectively block gamma rays originating from underlying rocks. 10 cm of fresh snow will attenuate gamma rays as effectively as 10 m of air (IAEA, 2003). Therefore, it is very important to evaluate variations in the isotope counts with respect to overburden and snow conditions before they are attributed to changes in the underlying geology.

For this survey, the counts for U, Th, and K isotopes have been masked and significantly attenuated as the ground was covered in variable amounts of snow. Consequently, the effects have reduced the usability of the radiometric data. No corrections have been applied and the radiometric data should therefore be used with discretion.

3.0 Survey Operations

Precision GeoSurveys flew the survey out of Carmacks, Yukon. The experience of the pilot helped to ensure that the data quality objectives were met and that the safety of the flight crew was never compromised given the potential risks involved in airborne geophysical surveying. Field processing and quality control checks were done daily.

3.1 Operations Base and Crew

The base of operation for this survey was at Carmacks airport, Yukon and barrels of fuel were located at the Minto airstrip, Yukon (Figure 6).

Figure 6: Map showing base of operations at Carmacks airport, Yukon and barrels of fuel located at the Minto airstrip, Yukon east of the Airstrip survey block.

The Precision geophysical crew consisted of three members:

Harmen Keyser – Pilot
Rob Radloff – Geophysical operator and electronics technician
Jenny Poon – Geophysicist and data processor

The survey was started on March 31, 2015 and completed on April 01, 2015. The survey did not encounter any delays.

3.2 Base Station Specifications

Base station magnetometers were set up before the survey to record diurnal magnetic variations during the survey flights. In this case, two GEM GSM 19T base stations (Figure 7), GEM 2 (Serial # 2105650) and GEM 4 (Serial # 2065370), were located hidden within the bushes east of the Carmacks airport terminal building (see Table 3 and Figure 8).

Station name	Easting/ Northing	Longitude/ Latitude	Datum/ Projection
GEM 2 (Serial # 2105650)	0437843E, 6887537N	136° 11' 28.5" W 62° 06' 53.17" N	WGS 84, Zone 8N
GEM 4 (Serial # 2065370)	0437847E, 6887538N	136° 11' 28.21" W 62° 06' 53.21" N	WGS 84, Zone 8N

Table 3: Base station specification.

Base station readings were reviewed at regular intervals to ensure that no data were collected during periods with high diurnal activity (greater than 5 nT per minute). The magnetic base stations were installed at a magnetically noise-free area, away from metallic items such as ferromagnetic objects, vehicles, or power lines that could affect the diurnal or survey data.

Figure 7: GEM 2 (left) and GEM 4 (right) magnetic base station locations.

Figure 8: GEM 4 and GEM 2 magnetic base stations hidden within the trees east of Carmacks airport terminal building.

The diurnal magnetic variations recorded by the stationary base station were removed from the magnetic data recorded in flight to ensure that the anomalies seen were real and not due to solar activity.

3.3 Field Processing and Quality Control

On a flight-by-flight basis, the survey data were transferred from the helicopter's data acquisition system onto a USB flash drive and copied onto a field data processing laptop. The raw data files were in PEI binary data format and were converted into Geosoft GDB database format. Using Geosoft Oasis Montaj 8.3.3, the quality of the data was inspected to see if it met the contract specifications (Table 4). Navigational accuracy (left/right or up/down) for all survey and tie lines were within contract specifications (Figure 9), and no re-flights were required due to navigational error. All suspect anomalies, especially those found on a single flight line, were re-flown for confirmation. Re-flight lines were a minimum of 2000 m long, so that survey line re-flights crossed at least two tie lines, and tie line re-flights crossed at least 10 survey lines.

Specification	Parameter	Details
Line Spacing	Position	Flight line deviation from flight path by more than 10 m left/ right for 1 km or more.
Height		Flight line deviation from height by more than 10 up/down with a nominal flight height of 35 m above ground for 1 km or more.
GPS		Any flight lines where 3 or less GPS satellites received for distances of greater than 1 km, provided signal loss is not due to topography.
Diurnal Variations	Magnetics	Non-linear magnetic diurnal variations exceed 10nT from a linear chord of length one (1) minute.
Normalized 4^{th} Difference		Magnetic data exceeding 0.30 nT peak to peak for distances greater than 1 km or more (provided noise is not due to geological or cultural features).

Table 4: Contract re-flight specifications.

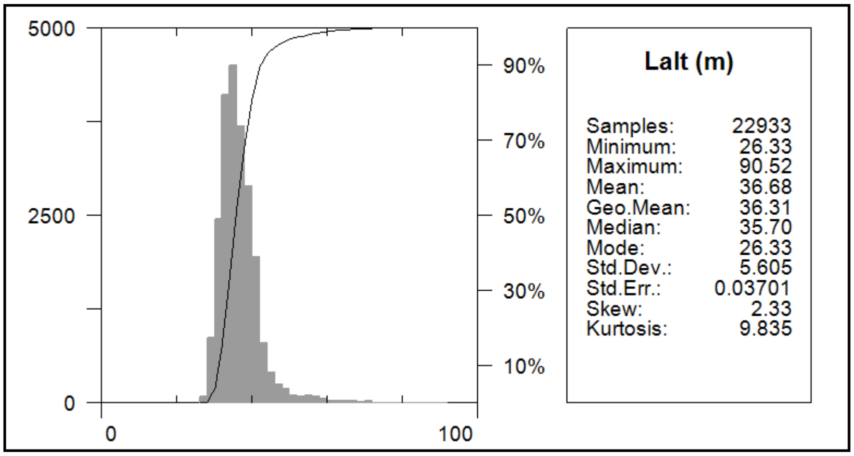


Figure 9: Histogram showing survey elevation vertically above ground.

4.0 Aircraft and Equipment

All geophysical and subsidiary equipment are carefully installed on Precision GeoSurveys aircraft. For this survey, a magnetometer, a spectrometer, a data acquisition system, laser altimeter, magnetic compensation system, a pilot guidance unit (PGU), a GPS navigation system, and magnetic base stations were required to carry out the survey and collect quality, high resolution data. The survey magnetometer was carried in an approved "stinger" configuration to enhance flight safety and improve data quality.

4.1 Aircraft

Precision GeoSurveys flew the Airstrip survey block using a Eurocopter AS350 helicopter (Figure 10), registration C-GOHK. The survey lines were flown at a nominal line spacing of one hundred (100) meters spacing and the tie lines were flown at nine hundred (900) meters spacing for both the magnetometer and spectrometer.

Figure 10: Eurocopter AS350 helicopter equipped with mag stinger for magnetic data acquisition, and internal spectrometer crystals for radiometric data acquisition.

4.2 Equipment

4.2.1 AGIS

The Airborne Geophysical Information System, AGIS, (Figure 11), is the main computer used in data recording, data synchronizing, displaying real-time quality control data for the geophysical operator, and the generation of navigation information for the pilot and operator display system. Information such as magnetic field, total gamma count, counts of various radioelements (K, U, Th, etc.), temperature, cosmic radiation, barometric pressure, atmospheric humidity and survey altitude can all be monitored on the AGIS monitor for immediate quality control.

Figure 11: AGIS operator display installed in the Eurocopter AS350.

The AGIS was manufactured by Pico Envirotec; therefore the system uses standardized Pico software and external sensors are connected to the system via RS-232 serial communication cables. The AGIS data format is converted into Geosoft or ASCII file formats by a conversion program called PEIView. Additional Pico software allows for post or real time magnetic compensation and survey quality control procedures.

4.2.2 Magnetometer

The airborne magnetic sensor used by Precision GeoSurveys is a Scintrex cesium vapor CS-3 magnetometer. The system was housed in a front mounted "stinger" (Figure 12). The CS-3 is a high sensitivity/low noise magnetometer with automatic hemisphere switching and a wide voltage range, the static noise rating for the unit is +/- 0.01 nT. On the AGIS monitor the operator can view the raw magnetic response, the magnetic fourth difference, compensated and uncompensated data, aircraft position, and the survey altitude for immediate QC (quality control) of the magnetic data. The magnetic data are recorded at 10 Hz. A fluxgate magnetic compensator is also used to remove noise created by the movement of the helicopter as it pitches, rolls and yaws within the Earth's geomagnetic field.

Figure 12: View of the mag stinger.

4.2.3 Spectrometer

The IRIS, or Integrated Radiometric Information System, is a fully integrated, gamma radiation detection system containing 8.4 litres of NaI (T1) synthetic downward looking crystals (Figure 13) with 256 channel output at 1 Hz sampling rate. The downward-looking crystals are designed to measure gamma rays from below the aircraft and are equipped with upward-shielding high density RayShield® gamma-attenuating blankets to minimize cosmic and solar gamma noise. Real time data acquisition, navigation and communication tasks are integrated into a single unit that is installed in the rear cabin of the aircraft.

