

ASSESSMENT REPORT  
ON  
GEOPHYSICAL WORK  
ON THE FOLLOWING CLAIMS

PORT 17-21.....324516-20  
CLONE 1-2 ..... 331439-33140  
CLONE 3-4 ..... 340012-340013  
SUT 2-3.....340495-340496  
CLONE 5 ..... 397737  
DON ..... 397738

STATEMENT OF EXPLORATION EVENT # 4071643

Located

19 KM SOUTHEAST OF  
STEWART, BRITISH COLUMBIA  
SKEENA MINING DIVISION

55 degrees 48 minutes latitude  
129 degrees 47 minutes longitude

N.T.S. 103P/13W  
MTRM 103P071, 072, 081, 082

PROJECT PERIOD Jan. 15, 2006 to March 5, 2006

ON BEHALF OF  
TEUTON RESOURCES CORP.  
VANCOUVER, B.C.

REPORT BY

D. Cremonese, P. Eng.  
6737 Cartier St.  
Vancouver, B.C.

Date: May 22, 2006

GEOLOGICAL SURVEY BRANCH  
ASSESSMENT REPORT

28,380



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## 1. INTRODUCTION

### A. Property, Location, Access and Physiography

The Clone property is located about 19km southeast of Stewart, British Columbia. Present access to the property is by helicopter from the base at Stewart (Prism Helicopters). A logging road running east up the Marmot River from tidewater in the Portland Canal to a point about 9km northwest of the property, provides an alternative staging point for helicopter access.

The Port and Clone claims are situated southeast of Treble Mountain at the head of Sutton Glacier. The main area of interest is a roughly 4km square nunatak with much of the southern sections only recently exposed by rapidly retreating ice (the southern ice boundary is up to 200m further south in places than that depicted on government topographic and claim maps). Elevations at the south end of the nunatak rise from about 1100 metres at the base to 1734 metres.

Most of the nunatak can be traversed safely on foot although local areas feature small bluffs. There is no forest cover on the property. Vegetation consists of alpine grasses and heather growing in patches along the talus, moraine and outcrop.

Climate is relatively severe, particularly at higher elevations.

### B. Status of Property

Relevant claim information is summarized below:

Name	Tenure No.
Port 17-21	324516-20
Clone 1-2	331439-40
Clone 3-4	340012-13
Sut 2-3	340495-96
Clone 5	397737
Don	397738

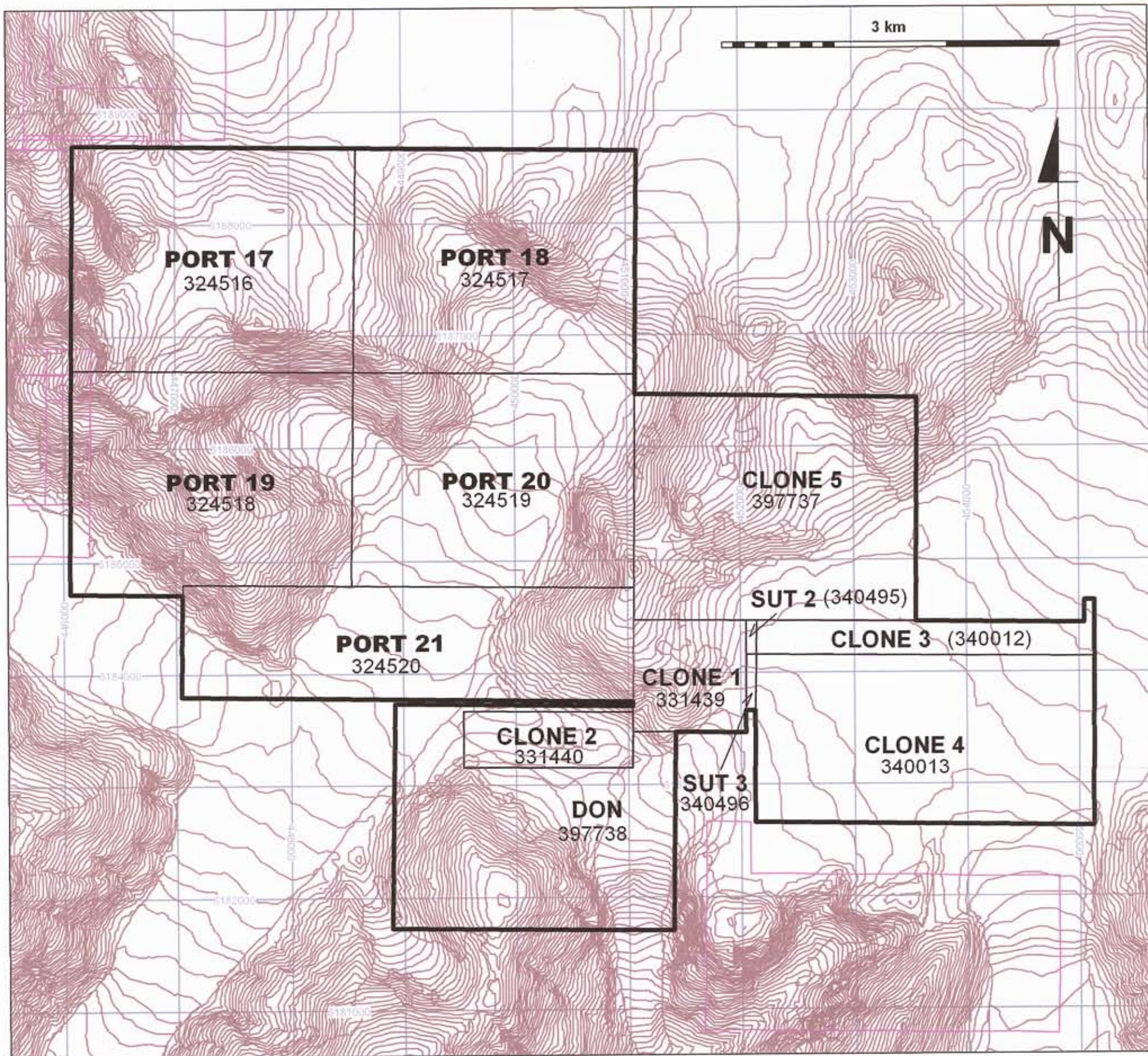
Claim locations are shown on Fig. 2a after government MTRM maps 103P071, 072, 081 and 082. Fig. 2b shows the location of the 2006 Aeroquest airborne survey grid in relation to claim lines.