Figure 13: GRS-10 Thallium-activated Sodium Iodide spectrometer crystal pack.

4.2.4 Base Stations

For monitoring and recording of the Earth's diurnal magnetic field variation, Precision GeoSurveys operates two GEM GSM-19T magnetometer base stations continuously throughout the airborne data acquisition operation. The base stations were hidden within the bushes south of Carmacks airport terminal, in a region with low magnetic gradient, to give accurate magnetic field readings. The base stations were located in an area away from electric transmission power lines and moving ferrous objects, such as aircraft and motor vehicles that could affect the survey data integrity.

The GEM GSM-19T magnetometer with integrated GPS (Figure 14) time synchronization uses proton precession technology with a rate of 0.5 Hz sampling rate. The GSM-19T has an accuracy of +/- 0.2 nT at 1 Hz. Base station data are recorded on the internal solid-state memory, and downloaded onto a field laptop computer using a serial cable and GEMLink 5.0 software. Profile plots of the base station readings are generated and updated at the end of each survey day.

Figure 14: GEM GSM-19T proton precession magnetometer.

4.2.5 Laser Altimeter

The pilot is provided with terrain guidance and clearance information from an Opti-Logic RS800 laser altimeter (Figure 15). This is attached at the aft end of the magnetometer boom. The RS800 sensor is a time-of-flight sensor that measures distance by a rapidly-modulated and collimated laser beam that creates a dot on the target surface. The maximum range of the laser altimeter is 700 m off of natural surfaces with an accuracy of +/- 1 meter on 1 x 1 m^2 diffuse target with 50% (+/- 20%) reflectivity. Within the sensor unit, reflected signal light is collected by the lens and focused onto a photodiode. Through serial communications and digital outputs, the ground clearance data are transmitted to an RS-232 compatible port and recorded and displayed by the AGIS and PGU at 10 Hz in meters.

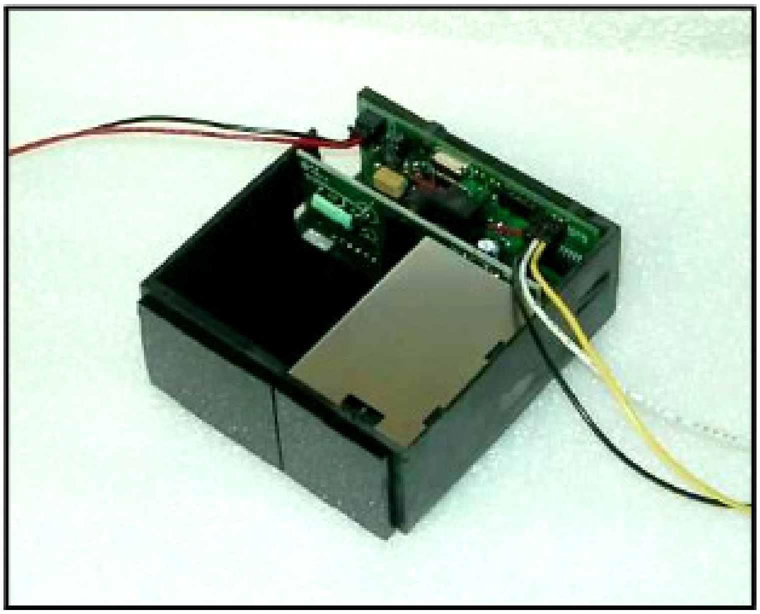


Figure 15: Opti-Logic RS800 laser altimeter.

4.2.6 Pilot Guidance Unit

The PGU (Pilot Guidance Unit) is a graphical display type unit that provides continuous steering and elevation information to the pilot (Figure 16). It is mounted remotely from the data system on top of the helicopter's instrument panel. The PGU assists the pilot in keeping the helicopter on the flight path and at the desired ground clearance.

Figure 16: Pilot Guidance Unit.

The LCD monitor measures 7 inches, with a full VGA 800 x 600 pixel display. The CPU for the PGU is housed in the PC-104 console and uses Windows XP Embedded operating system control, with input from the GPS antenna, laser altimeter, and AGIS.

4.2.7 GPS Navigation System

A Hemisphere R220 GPS receiver (Figure 17) navigation system integrated with the pilot display (PGU) and AGIS provided navigational information and control. The R220 GPS receiver features RTK (Real Time Kinematic) for fast, reliable, and long range centimeter level performance. It employs COAST technology that allows continuous operation for at least 40 minutes during temporary signal outages.

Figure 17: Hemisphere R220 GPS Receiver.

It can track GPS, SBAS (Satellite-Based Augmentation System), and L-Band (OmniSTAR HP and XP) differential corrections to provide high precision positioning.

5.0 Data Acquisition Equipment Checks and Calibration

Airborne equipment tests were conducted at the start of the survey. There are three tests conducted for the airborne magnetometer: compensation flight, lag test, and heading error test.

5.1 Magnetometer Checks

5.1.1 Compensation Flight Test

During aeromagnetic surveying a small but significant amount of noise is introduced to the magnetic data by the aircraft itself, as the magnetometer is within the helicopter's magnetic field. Movement of the aircraft (roll, pitch and yaw) and the permanent magnetization of certain aircraft parts (engine and other ferrous magnetic objects) contribute to this noise. To remove noise generated by the aircraft a process called magnetic compensation is implemented. The magnetic compensation process starts with a test flight at the beginning of the survey where the aircraft flies in the four orthogonal headings required for the survey (035°/215° and 125°/305° in the case of this survey) at a sufficient altitude (typically > 1,500 m AGL) where the Earth's magnetic field becomes nearly uniform at the scale of the compensation flight. In each heading direction, three specified roll, pitch, and yaw maneuvers are performed by the pilot at constant elevation so that any magnetic variation recorded by the airborne magnetometer can be attributed to the aircraft movement. The variations recorded by these maneuvers provide the data that are required to calculate the necessary parameters for compensating the magnetic data and removing the aircraft noise.

Pre-Compensation					**Post-Compensation**				
Heading	**Roll**	**Pitch**	**Yaw**	**Total**	**Heading**	**Roll**	**Pitch**	**Yaw**	**Total**
031	7.5957	1.4943	2.9032	11.9932	031	0.3269	0.2903	0.3423	0.9595
123	11.4615	4.5540	2.1899	18.2054	123	0.2452	0.2517	0.2606	0.7575
206	6.6827	5.8345	2.3909	14.9081	206	0.2548	0.3350	0.3214	0.9112
303	6.9083	3.0008	1.6292	11.5383	303	0.2824	0.3549	0.2918	0.9291
Total	32.6482	14.8836	9.1132		**Total**	1.1093	1.2319	1.2161	
FOM = 56.6450 nT					**FOM = 3.5573 nT**				

Table 5: Figure of Merit maneuver test results for compensation flight flown on March 29, 2015 at an area 25 km north of Whitehorse, Yukon.

5.1.2 Lag Test

A lag test was performed to determine the relationship between the time the digital reading was recorded by the instrument magnetic sensor and the time for the position fix that the fiducial of the reading was obtained by the GPS system.

The test was flown in the four orthogonal headings over an identifiable magnetic anomaly (ie. Truck, Trailer, etc.) at survey speed and height. A lag of 7 fiducials (0.7 seconds) was determined from the lag test.

5.1.3 Heading Error Test

To determine the magnetic heading effect a cloverleaf pattern flight test was conducted. The cloverleaf test was flown in the same orthogonal headings as the survey and tie lines (056°/236° and 146°/326°) at >1000 m AGL in an area with low magnetic gradient. For all four directions the survey helicopter must pass over the same mid-point all four times at the same elevation (Table 6 and Figure 18).

Line Number	Fiducials	Heading	Mag (nT)	Average (nT)
L035	1162.4	NEN – 035°	56535.6810	
L125	635.9	SEE – 125°	56544.2596	
L215	973.0	SWS - 215°	56527.1216	
L305	848.0	NWW - 305°	56511.7362	
				56529.6996

Table 6: Heading error test data format flown on March 29, 2015 north of Whitehorse, Yukon.

```
/Geosoft Heading Correction Table

/
/=Direction:real:i
/=Correction:real
/
/Direction Correction
 035    -5.9814
 125    -14.56
 215    +2.578
 305    +17.9634
```

Figure 18: Heading data results in .tbl format in Geosoft table.