The claims are owned 50/50 by Teuton Resources Corp. and Silver Grail Resources Ltd. (formerly Minvita Enterprises Ltd.) of Vancouver, British Columbia. In November of 2005 the property was optioned to Canasia Industries Inc. pursuant to terms whereby

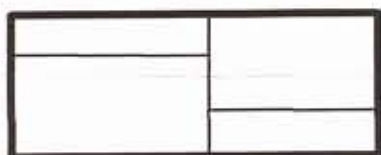


TEUTON RESOURCES CORP. (TUO: TSXV) SILVER GRAIL RESOURCES LTD. (SVG: TSXV) CANASIA INDUSTRIES LTD. (CAJ.H: TSXV)		
<b>CLONE PROPERTY</b> <b>2006 Airborne Survey</b>		
<b>Location Map</b>		
NTS No.: 103P 071, 103P 072, 103P 081, 103P 082 Skeena Mining Division	Date: May 2006 <i>K. Mastalere</i>	Fig. 1

*J.C.*



**LEGEND**



Clone Property

TEUTON RESOURCES CORP. (TUO: TSXV)  
 SILVER GRAIL RESOURCES LTD. (SVG: TSXV)  
 CANASIA INDUSTRIES LTD. (CAJ.H: TSXV)

**CLONE PROPERTY  
 2006 Airborne Survey**

**Claim Location Map**

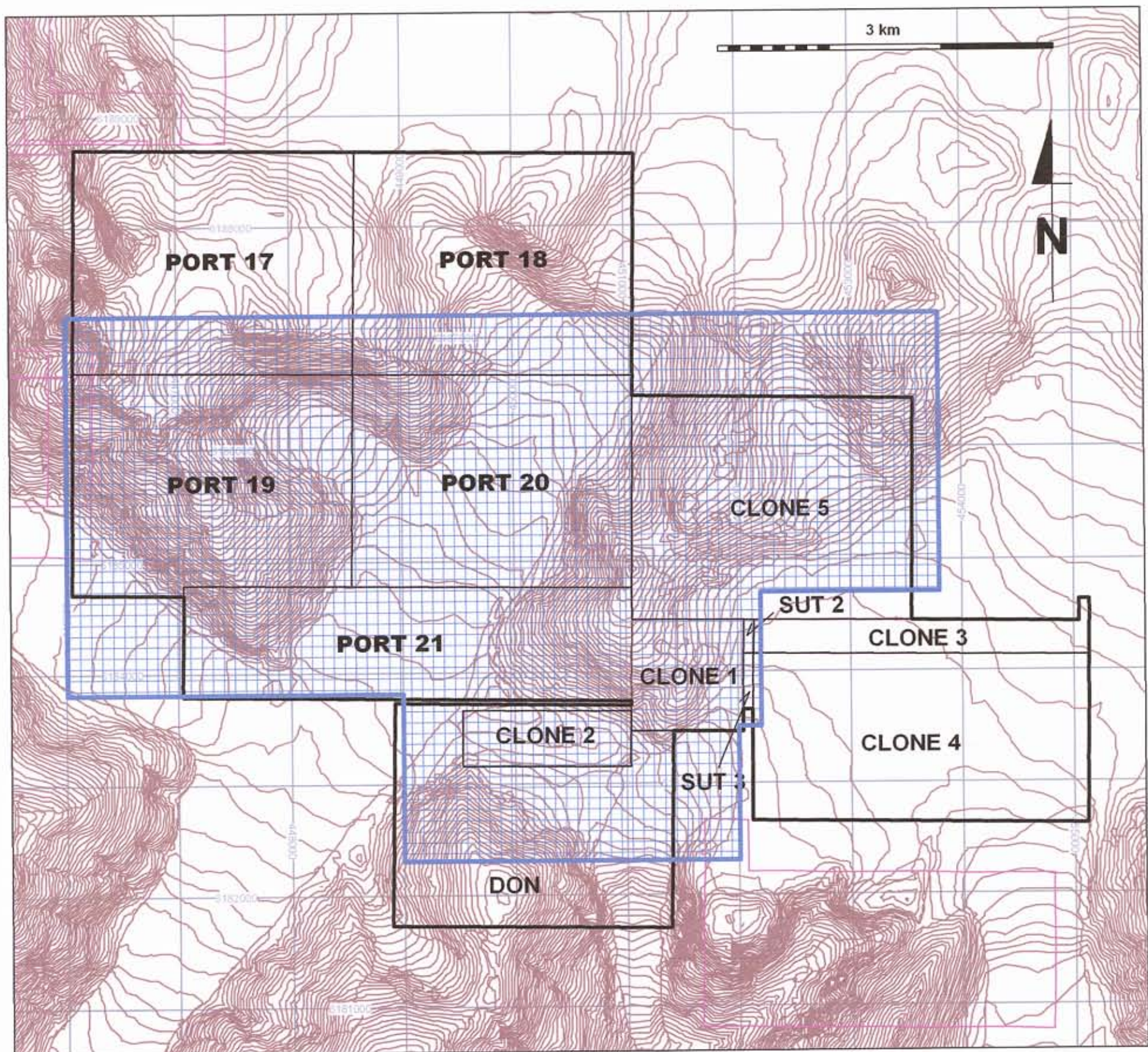
NTS No.: 103P 071, 103P 072,  
 103P 081, 103P 082  
 Skeena Mining Division

Date: May 2006

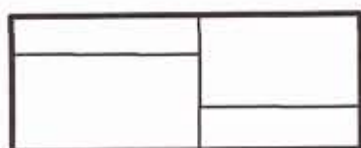
*K. Mastalerz*

Fig. 2a

*Claim boundaries as of February 2006*



**LEGEND**



Clone Property



Airborne Survey Area

*Claim boundaries as of February 2006*

TEUTON RESOURCES CORP. (TUO: TSXV)  
 SILVER GRAIL RESOURCES LTD. (SVG: TSXV)  
 CANASIA INDUSTRIES LTD. (CAJ.H: TSXV)

**CLONE PROPERTY**

**Aeroquest Survey Grid  
 Relative to Claim Boundaries**

NTS No.: 103P 071, 103P 072,  
 103P 081, 103P 082  
 Skeena Mining Division

Date: May 2006

*K. Mastalerz*

*J.C.*  
 Fig. 2b

Canasia could earn up to a 50% interest in the property over a five year term.

Teuton-Silver Grail is the operator.

### C. History

Exploration for metals began in the Stewart region about 1898 after the discovery of mineralized float by a party of placer miners. Sites which could be easily reached from Stewart were the first to be explored among which was the lower Marmot River area.

This early phase of exploration culminated in 1910 when both Stewart and the neighbouring town of Hyder, Alaska boasted a population of around 10,000. Another boom period began in the early 1920's after the discovery of the very rich Premier gold-silver mine in the Salmon River area, northwest of Stewart.

Although a number of gold and silver prospects were sporadically worked in the Marmot River region up to the early 1930's, only the Prosperity-Porter Idaho mine (at the head of Kate Ryan Creek, a tributary of the Marmot River) saw limited production. The prospect closest to the Clone claims is the old Ficklin-Harder located at the head of the Marmot River on the southern flank of Treble Mountain. It was explored by a few tunnels attempting to intersect high-grade quartz-sulfide mineralization intermittently exposed on surface. At this time, the area covered by the Clone property was probably mostly under snow and ice and hence unavailable for exploration by the oldtimers.