6.0 Data Processing

After all the data were collected from a survey flight several procedures were undertaken to ensure that the data met a high standard of quality. All data were processed using Pico Envirotec software and Geosoft Oasis Montaj 8.3.3 geophysical processing software along with proprietary processing algorithms.

6.1 Magnetic Processing

The data obtained from the compensation flight test were applied to the raw magnetic data before any further processing and editing. A computer program called PEIComp was used to create a model from the compensation flight test for each survey to remove the noise induced by aircraft movement; this model was applied to each survey flight so the data could be further processed.

Over glassy water or fog, the laser altimeter (converted from yards to meter) is unable to record a valid reading and a zero is recorded; therefore all data points recorded at zero were replaced with a nominal height of 35 m. Filtering was then applied to the laser altimeter data to remove vegetation clutter and to show the actual ground clearance. To remove vegetation clutter a Rolling Statistic filter was applied to the laser altimeter data and a low pass filter was used to smooth out the laser altimeter profile to eliminate isolated noise. As a result, filtering the data will yield a more uniform surface in close conformance with the actual terrain. A digital terrain model channel was calculated by subtracting the filtered laser altimeter data from the filtered GPS altimeter data defined by the WGS 84 ellipsoidal height.

The processing of the magnetic data first involved the correction for diurnal variations. The base station data that were used for the correction came from GEM 4. The diurnal data were edited, plotted and merged into a Geosoft (.gdb) database on a daily basis. The airborne magnetic data were corrected for diurnal variations by subtracting the observed magnetic base station deviations. Following the diurnal correction, a lag correction was applied. A lag correction of 0.7 seconds was applied to the total magnetic field data to compensate for the combination of lag in the recording system and the magnetometer sensor flying 15.2 m ahead of the GPS antenna. Lastly, a heading correction was applied to the data. As a result, after all corrections have been applied the initial Total Magnetic Intensity (TMI) data was generated.

The initial Total Magnetic Intensity (TMI) data from the survey and tie lines were used to level the entire survey dataset. Two forms of leveling were applied to the corrected data: conventional leveling and micro-leveling. There were two components to conventional leveling; the first involved statistical leveling of magnetic data to correct miss ties (intersection errors) followed by specific patterns or trends. For the second component, tie lines were brought to a common regional base value using the mean value of the cross-level error. To obtain the best possible leveled data, individual corrections were edited at selected intersections. Lastly, micro-leveling was applied to the corrected conventional leveled data. This will remove any residual noise related to flight line direction, and any low amplitude component of flight line noise, that still remained in the data after tie line leveling.

6.1.1 IGRF Removal and Calculation of the First Vertical Derivative

The International Geomagnetic Reference Field (IGRF) model is the empirical representation of the Earth's magnetic field (main core field without external sources) collected and disseminated from satellites and from observatories around the world. The IGRF is generally revised and updated every five years by a group of modelers associated with the International Association of Geomagnetism and Aeronomy (IAGA). In this case, the IGRF values were calculated from the recently updated model (IGRF – 12) year 2015 and the actual survey dates were obtained from the "Date" channel.

With the removal of the IGRF from the observed Total Magnetic Intensity (TMI) a Residual Magnetic Intensity (RMI) was generated. This created a more valid model of individual near surface anomalies and the data will not be referenced to a time which can be easily incorporated into databases of magnetic data acquired in the past or in the future.

The first vertical derivative was computed from the Total Magnetic Intensity (TMI) data. Long wavelengths and vertical rate of change were suppressed in the magnetic field. Therefore, the edges of magnetic anomalies were highlighted and spatial resolution was increased.

7.0 Deliverables

All digital data are presented on a compact disc (CD) and USB memory stick with the logistic report. The survey data are presented as digital databases, maps, and a report.

7.1 Digital Data

The file format will be provided in two (2) formats, the first will be a .GDB file for use in Geosoft Oasis Montaj, the second format will be a .XYZ file, this is text file. A complete file provided in each format will contain magnetic and radiometric data separately. Full description of the digital data and contents are included in the report (Appendix B).

The digital data are represented into grids. The following grids are prepared for the Airstrip survey block at 25 m cell size listed below:

- Digital terrain model (DTM)
- Total magnetic intensity (TMI)
- Residual magnetic intensity (RMI) – removal of IGRF from TMI
- Calculated vertical gradient (CVG) - first vertical derivative of TMI
- Raw Potassium (rawK) – uncorrected radiometric data in counts/sec
- Raw Thorium (rawTh) - uncorrected radiometric data in counts/sec

- Raw Uranium (rawU) - uncorrected radiometric data in counts/sec
- Raw Total count (rawTC) – uncorrected radiometric data in counts/sec

7.2 KMZ Grids

The digital data represented into grids were exported into kmz files which can be displayed using Google Earth. The grids can be draped onto topography and rendered to give a 3D view.

7.3 Maps

Digital maps were created for the Airstrip survey block. The following map products were prepared:

Survey Overview Maps (colour images with elevation contour lines):

- Actual flight lines
- Digital terrain model

Magnetic Maps (colour images with elevation contour lines):

- Total magnetic intensity
- Total magnetic intensity with plotted flight lines
- Residual magnetic intensity
- Calculated vertical gradient of the total magnetic intensity

Radiometric Maps (colour images with elevation contour lines):

- Raw Potassium – counts/sec
- Raw Thorium – counts/sec
- Raw Uranium – counts/sec
- Raw Total Count – counts/sec

All maps were prepared in WGS 84 and UTM zone 8N.

7.4 Report

The logistics report provides information on the acquisition procedures, magnetic processing, and presentation of the Airstrip survey block data. A pdf copy of the report is included along with the digital data and maps that are provided on the CD and USB stick.

Appendix A

Equipment Specifications

- GEM GSM-19T Proton Precession Magnetometer (Base Station)
- Hemisphere R220 GPS Receiver
- Opti-Logic RS800 Laser Altimeter
- Scintrex CS-3 Survey Magnetometer
- Bartington Mag-03 three-axis fluxgate magnetic field sensor
- Pico Envirotec GRS-10 Gamma Spectrometer
- Pico Envirotec AGIS data recorder system (for Navigation, Gamma spectrometer, VLF-EM and Magnetometer Data Acquisition)

GEM GSM-19T Proton Precession Magnetometer (Base Station) Specifications

Configuration Options	15
Cycle Time	999 sec to 0.5 sec
Environmental	-40°C to +60°C
Gradient Tolerance	7,000 nT/m
Magnetic Readings	299,593
Operating Range	10, 000 to 120,000 nT
Power	12 V @ 0.62 A
Sensitivity	0.1 nT @ 1 sec
Weight (Console/ Sensor)	3.2 Kg
Integrated GPS	Yes

Hemisphere R220 GPS Receiver Specifications

GPS Sensor	Receiver Type	L1 and L2 RTK with carrier phase	
	Channels	12 L1CA GPS 12 L1P GPS 12 L2P GPS 3 SBAS or 3 additional L1CA GPS	
	Update Rate	10 Hz standard, 20 Hz available	
	Cold Start Time	<60 s	
	Warm Start Time 1	30 s (valid ephemeris)	
	Warm Start Time 2	30 s (almanac and RTC)	
	Hot Start Time	10 s typical (valid ephemeris and RTC)	
	Reacquisition	<1 s	
	Differential Options	SBAS, Autonomous, External RTCM, RTK, OmniSTAR (HP/XP)	
Horizontal Accuracy		RMS (67%)	2DRMS (95%)
	RTK [1, 2]	10 mm + 1 ppm	20 mm+2 ppm
	OmniSTAR HP [1, 3]	0.1 m	0.2 m
	SBAS (WAAS) [1]	0.3 m	0.6 m
	Autonomous, no SA [1]	1.2 m	2.5 m
L-Band Sensor	Channel	Single channel	
	Frequency Range	1530 MHz to 1560 MHz	
	Satellite Selection	Manual or Automatic (based on location)	
	Startup and Satellite Reacquisition Time	15 seconds typical	
Communications	Serial Ports	2 full duplex RS232	
	Baud Rates	4800 – 115200	
	USB Ports	1 Communications, 1 Flash Drive data storage	
	Correction I/O Protocol	Hemisphere GPS proprietary, RTCM v2.3 (DGPS), RTCM v3 (RTK), CMR, CMR+NMEA 0183, Hemisphere GPS binary	
	Timing Output	1 PPS (HCMOS, active high, rising edge sync, 10kΩ, 10pF load)	
	Event Marker Input	HCMOS, active low, falling edge sync, 10kΩ	
Environmental	Operating Temperature	-30°C to +65°C	
	Storage Temperature	-40°C to +85°C	
	Humidity	95% non-condensing	
Power GPS Sensor	Input Voltage Range	8 to 36 VDC	
	Consumption, RTK	<4.9W (0.40A @ 12 VDC typical)	
	Consumption, OmniSTAR	<5.5W (0.46A @ 12 VDC typical)	

[1]Depends on multipath environment, number of satellites in view, satellite geometry and ionospheric activity.
[2] Depends also on baseline length.
[3] Requires a subscription from OmniSTAR.

Opti-Logic RS800 Laser Altimeter Specifications

Accuracy	+/- 1m on 1x1 m^2 diffuse target with 50% reflectivity
Resolution	0.2 m
Communication Protocol	RS232-8,N,1
Baud Rate	19200
Data Raw Counts	~200 Hz
Data Calibrated Range	~10 Hz
Calibrated Range Units	Feet, Meters, Yards
Laser	Class I (eye-safe) 905nm +/- 10nm
Power	7-9VDC conditioned required, current draw at full power (~ 1.8W)
Laser Wavelength	RS100 905 nm +/- 10 nm
Laser Divergence	Vertical axis – 3.5 mrad half- angle divergence; Horizontal axis – 1 mrad half- angle divergence; (Approximate beam footprint at 100 m is 35 cm x 5 cm)
Data Rate	~200 Hz raw counts for un-calibrated operation; ~10 Hz for calibrated operation (averaging algorithm seeks 8 good readings)
Dimensions	32 x 78 x 84 mm (lens face cross section is 32 x 78 mm)
Weight	< 227 g (8oz)
Casing	RS100/RS400/RS800 units are supplied as OEM modules consisting of an open chassis containing optics and circuit boards. Custom housings can be designed and built on request.

Scintrex CS-3 Magnetometer Specifications

Operating Principal	Self-oscillation split-beam Cesium Vapor (non-radioactive Cs-133)
Operating Range	15,000 to 105,000 nT
Gradient Tolerance	40,000 nT/metre
Operating Zones	10° to 85° and 95° to 170°
Hemisphere Switching	a) Automatic b) Electronic control actuated by the control voltage levels (TTL/CMOS) c) Manual
Sensitivity	0.0006 nT √Hz rms
Noise Envelope	Typically 0.002 nT P-P, 0.1 to 1 Hz bandwidth
Heading Error	+/- 0.25 nT (inside the optical axis to the field direction angle range 15° to 75° and 105° to 165°)
Absolute Accuracy	<2.5 nT throughout range
Output	a) Continuous signal at the Larmor frequency which is proportional to the magnetic field (proportionality constant 3.49857 Hz/nT) sine wave signal amplitude modulated on the power supply voltage b) Square wave signal at the I/O connector, TTL/CMOS compatible
Information Bandwidth	Only limited by the magnetometer processor used
Sensor Head	Diameter: 63 mm (2.5") Length: 160 mm (6.3") Weight: 1.15 kg (2.6 lb)
Sensor Electronics	Diameter: 63 mm (2.5") Length: 350 mm (13.8") Weight: 1.5 kg (3.3 lb)
Cable, Sensor to Sensor Electronics	3m (9' 8"), lengths up to 5m (16' 4") available
Operating Temperature	-40°C to +50°C
Humidity	Up to 100%, splash proof
Supply Power	24 to 35 Volts DC
Supply Current	Approx. 1.5A at start up, decreasing to 0.5A at 20°C
Power Up Time	Less than 15 minutes at -30°C

Bartington Mag-03 three-axis fluxgate magnetic field sensor Specifications

Number of Axes	3
Bandwidth	0 to 3kHz at 50µT peak
Internal Noise	Basic version: >10 to 20pTrms/√Hz at 1Hz Standard version: 6 to ≤10pTrms/√Hz at 1Hz Low Noise version: <6pTrms/√Hz at 1Hz
Scaling error (DC)	<±0.5%
Orthogonality error	<0.1°
Alignment error (Z axis to reference face)	<0.1°
Linearity error	<0.0015%
Frequency response	0 to 1kHz maximally flat, ±5% maximum at 1kHz
Input voltage	±12V to ±17V
Supply current	+30mA, -10mA (+1.4mA per 100µT for each axis)
Power supply rejection ratio	5µV/V (-106dB)
Analog output	±10V (±12V supply) swings to within 0.5V of supply voltage
Output impedance	10 Ω
Operating temperature range	-40°C to +70°C
Environmental protection	IP51
Dimensions (W x H x L)	32 x 32 x 152mm
Weight	160g
Enclosure material	Reinforced epoxy
Connector	ITT Cannon DEM-9P-NMB
Mating connector	ITT Cannon DEM-9S-NMB
Mounting	2 x M5 fixing holes

Pico Envirotec GRS-10 Gamma Spectrometer Specifications

Crystal volume	8.4 litres of NaI (T1) synthetic downward looking crystals
Resolution	256/512 channels
Tuning	Automatic using peak determination algorithm
Detector	Digital Peak
Calibration	Fully automated detector
Real Time	Linearization and gain stabilization
Communication	RS232
Detectors	Expandable to 10 detectors and digital peak
Count Rate	Up to 60,000 cps per detector
Count Capacity per channel	65545
Energy detection range:	36 KeV to 3 MeV
Cosmic channel	Above 3 MeV
Upward Shielding	RayShield® non-radioactive shielding on downward looking crystals
Spectra	Collected spectra of 256/512 channels, internal spectrum resolution 1024
Software	Calibration: High voltage adjustment, linearity correction coefficients calculation, and communication test support Real Time Data Collection: Automatic Gain real time control on natural isotopes, and PC based test and calibration software suite
Sensor	Each box containing two (2) gamma detection NaI(Tl) crystals – each 4.2 liters. (256 cu in.) (approx. 100 x 100 x 650 mm) Total volume of approx 8.4 litres or 512 cu in with detector electronics
Spectra Stabilization	Real time automatic corrections on radio nuclei: Th, Ur, K. No implanted sources

Pico Envirotec AGIS data recorder system Specifications

(for Navigation, Gamma spectrometer, VLF-EM and Magnetometer Data Acquisition)

Functions	Airborne Geophysical Information System (AGIS) with integrated Global Positioning System Receiver (GPS) and all necessary navigation guidance software. Inputs for geophysical sensors - portable gamma ray spectrometer GRS-10, MMS4 Magnetometer, Totem 2A EM, A/D converter, temperature probe, humidity probe, barometric pressure probe, and laser altimeter. Output for the multi-parameter PGU (Pilot Guidance Unit)
Display	Touch screen with display of 800 x 600 pixels; customized keypad and operator keyboard. Multi-screen options for real-time viewing of all data inputs, fiducial points, flight line tracking, and GPS channels by operator.
GPS Navigation	Garmin 12-channel, WAAS-enabled
Data Sampling	Sensor dependent
Data Synchronization	Synchronized to GPS position
Data File	PEI Binary data format
Storage	80 GB
Supplied Software	PEIView: Allows fast data Quality Control (Airstrip) Data Format: Geosoft GBN and ASCII output PEIConv: For survey preparation and survey plot after data acquisition
Software	Calibration: High voltage adjustment, linearity correction coefficients calculation, and communication test support Real Time Data Collection: Automatic Gain real time control on natural isotopes and PC based test and calibration software suite
Power Requirements	24 to 32 VDC
Temperature	Operating:-10°C to +55°C; storage:-20°C to +70°C

Appendix B

Digital File Descriptions

- Magnetic database description
- Radiometric database description
- Grids
- Maps

Magnetic Database:

Abbreviations used in the GDB files listed below:

Channel	Units	Description
X_WGS84	m	UTM Easting – WGS 84 Zone 8 North
Y_WGS84	m	UTM Northing – WGS 84 Zone 8 North
Lon_deg	deg	Longitude
Lat_deg	deg	Latitude
Date	yyyy/mm/dd	Dates of the survey flight(s)
FLT		Flight Line numbers
LineNo		Line numbers
STL		Number of satellite(s)
GPSfix		GPS fix
GPStime	Hours:min:secs	GPS time (UTC)
Geos_m	m	Geoidal separation
GHead_deg	deg	Heading of the helicopter
XTE_m	m	Flight line cross distance
Galt	m	GPS height – WGS 84 Zone 8 North
Lalt	m	Laser Altimeter readings
DTM	m	Digital Terrain Model
basemag	nT	Base station diurnal data
IGRF		International Geomagnetic Reference Field 2015
Declin	Decimal deg	Calculated declination of magnetic field
Inclin	Decimal deg	Calculated inclination of magnetic field
TMI	nT	Total Magnetic Intensity
RMI	nT	Residual Magnetic Intensity