From 1940 to 1979 there was little activity in the region due to lacklustre precious metal prices. However when silver and gold prices skyrocketed in the early 1980's, many of the old properties in the area were re-examined by both small and large exploration companies. Discovery by Bond Gold Canada of auriferous mineralization at Red Mountain, north of the Clone property, rekindled interest in the Cambria Icefield area in the mid-1990's.

A reconnaissance effort by Teuton Resources personnel in the region surrounding Red Mountain culminated in the discovery of unusual gold and gold-cobalt bearing shear structures on the Clone property in the latter half of the 1995 field season. This led to a much larger program including property-wide prospecting, mapping, trenching, geophysical surveys and diamond drilling from 1996-97. Approximately \$3 million was spent during this period, most of it on drilling of the Main zone area, details of which are on file in assessment reports filed with the British Columbia Ministry of Energy Mines and Petroleum Resources (see References).

In 1998 Ross Sherlock, Ph.D., visited the Clone property and undertook a structural study under the auspices of SRK Engineering. This work helped to elucidate some of the controls

for the gold mineralization in the Clone shears. Details of this work are in a 1999 assessment report by the author on file with the British Columbia Ministry of Energy Mines and Petroleum Resources (see References).

In 2003 the Clone property was optioned to Lateegra Resources Inc. which carried out a 9 hole drilling program during the same year. Significant intersections from Main Zone drilling carried out in 2003 are summarized below.

Hole #	From (m)	To (m)	Interval (m)	Gold (oz/ton)
CL03-1	12.3	13.8	1.5	0.769
CL03-1	21.5	22.26	0.76	0.494
CL03-2	4.5	13.0	8.5	2.357
CL03-3	90.5	92.0	1.5	0.159
CL03-4	52.0	53.5	1.5	3.023

The first two holes were drilled on the same sections wherein previous close-spaced holes intersected high-grade mineralization (1995-96). Results were consistent with previous results from both trenching and drilling within the richest area of the H-1 hematite structure, situated between Trenches 13 and 78.

The third hole was a deep test below two holes drilled in 1997 in the Trench 81 area, designed to intersect a cross-structure identified during Sherlock's 1999 visit to the property. Although the grade obtained is similar, it appears that the structure here is narrowing at depth.

Hole CL03-04 was designed to test the depth extension of a hematite-rich shear in the southern portion of the Main Zone. It intersected a narrow high-grade interval which conforms to values obtained in surface sampling. Unfortunately the follow-up hole, at a steeper dip, did not go deep enough to encounter the postulated down-dip extension of this mineralization.

Although values up to 2.0 oz/ton gold were obtained in surface sampling of a narrow shear in the C-1 area on the Port 21 claim, all holes drilled in this vicinity during the 2003 program failed to intersect similar mineralization at depth.

#### D. References

1. ALLDRICK, D.J.(1984); Geological Setting of the Precious Metals Deposits in the Stewart Area, Paper 84-1, Geological Fieldwork 1983", B.C.M.E.M.P.R.



2. ALLDRICK, D.J.(1985); "Stratigraphy and Petrology of the Stewart Mining Camp (104B/1E)", p. 316, Paper 85-1, Geological Fieldwork 1984, B.C.M.E.M.P.R.
3. GREIG, C.J., ET AL (1994); "Geology of the Cambria Icefield: regional setting for Red Mountain gold deposit, northwestern British Columbia", p. 45, Current Research 1994-A, Cordillera and Pacific Margin, Geological Survey of Canada.
4. GROVE, E.W. (1971): Bulletin 58, Geology and Mineral Deposits of the Stewart Area. B.C.M.E.M.P.R.
5. GROVE, E.W. (1982): Unuk River, Salmon River, Anyox Map Areas. Ministry of Energy, Mines and Petroleum Resources, B.C.
6. GROVE, E.W. (1987): Geology and Mineral Deposits of the Unuk River-Salmon River-Anyox Area, Bulletin 63, BCMEMPR
7. KRUCHKOWSKI, E. (1996); Assessment Report on Geochemical Program-Clone 1 Claim, on file with BCMEMPR.
8. KRUCHKOWSKI, E. (1998); Assessment Report on Geological, Geochemical and Geophysical and Diamond Drilling Work on the Clone Property, on file with BCMEMPR.
9. CREMONESE, D., P.ENG. (1999) Assessment Report on Geological Work on the Clone Property, on file with BCMEMPR. [Incorporating the Structural Study of the Clone Property by Ross Sherlock, Ph.D., 1999).
10. SHERLOCK, ROSS, PH.D. (1999) Geology of the Clone Project, Stewart Region, NW British Columbia, Canada (Structural Study by SRK Consulting Engineers commissioned by Teuton Resources Corp.).
11. EMPR ASSESSMENT REPORTS: #24376, #24699, #24938, #25335, #25785, #26105, #27297

#### **E. Summary of Work Done.**

A helicopter borne geophysical survey was carried out over the Clone property by Aeroquest Limited on behalf of Teuton Resources Corp. from Feb. 17<sup>th</sup> to Feb. 26<sup>th</sup>, 2006. A total of 661 line-kms were flown over a survey grid as delineated in Fig. 2b.

Because past exploration has determined that two sets of mineralized shear zones occur on the property, one perpendicular

to the other, the airborne survey was also flown in two directions. Line spacing was 100m.

The geophysical crew was stationed out of Stewart, BC and used a contract helicopter supplied by Hi-Wood Helicopters from Oakchoke, Alberta. This particular survey was part of a multi-property survey carried out by Aeroquest on behalf of Teuton Resources beginning in early January, 2006.

Full particulars of the survey are attached to this report as Appendix III, entitled "Report on a Helicopter-Borne AerotEM II Electromagnetic and Magnetic Survey", by Aeroquest Limited of Milton, Ontario.