Radiometric Database:

Abbreviations used in the GDB files listed below:

Channel	Units	Description
X_WGS84	m	UTM Easting – WGS 84 Zone 8 North
Y_WGS84	m	UTM Northing – WGS 84 Zone 8 North
Lon_deg	deg	Longitude
Lat_deg	deg	Latitude
Date	yyyy/mm/dd	Dates of the survey flight(s)
FLT		Flight numbers
LineNo		Line numbers
STL		Number of satellite(s)
GPStime	Hours:min:secs	GPS time (UTC)
Geos_m	m	Geoidal separation
GPSFix		GPS fix
GHead_deg	deg	Heading of the helicopter
XTE_m	m	Flight line cross distance
Galt	m	GPS height – WGS 84 Zone 8 North
Lalt	m	Laser Altimeter readings
DTM	m	Digital Terrain Model
BaroSTP_kP	KiloPascal	Barometric Altitude (Press and Temp Corrected)
Temp_degC	Degrees C	Air Temperature
Press_kP	KiloPascal	Atmospheric Pressure
Cos_cps	counts/sec	Raw Cosmic
Cs_cps	counts/sec	Raw Cesium
K_cps	counts/sec	Raw Potassium
Th_cps	counts/sec	Raw Thorium
U_cps	counts/sec	Raw Uranium
TC_cps	counts/sec	Raw Total Count

Grids: Airstrip survey block, WGS 84 Datum, Zone 8N

FILE NAME	DESCRIPTION
Airstrip_SurveyBlock_DTM_25m.grd	Airstrip survey block digital terrain model gridded at 25 m cell size
Airstrip_SurveyBlock_TMI_25m.grd	Airstrip survey block total magnetic intensity gridded at 25 m cell size
Airstrip_SurveyBlock_RMI_25m.grd	Airstrip survey block residual magnetic intensity gridded at 25 m cell size
Airstrip_SurveyBlock_CVG_25m.grd	Airstrip survey block calculated vertical gradient of TMI gridded at 25 m cell size
Airstrip_SurveyBlock_rawK_25m.grd	Airstrip survey block raw potassium (rawK) in counts/sec gridded at 25 m cell size
Airstrip_SurveyBlock_rawTh_25m.grd	Airstrip survey block raw Thorium (rawTh) in counts/sec gridded at 25 m cell size
Airstrip_SurveyBlock_rawU_25m.grd	Airstrip survey block Uranium (rawU) in counts/sec gridded at 25 m cell size
Airstrip_SurveyBlock_rawTC_25m.grd	Airstrip survey block Total Count (rawTC) in counts/sec gridded at 25 m cell size

Maps: Airstrip survey block, WGS 84 Datum, Zone 8N (jpegs and pdfs)

FILE NAME	DESCRIPTION
Airstrip_SurveyBlock_ActualFlightLines_25m	Airstrip survey block plotted actual flown flight lines
Airstrip_SurveyBlock_DTM_25m	Airstrip survey block digital terrain model gridded at 25 m cell size
Airstrip_SurveyBlock_TMI_25m	Airstrip survey block total magnetic intensity gridded at 25 m cell size
Airstrip_SurveyBlock_TMI_with_FlightLines_25m	Airstrip survey block total magnetic intensity with plotted actual flight lines gridded at 25 m cell size
Airstrip_SurveyBlock_RMI_25m	Airstrip survey block residual magnetic intensity gridded at 25 m cell size
Airstrip_SurveyBlock_CVG_25m	Airstrip survey block calculated vertical gradient of TMI gridded at 25 m cell size
Airstrip_SurveyBlock_rawK_25m	Airstrip survey block raw potassium (rawK) in counts/sec gridded at 25 m cell size
Airstrip_SurveyBlock_rawTh_25m	Airstrip survey block raw Thorium (rawTh) in counts/sec gridded at 25 m cell size
Airstrip_SurveyBlock_rawU_25m	Airstrip survey block raw Uranium (rawU) in counts/sec gridded at 25 m cell size
Airstrip_SurveyBlock_rawTC_25m	Airstrip survey block raw Total Count (rawTC) in counts/sec gridded at 25 m cell size

Appendix C

Airstrip Survey Block Maps

Survey Overview Maps (colour image with elevation contour lines):

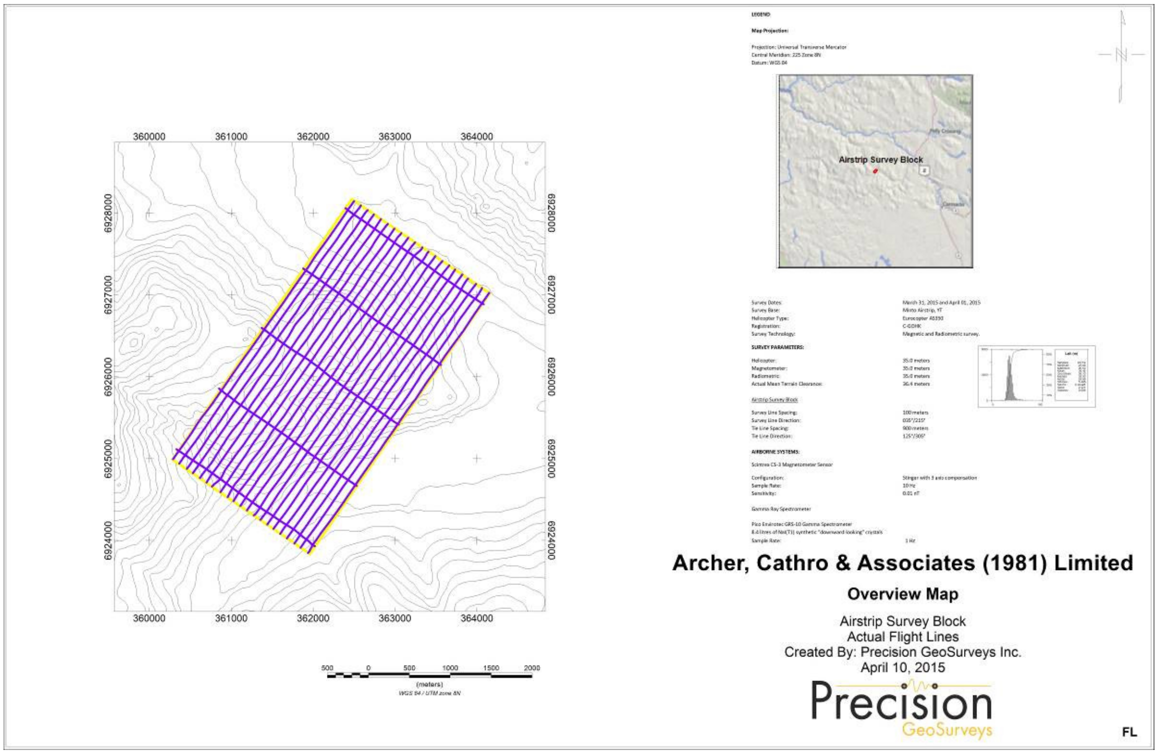
- Flight Lines (FL)
- Digital Terrain Model (DTM)

Magnetic Maps (colour image with elevation contour lines):

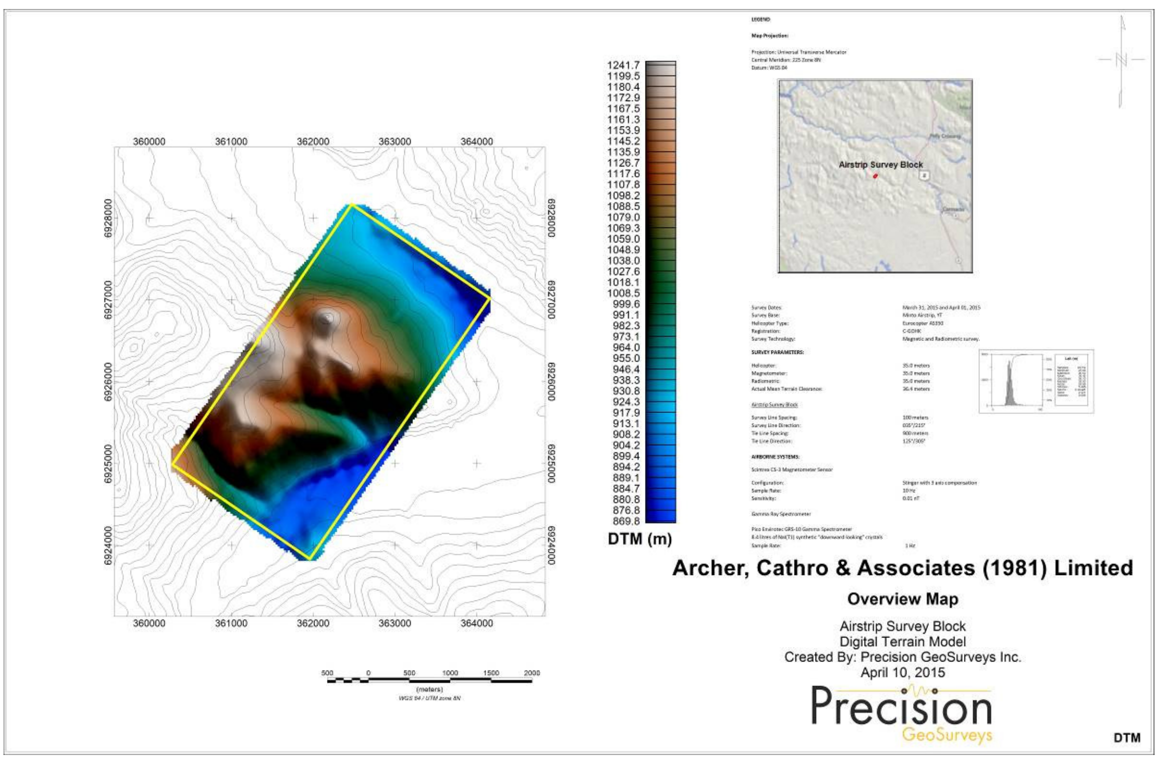
- Total Magnetic Intensity (TMI)
- Total Magnetic Intensity (TMI_wFL) with flight lines
- Residual Magnetic Intensity (RMI)
- Calculated Vertical Gradient (CVG) of TMI

Radiometric Maps (colour image with elevation contour lines):

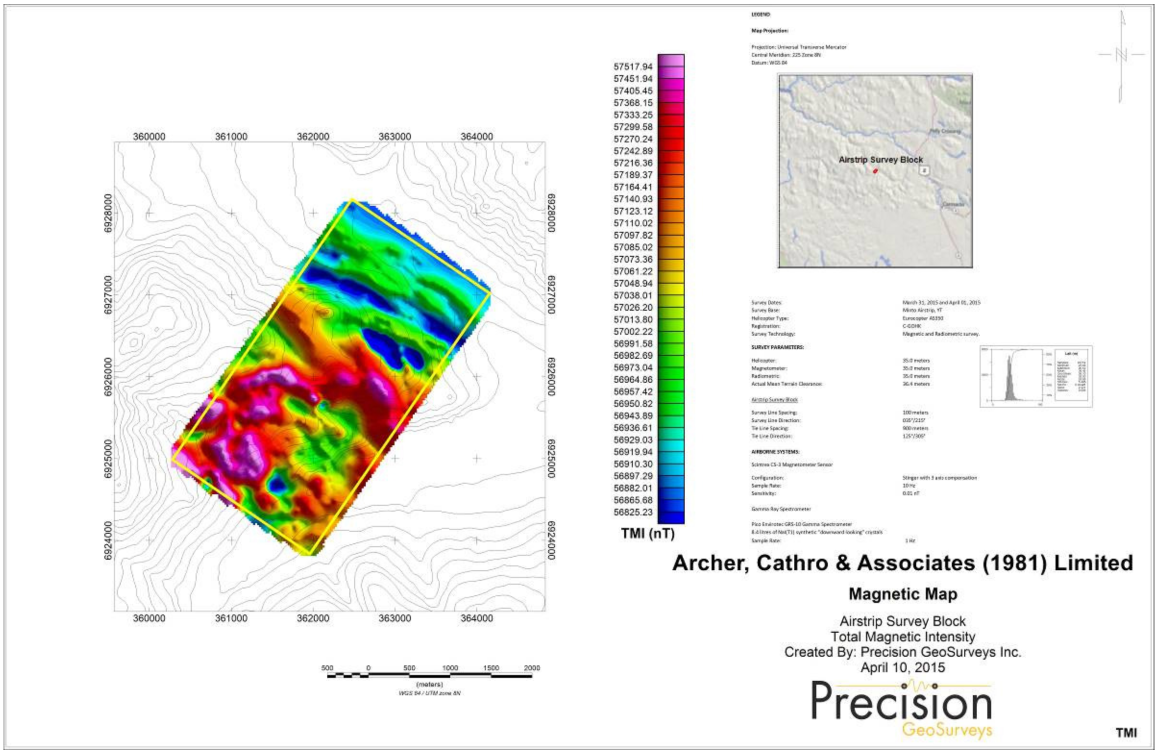
- Raw Potassium – counts/sec (rawK)
- Raw Thorium – counts/sec (rawTh)
- Raw Uranium – counts/sec (rawU)
- Raw Total Count – counts/sec (rawTC)



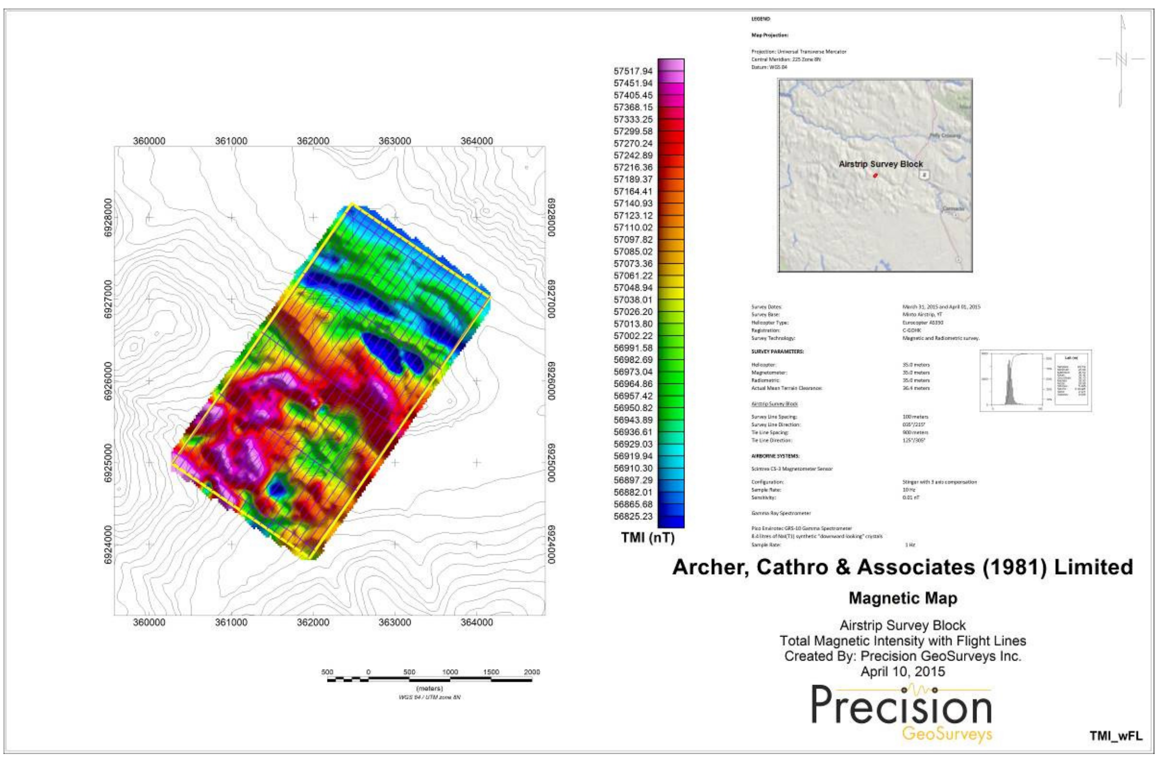
Map 1: Airstrip survey block actual flight lines.