## 2. TECHNICAL DATA AND INTERPRETATION

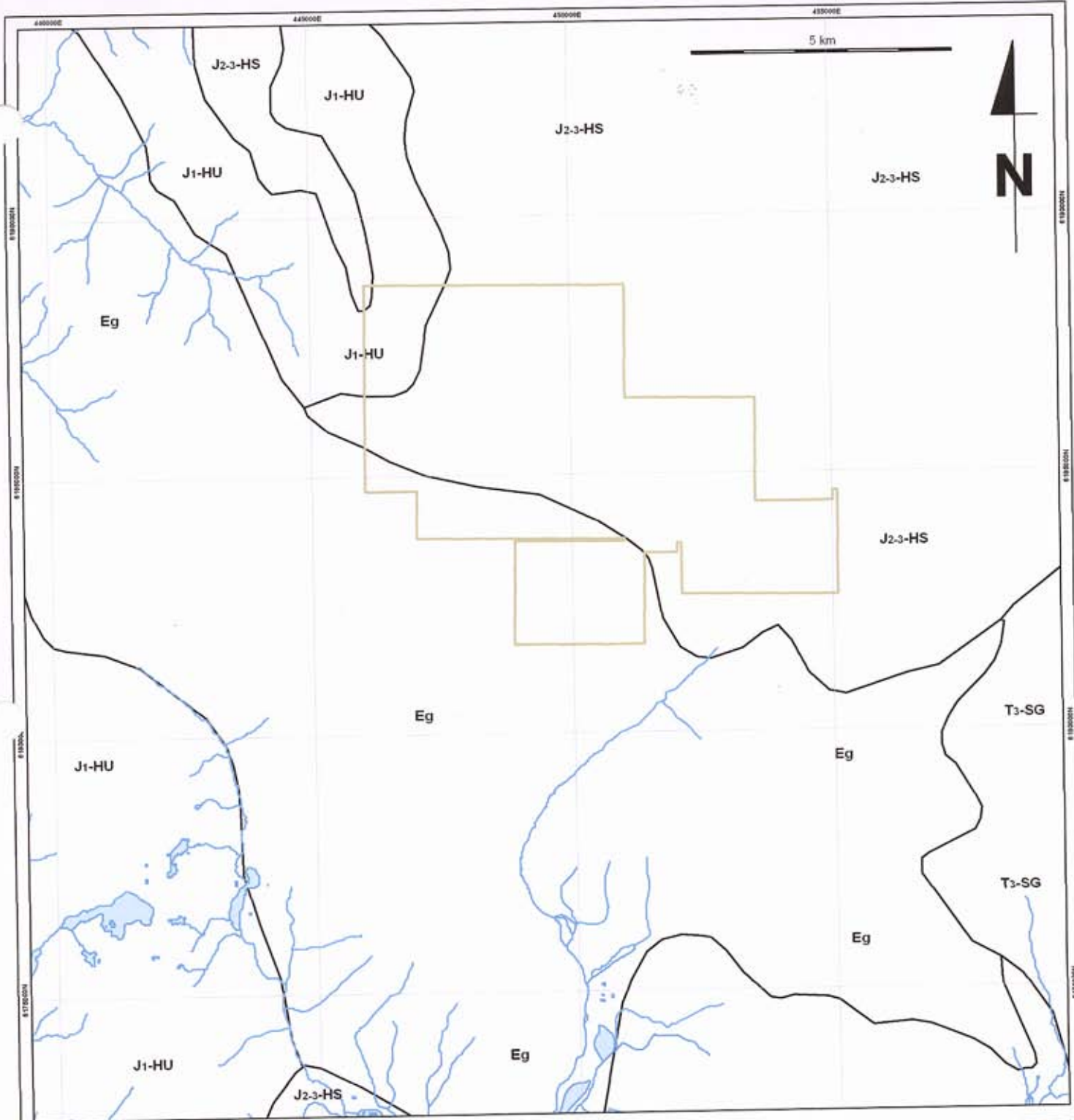
### A. Geology

The Stewart district is near the western margin of the Stikine terrane of the Intermontane belt. Stikinia is the largest and metallogenically most prolific terrain in the Canadian Cordillera. Stikinia generally comprises three stratigraphic groups, all of which are recognized in the Stewart region: (1) Middle and Upper Triassic mafic volcanics and clastic rocks and cherts of the Stuhini Group; (2) Lower and Middle Jurassic volcanic and clastic rocks of the Hazelton group; and (3) Upper Jurassic mudstones and sandstones of the Bowser Lake group. The stratigraphic sequence has been deformed into non-cylindrical northwesterly trending syncline-anticline pairs, the axial planes of which have been cut by easterly dipping thrusts (Greig et al, 1994).

Intrusive phases in the region include Late Triassic calc-alkaline intrusives, coeval with Stuhini volcanic rocks, Early to Middle Jurassic intrusives that are variable in composition and roughly coeval with the Hazelton group volcanics. Also present are Eocene age intrusives, part of the Coast Plutonic suite.

More than 600 mineral deposits, at least 70 of which have shown some production, have been discovered within the boundaries of this region. Famous historical producers include the Premier, Granduc and Anyox mines. The Eskay Creek mine currently owned by Barrick Corp. is successfully in production and is one of North America's highest grade gold-silver mines.

Locally, the Clone nunatak is underlain by a homoclinal sequence of volcanic and sedimentary strata which strikes SE and youngs to the SW. From NE to SW the sequence includes: a dominantly sedimentary sequence with lesser intercalated andesite volcanics cut by a large dioritic to gabbroic intrusion; a heterolithic sequence including a basal maroon volcanic breccia overlain by



JURASSIC

- Eg** Eocene, Coast Plutonic Complex; intrusive rocks, undivided
- J2-3-HS** Hazelton Group; Salmon River Fm, undivided sedimentary rocks
- J1-Hvc** Hazelton Group; Intermediate Volcanic Unit; volcaniclastic rocks
- J1-HU** Hazelton Group; Unuk River Fm, andesitic volcanic rocks
- T3-SG** Stuhini Group (Upper Triassic); coarse clastic sedimentary rocks

**Legend:**

- Clone Property
- Geological Contacts
- Faults
- Rivers and Lakes

TEUTON RESOURCES CORP. (TUO: TSXV) SILVER GRAIL RESOURCES LTD. (SVG: TSXV) CANASIA INDUSTRIES LTD. (CAJ.H: TSXV)		
CLONE PROPERTY <i>J.C.</i>		
REGIONAL GEOLOGY MAP		
NTS No.: 103P 071, 103P 072, 103P 081, 103P 082 Skeena Mining Division	Date: May 2006 <i>K. Mastaler</i>	Fig. 3

Source: BCS's Geology Mapfile (revised) on geoserver@bcsgov.bc.ca

basaltic to andesitic breccias and siltstones and intruded by a series of hornblende and biotite porphyritic intrusives; and, a dominantly volcanic package composed of mafic flows, sills and breccias.

Gold mineralization at the Clone property is hosted in well defined brittle-ductile shear zones in late Triassic volcanic-sedimentary strata. The shear zones range from 20 cm to 3m wide and can be traced for over 500m along strike. Mineralization occurred early in the development of the shears and has been disrupted and deformed by continued post-mineralization deformation. Precious metal mineralization is localized in massive-semimassive iron oxides and lesser sulfides. The iron oxide facies ranges from hematite-specularite to massive magnetite. The massive sulfides are pyrite-pyrrhotite-arsenopyrite. The distribution of the oxide and sulfide facies is related to buffering of the hydrothermal fluids by oxidized or reduced host lithologies.

[Author's Note: Geological observations in this and the preceding section have been largely excerpted from Sherlock (1999, Ref. 10).]

Regional geology is presented in Fig. 3.