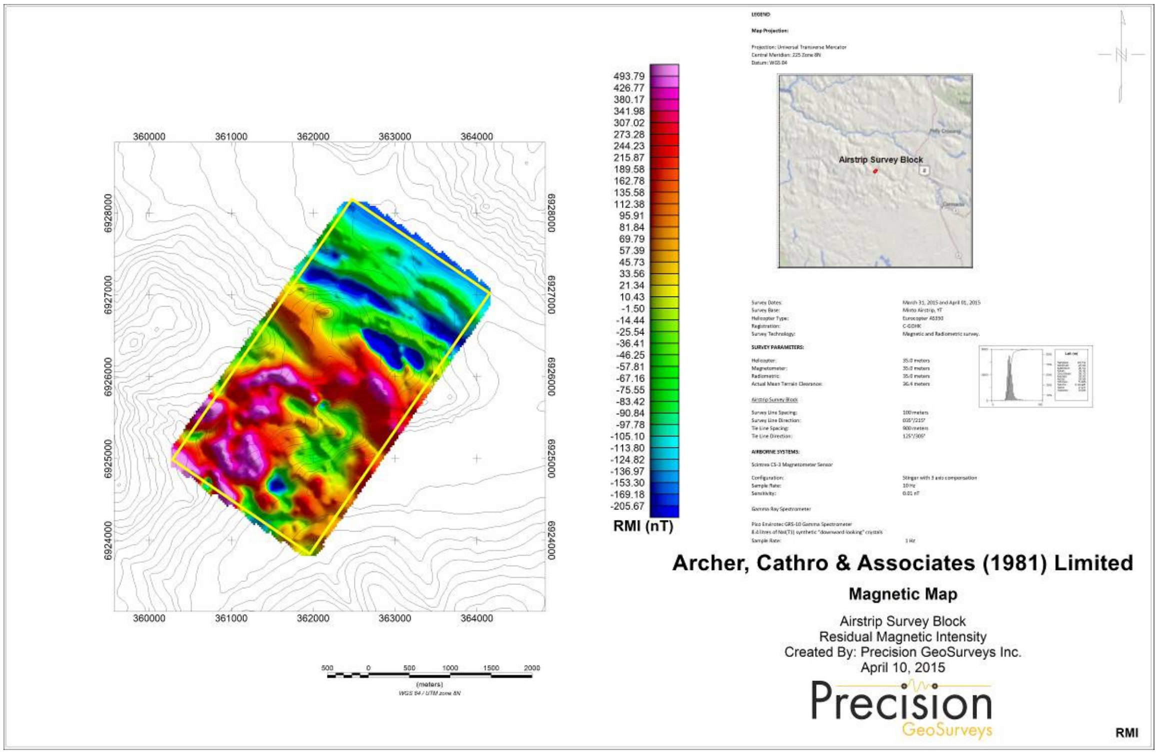
Map 2: Airstrip survey block digital terrain model.



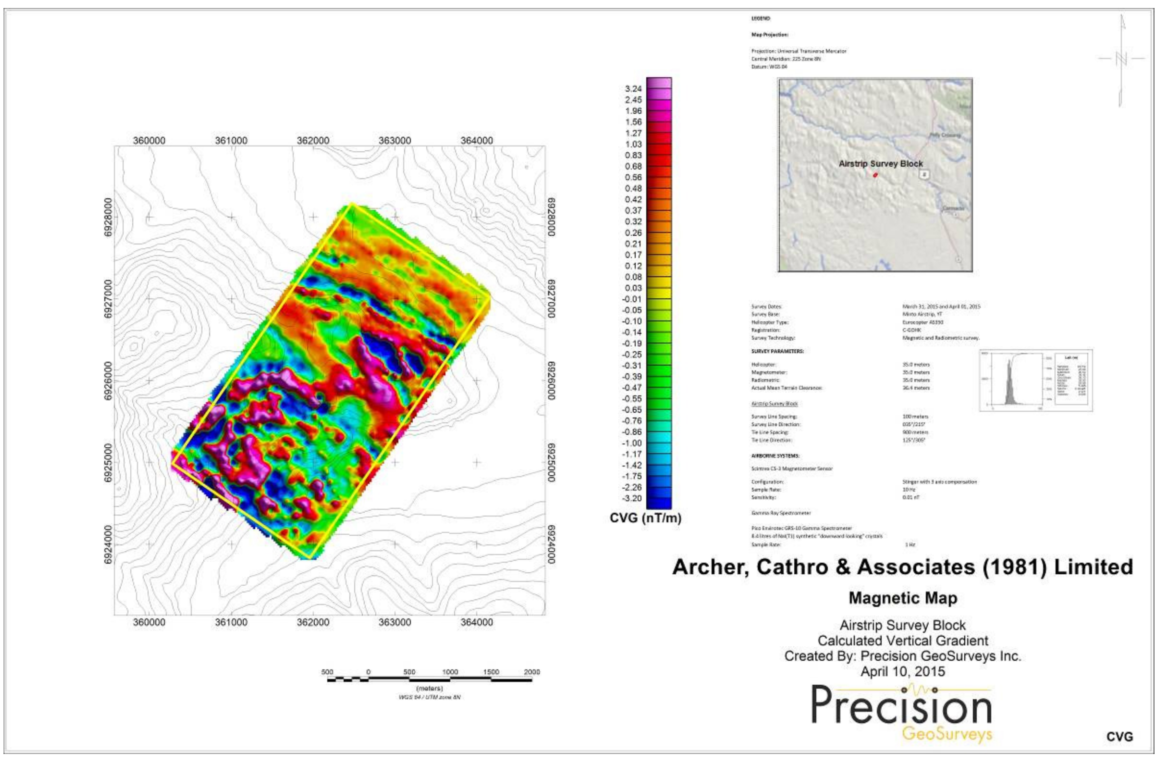
Map 3: Airstrip survey block total magnetic intensity.



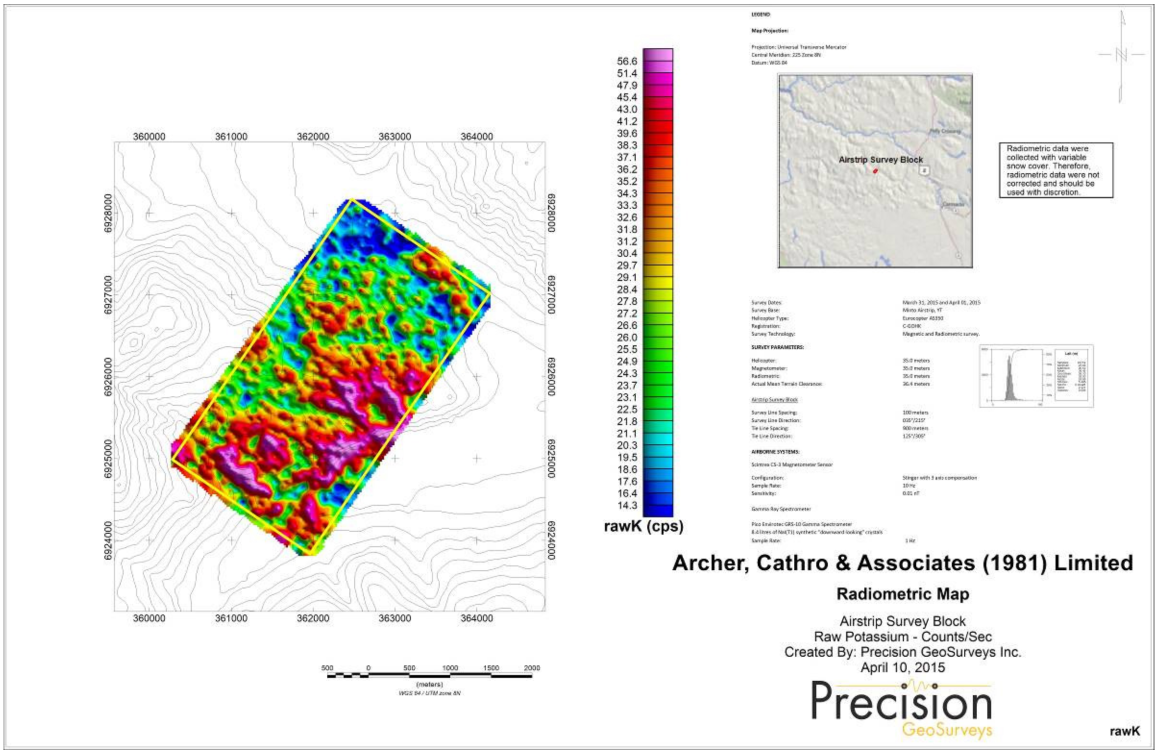
Map 4: Airstrip survey block total magnetic intensity with displayed actual flight lines.