## **B. Geophysics**

Geophysical data related to the 2006 helicopter-borne EM and Mag survey over the Clone property is presented herein in Appendix III: "Report on a Helicopter-Borne AerotEM II Electromagnetic and Magnetic Survey", by Aeroquest Limited of Milton, Ontario.

Prior to the completion of the Aeroquest report, Aeroquest chief geophysicist Jonathan Rudd met with the author and Teuton geologist K. Mastalerz, Ph.D., in Teuton's Vancouver office to review data from previous work on the property so as to provide the proper context for interpretation of survey

## **C. Discussion**

The author concurs with the interpretation of results by Aeroquest geophysicists Gord Smith and Jonathan Rudd as presented in their report in Appendix III.

## **D. Conclusions**

The 2006 airborne geophysical survey was successful in outlining a number of target areas worthy of further exploration.

Principal among these is the long zone of conductivity discussed in section 10.3 of the Aeroquest Report (Appendix III), peak values occurring in an area approximately 800m northeast of the Main zone. This locality may represent a thrust fault slice repeating the package of geological units present in the Main zone area. In such case, the conductors may be due to mineralization contained in sub-parallel shears as observed in the Main zone.

A comprehensive surface investigation of this anomalous area is recommended to include detailed geological mapping both in recently ablated and previously unmapped areas, along with sampling and trenching. Targets defined by this work should be followed up by diamond drilling.

At the same time, geological crews should be sent out to ground-truth other anomalous geophysical responses detected during the 2006 survey. Among these are several long, narrow magnetic low features occurring elsewhere within the claim block. These lows signal previously undetected shear zones which, like the Main zone, could host gold-bearing mineralization.

Respectfully submitted,



D. Cremonese, P.Eng.

May 22, 2006

**APPENDIX I - WORK COST STATEMENT**

Aeroquest Limited Geophysical Survey: Feb. 17-26, 2006 661 line-km & \$117.70/line-km	\$	77,800
Food & Accommodation	\$	10,575
Fuel	\$	1,166
Fuel Positioning by Aeroquest	\$	2,719
Fuel Positioning by Prism Helicopters	\$	1,670
Report and map preparation, compilation and research D. Cremonese, P. Eng., 1.0 days @ \$400/day	\$	400
Draughting-	\$	240
<b>TOTAL .....</b>	<b>\$</b>	<b>94,570</b>

**Allocation:**

Amount filed per Event# 4071377 on Feb. 23, 2006*	\$	13,440
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Please adjust PAC withdrawals accordingly, applying any balance remaining to the PAC Account of Teuton Resources Corp.

\*The author is satisfied that ample surveying was done between the start of the survey on Feb. 17 to date of filing on Feb. 23 to justify the \$13,440 allocation.

**APPENDIX II -CERTIFICATE OF AUTHOR**

I, Dino M. Cremonese, do hereby certify that:

1. I am a mineral property consultant with an office at Suite 509-675 W. Hastings, Vancouver, B.C.
2. I am a graduate of the University of British Columbia (B.A.Sc. in metallurgical engineering, 1972, and L.L.B., 1979).
3. I am a Professional Engineer registered with the Association of Professional Engineers of the Province of British Columbia as a resident member, #13876.
4. I have practiced my profession since 1979.
5. This report is based primarily upon the 2006 Aeroquest airborne survey over the Clone property. Additional information comes from several site visits to the property between 1995-98 and an extensive review of literature concerning the property.
6. I am a principal of Teuton Resources Corp. and Silver Grail Resources Ltd., owner of the Clone property. This report is for assessment report only and does not purport to be an independent assessment of the merits of the property.

Dated at Vancouver, B.C. this 22nd day of May, 2006.



D. Cremonese, P.Eng.

APPENDIX III

REPORT ON A HELICOPTER-BORNE AEROTEM II  
ELECTROMAGENETIC AND MAGNETIC SURVEY

by

Aeroquest Limited of Milton, Ontario.

March, 2006



# **Report on a Helicopter-Borne AeroTEM<sup>©</sup> II Electromagnetic and Magnetic Survey**

**Aeroquest Job # 05056**  
**Clone Property**  
Stewart, British Columbia  
NTS 103P13

for

**Teuton Resources Corporation**  
207-675 West Hastings Street.  
VANCOUVER  
British Columbia  
CANADA, V6B 1N2

by

**≡ AEROQUEST LIMITED**

4-845 Main Street East  
Milton, Ontario, L9T 3Z3  
Tel: (905) 693-9129 Fax: (905) 693-9128  
[www.aeroquestsurveys.com](http://www.aeroquestsurveys.com)  
March, 2006

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**1.2. Appendices**

Appendix 1: Survey Block Co-ordinates
Appendix 2: Description of Database Fields
Appendix 3: Technical Paper: “AeroTEM Design Considerations”
Appendix 4: Instrumentation Specification Sheet

**1.3. Maps (1:10,000)**

The report includes a set of four (4) geophysical maps plotted at a scale of 1:10,000. The survey area is covered by one (1) map plate. Four (4) geophysical data products are presented for each Plate (listed below).

- Map 1: Coloured Total Magnetic Intensity (TMI) with line contours and EM anomalies
- Map 2: Coloured Tilt Derivative of the TMI with line contours and EM anomalies
- Map 3: AeroTEM Off-Time Profiles (Z5-Z15) and EM anomalies (East-West lines)
- Map 4: AeroTEM Off-Time Profiles (Z5-Z15) and EM anomalies (North-South lines)

## 2. INTRODUCTION

This report describes a helicopter-borne geophysical survey carried out on behalf of Teuton Resources Corp. on the Clone Property, British Columbia. The principal geophysical sensor is Aeroquest's exclusive AeroTEM II time domain helicopter electromagnetic system which is employed in conjunction with a high-sensitivity cesium vapour magnetometer. Ancillary equipment includes a real-time differential GPS navigation system, radar altimeter, digital video acquisition system, and a base station magnetometer. Full-waveform streaming EM data is recorded at 38,400 samples per second. The streaming data comprise the transmitted waveform, and the X component and Z component of the resultant field at the receivers. A secondary acquisition system (RMS) records the ancillary data.

The total line kilometre flown is totaled at 661 km. The survey flying described in this report took place from February 17<sup>th</sup> to February 26<sup>th</sup>, 2006.

Bedrock EM anomalies were auto-picked from the Z-component on-time data and graded according to the 'off-time' conductance. These anomalies were then review by hand and classified for presentation on the maps. This report describes the survey logistics, the data processing, presentation, and provides a brief interpretation of the results.

## 3. SURVEY AREA

The Clone Property of Teuton Resources Corp. is situated 20km southeast from Stewart, BC. Figure 2. Access to the property is available exclusively by helicopter. The helicopter was provided by Hi-Wood helicopters, Oakchoke, Alberta. The field crew were based in Stewart at the King Edward Hotel. The helicopter and geophysical equipment were staged out of Stewart Airport, Stewart, B.C.

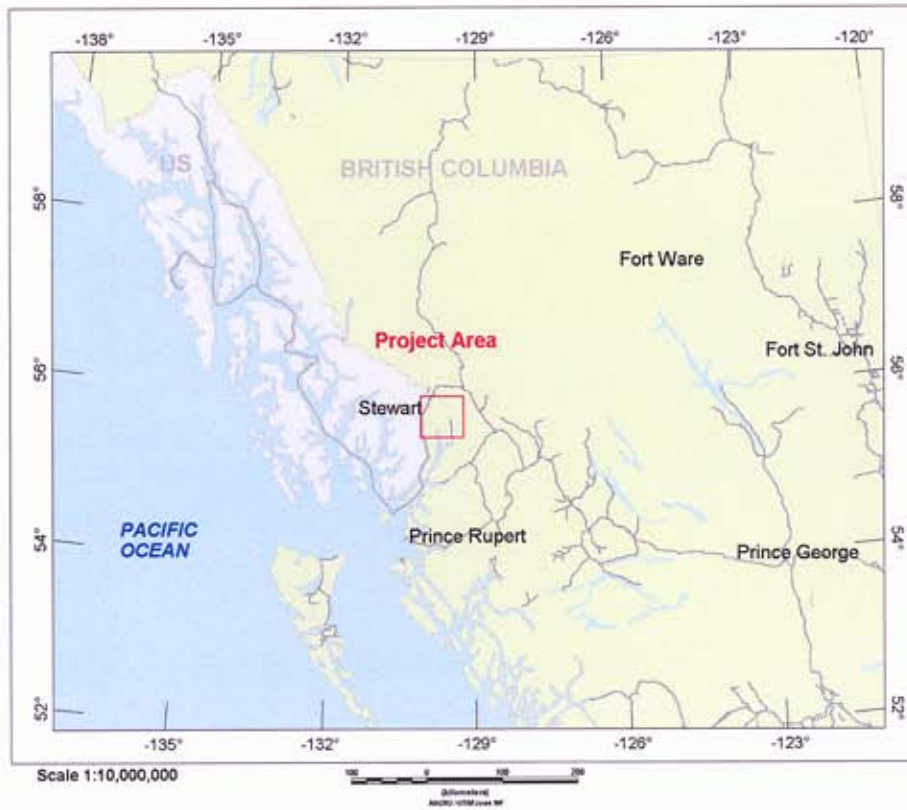


Figure 1. Regional location map of the Property area

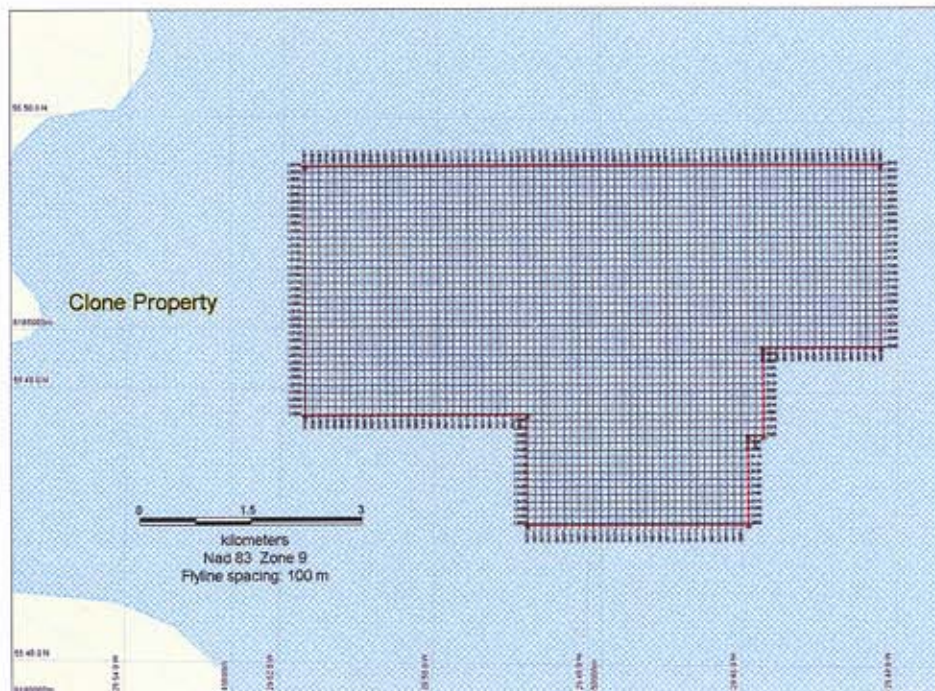


Figure 2. Location of the Clone Property.

**4. REGIONAL GEOLOGY and EXPLORATION (from Teuton Resources web site)**

“The property was staked by Teuton-Minvita in 1994, as part of a regional effort aimed at exploration of virgin ground exposed by rapidly melting snow and icefields”.

“High-grade gold-bearing shear zones were discovered by Teuton-Minvita prospectors in 1995 at the head of Sutton Glacier, 20 kilometres southeast of Stewart, BC”.

“Drilling programs carried out from 1995-97 defined several high-grade gold shoots within the Main Zone, situated at the southeastern end of a 3 km long package of volcanic and sedimentary rocks”.

“High-grade gold and gold-cobalt mineralization was discovered by Teuton prospectors in 1995 within a series of shears exposed over a strike length of 500m and a vertical range of 130m. Trenching of the shears returned values ranging up to 3.59 oz/ton gold over 5.5m (18 feet). Significant cobalt values were found to accompany gold in the southeast portion of the zone”.

“Drilling in 1995-96 was confined to the 500m long Main zone at the south end of the mineralized system, overlapping the original discovery area. The most promising structure outlined by the drilling was the "H-1" which yielded many holes carrying high-grade gold mineralization over significant widths. The best of these was Hole #110 which contained a 32.9 foot intercept grading 1.28 oz/ton gold. Some outstanding intersections were also reported from the parallel S-2A structure, known from trenching to host both gold and cobalt mineralization. Hole #18 into the S-2A contained a 19.7 foot intercept grading 1.53 oz/ton gold and 0.33% cobalt”.

**5. SURVEY SPECIFICATIONS AND PROCEDURES**

**5.1. Flight Specifications**

The survey specifications are summarised in the following table:

Block Name	Line Spacing (m)	Line direction	Survey Coverage (line-km)	Dates Flown
Clone	100	NS-EW (0 and 090)	661	February 17 <sup>th</sup> to February 26 <sup>th</sup> , 2006

The survey coverage was calculated by adding up the along-line distance of the survey lines and control (tie) lines as presented in the final Geosoft database. The survey was flown with a line spacing of 100 m. The control (tie) lines were flown perpendicular to the survey lines with a spacing of 100 m.