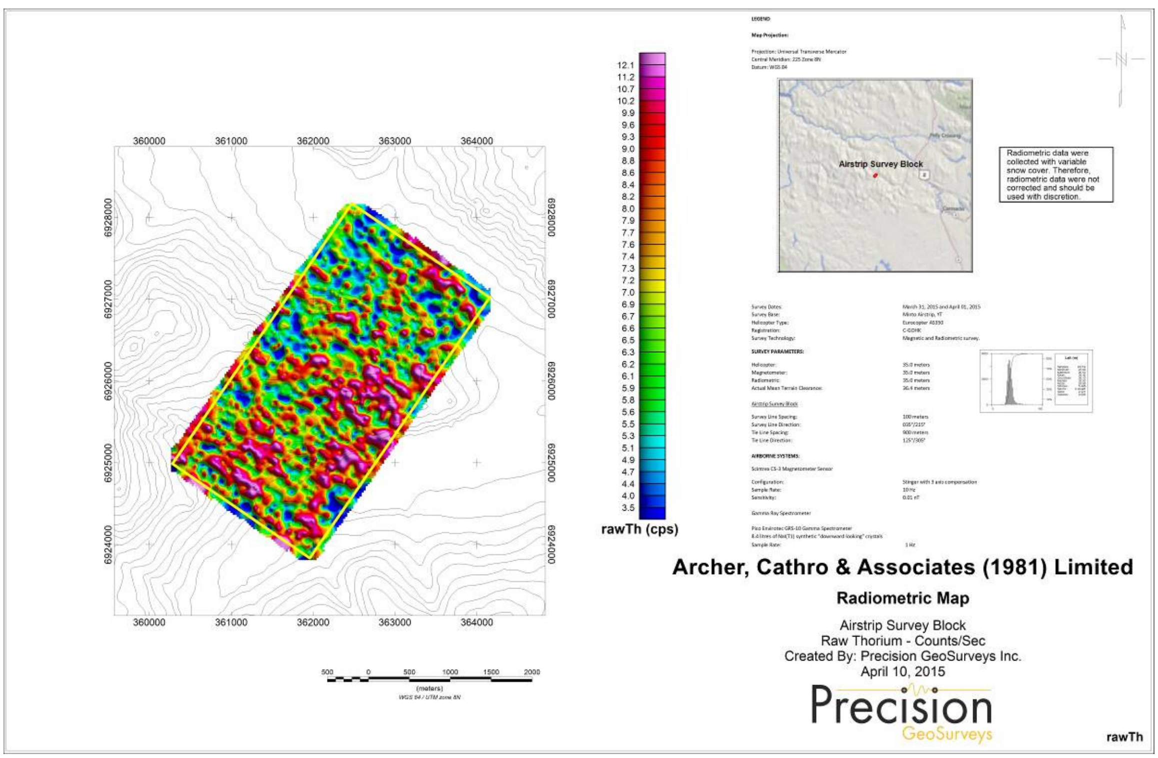
Map 5: Airstrip survey block residual magnetic intensity.



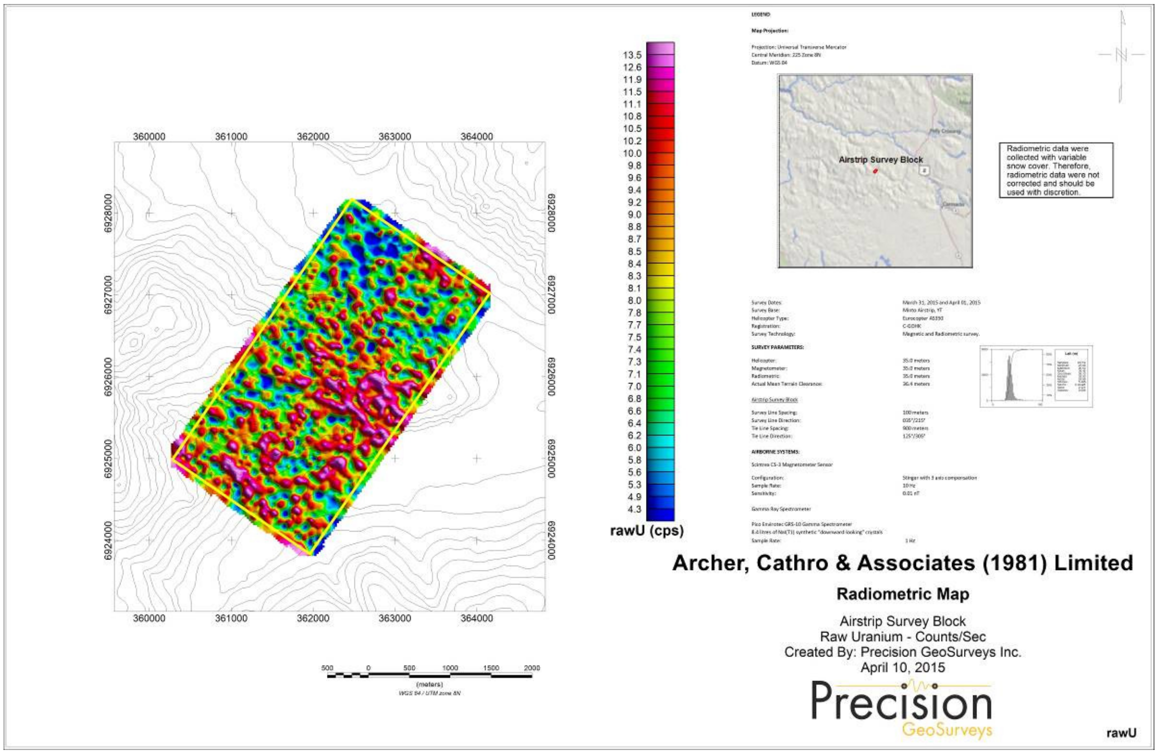
Map 6: Airstrip survey block calculated vertical gradient of the total magnetic intensity.



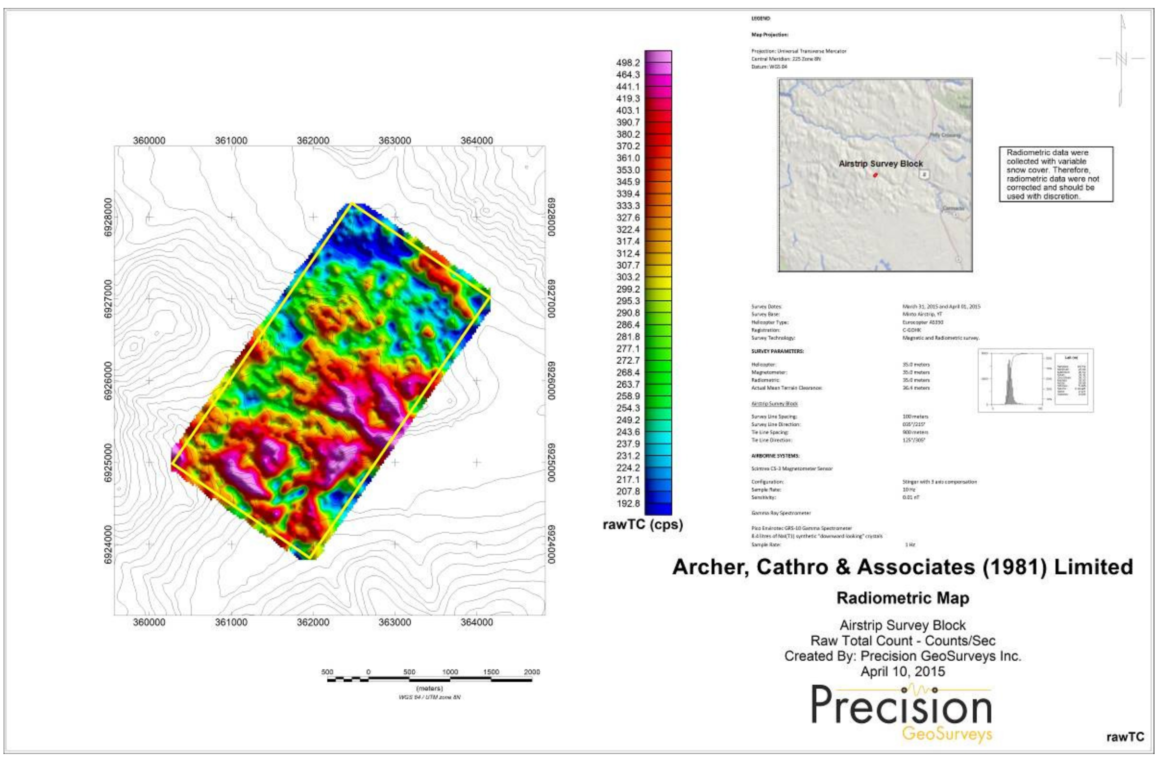
Map 7: Airstrip survey block raw potassium – counts/sec.



Map 8: Airstrip survey block raw thorium – counts/sec.



Map 9: Airstrip survey block raw uranium – counts/sec.



Map 10: Airstrip survey block raw total count – counts/sec

APPENDIX II

DIGITAL COPY OF GEOPHYSICAL SURVEY REPORT