The nominal EM bird terrain clearance is 30m (98 ft), but can be higher in more rugged terrain. The magnetometer sensor is mounted in a smaller bird connected to the tow rope 15 metres above the EM bird and 18.5 metres below the helicopter (Figure 4). Nominal survey speed over relatively flat terrain

is 75 km/hr and is generally lower in rougher terrain. Scan rates for ancillary data acquisition is 0.1 second for the magnetometer and altimeter, and 0.2 second for the GPS determined position. The EM data is acquired as a data stream at a sampling rate of 38,400 samples per second and is processed to generate final data at 10 samples per second. The 10 samples per second translates to a geophysical reading about every 1.5 to 2.5 metres along the flight path.

## **5.2. Navigation**

Navigation is carried out using a GPS receiver, an AGNAV2 system for navigation control, and an RMS DGR-33 data acquisition system which records the GPS coordinates. The x-y-z position of the aircraft, as reported by the GPS, is recorded at 0.2 second intervals. The system has a published accuracy of under 3 metres. A recent static ground test of the Mid-Tech WAAS GPS yielded a standard deviation in x and y of under 0.6 metres and for z under 1.5 metres over a two-hour period.

## **5.3. System Drift**

Unlike frequency domain electromagnetic systems, the AeroTEM<sup>©</sup> II system has negligible drift due to thermal expansion. The operator is responsible for ensuring the instrument is properly warmed up prior to departure and that the instruments are operated properly throughout the flight. The operator maintains a detailed flight log during the survey noting the times of the flight and any unusual geophysical or topographic features. Each flight included at least two high elevation 'background' checks. During the high elevation checks, an internal 5 second wide calibration pulse in all EM channels was generated in order to ensure that the gain of the system remained constant and within specifications.

## **5.4. Field QA/QC Procedures**

On return of the pilot and operator to the base, usually after each flight, the ProtoDAS streaming EM data and the RMS data are carried on removable hard drives and FlashCards, respectively and transferred to the data processing work station. At the end of each day, the base station magnetometer data on FlashCard is retrieved from the base station unit.

Data verification and quality control includes a comparison of the acquired GPS data with the flight plan; verification and conversion of the RMS data to an ASCII format XYZ data file; verification of the base station magnetometer data and conversion to ASCII format XYZ data; and loading, processing and conversion of the streaming EM data from the removable hard drive. All data is then merged to an ASCII XYZ format file which is then imported to an Oasis database for further QA/QC and for the production of preliminary EM, magnetic contour, and flight path maps.

Survey lines which show excessive deviation from the intended flight path are re-flown. Any line or portion of a line on which the data quality did not meet the contract specification was noted and re-flown.

## 6. AIRCRAFT AND EQUIPMENT

### 6.1. Aircraft

A Eurocopter (Aerospatiale) AS350B2 "A-Star" helicopter - registration C-GPTY used as survey platform. The helicopter was owned and operated by Hi-Wood Helicopters, Oakachoke, Alberta.. Installation of the geophysical and ancillary equipment was carried out by Aeroquest Limited in Stewart and ferried to the survey area. The survey aircraft was flown at a nominal terrain clearance of 180 feet (55 m).



Figure 3. Survey Helicopter C-GPTY





Figure 4. The magnetometer bird (A) and AeroTEM II EM bird (B)

## 6.2. Magnetometer

The Aeroquest airborne survey system employs the Geometrics G-828 cesium vapour magnetometer sensor installed in a two metre towed bird airfoil attached to the main tow line, 15 metres below the helicopter. The sensitivity of the magnetometer is 0.001 nanoTesla at a 0.1 second sampling rate. The nominal ground clearance of the magnetometer bird is 48.5 metres (170 ft.). The magnetic data is recorded at 10Hz by the RMS DGR-33.

## 6.3. Electromagnetic System

The electromagnetic system is an Aeroquest AeroTEM II time domain towed-bird system. The current AeroTEM<sup>®</sup> transmitter dipole moment is 38.8 kNIA. The AeroTEM<sup>®</sup> bird is towed 33.5 m (110 ft) below the helicopter. More technical details of the system may be found in Appendix 4.

The wave-form is triangular with a symmetric transmitter on-time pulse of approximately 1.1 ms and a base frequency of 150 Hz. The current alternates polarity every on-time pulse. During every Tx on-off cycle (300 per second), 128 contiguous channels of raw x and z component (and a transmitter current monitor) of the received waveform are measured. Each channel width is 26.06 microseconds starting at the beginning of the transmitter pulse. This 128 channel data is referred to as the raw streaming data.

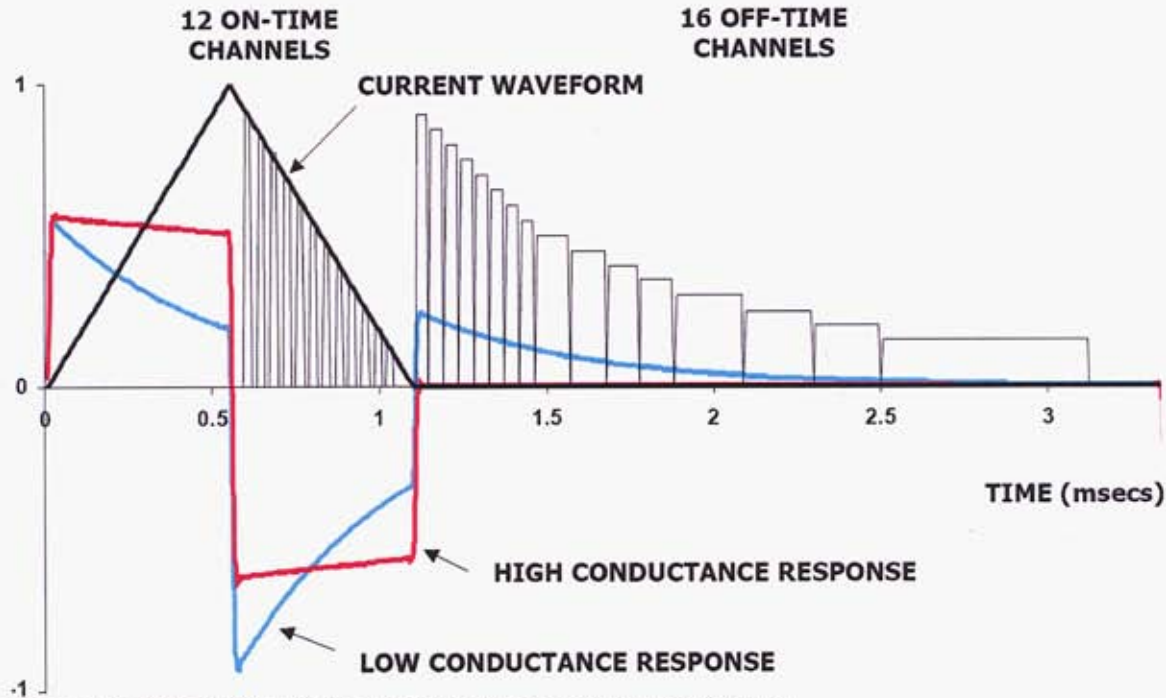


Figure 5. Schematic of Transmitter and Receiver waveforms

#### 6.4. PROTODAS Acquisition System

The 128 channels of raw streaming data are recorded by the AERODAS acquisition system onto a removable hard drive. The streaming data are processed post-survey to yield 33 stacked and binned on-time and off-time channels at a 10 Hz sample rate. The timing of the final processed EM channels is described in the following table:

Channel	Width	Gate	Start( $\mu$ s)	Stop( $\mu$ s)	Mid( $\mu$ s)	Width( $\mu$ s)
1 ON	1	25	651.0	677.1	664.1	26.04
2 ON	1	26	677.1	703.1	690.1	26.04
3 ON	1	27	703.1	729.2	716.1	26.04
4 ON	1	28	729.2	755.2	742.2	26.04
5 ON	1	29	755.2	781.3	768.2	26.04
6 ON	1	30	781.3	807.3	794.3	26.04
7 ON	1	31	807.3	833.3	820.3	26.04

8 ON	1	32	833.3	859.4	846.4	26.04
9 ON	1	33	859.4	885.4	872.4	26.04
10 ON	1	34	885.4	911.5	898.4	26.04
11 ON	1	35	911.5	937.5	924.5	26.04
12 ON	1	36	937.5	963.5	950.5	26.04
13 ON	1	37	963.5	989.6	976.6	26.04
14 ON	1	38	989.6	1015.6	1002.6	26.04
15 ON	1	39	1015.6	1041.7	1028.6	26.04
16 ON	1	40	1041.7	1067.7	1054.7	26.04
0 OFF	1	44	1145.8	1171.9	1158.9	26.04
1 OFF	1	45	1171.9	1197.9	1184.9	26.04
2 OFF	1	46	1197.9	1224.0	1210.9	26.04
3 OFF	1	47	1224.0	1250.0	1237.0	26.04
4 OFF	1	48	1250.0	1276.0	1263.0	26.04
5 OFF	1	49	1276.0	1302.1	1289.1	26.04
6 OFF	1	50	1302.1	1328.1	1315.1	26.04
7 OFF	1	51	1328.1	1354.2	1341.1	26.04
8 OFF	1	52	1354.2	1380.2	1367.2	26.04
9 OFF	1	53	1380.2	1406.3	1393.2	26.04
10 OFF	1	54	1406.3	1432.3	1419.3	26.04
11 OFF	1	55	1432.3	1458.3	1445.3	26.04
12 OFF	1	56	1458.3	1484.4	1471.4	26.04
13 OFF	4	57	1484.4	1588.5	1536.5	104.17
14 OFF	8	61	1588.5	1796.9	1692.7	208.33
15 OFF	16	69	1796.9	2213.5	2005.2	416.67
16 OFF	32	85	2213.5	3046.9	2630.2	833.33

### 6.5. RMS DGR-33 Acquisition System

In addition to the magnetics, altimeter and position data, six channels of real time processed off-time EM data in the Z direction and one in the X direction are recorded by the RMS DGR-33 acquisition system at 10 samples per second and plotted real-time on the analogue chart recorder. These channels are derived by a binning, stacking and filtering procedure on the raw streaming data. The primary use of the RMS EM data (Z1 to Z6, X1) is to provide for real-time QA/QC on board the aircraft.

The channel window timing of the RMS DGR-33 6 channel system is described in the table below.

RMS Channel	Start time (microsec)	End time (microsec)	Width (microsec)	Streaming Channels	Noise tolerance
Z1, X1	1269.8	1322.8	52.9	48-50	20 ppb
Z2	1322.8	1455.0	132.2	50-54	20 ppb
Z3	1428.6	1587.3	158.7	54-59	15 ppb
Z4	1587.3	1746.0	158.7	60-65	15 ppb
Z5	1746.0	2063.5	317.5	66-77	10 ppb
Z6	2063.5	2698.4	634.9	78-101	10 ppb

## **6.6. Magnetometer Base Station**

The base magnetometer was a Geometrics G858 magnetometer with a built in GPS receiver and external GPS antenna. Data logging and UTC time synchronisation was carried out within the magnetometer, with the GPS providing the timing signal. The data logging was configured to measure at 1.0 second intervals. Digital recording resolution was 0.001 nT. The sensor was placed on a tripod in an area of low magnetic gradient and free of cultural noise sources. A continuously updated display of the base station values was available for viewing and regularly monitored to ensure acceptable data quality and diurnal variation.

## **6.7. Radar Altimeter**

A Terra TRA 3500/TRI-30 radar altimeter is used to record terrain clearance. The antenna was mounted on the outside of the helicopter beneath the cockpit. Therefore, the recorded data reflect the height of the helicopter above the ground. The Terra altimeter has an altitude accuracy of +/- 1.5 metres.

## **6.8. Video Tracking and Recording System**

A high resolution digital colour 8mm video camera is used to record the helicopter ground flight path along the survey lines. The video is digitally annotated with GPS position and time and can be used to verify ground positioning information and cultural causes of anomalous geophysical responses.

## **6.9. GPS Navigation System**

The navigation system consists of an Ag-Nav Incorporated AG-NAV2 GPS navigation system comprising a PC-based acquisition system, navigation software, a deviation indicator in front of the aircraft pilot to direct the flight, a full screen display with controls in front of the operator, a Mid-Tech RX400p WAAS-enabled GPS receiver mounted on the instrument rack and an antenna mounted on the magnetometer bird. WAAS (Wide Area Augmentation System) consists of approximately 25 ground reference stations positioned across the United States that monitor GPS satellite data. Two master stations, located on the east and west coasts, collect data from the reference stations and create a GPS correction message. This correction accounts for GPS satellite orbit and clock drift plus signal delays caused by the atmosphere and ionosphere. The corrected differential message is then broadcast through one of two geostationary satellites, or satellites with a fixed position over the equator. The corrected position has a published accuracy of under 3 metres. A recent static ground test of the Mid-Tech WAAS GPS yielded a standard deviation in x and y of under 0.6 metres and for z under 1.5 metres over a two-hour period.

Survey co-ordinates are set up prior to the survey and the information is fed into the airborne navigation system. The co-ordinate system employed in the survey design was WGS84 [World] using the UTM zone 10N projection. The real-time differentially corrected GPS positional data was recorded by the RMS DGR-33 in geodetic coordinates (latitude and longitude using WGS84) at 0.2 s intervals.

### 6.10. Digital Acquisition System

The AeroTEM<sup>©</sup> received waveform (Figure 5) sampled during on and off-time at 128 channels per decay, 300 times per second, was logged by the proprietary AERODAS data acquisition system. The channel sampling commences at the start of the Tx cycle and the width of each channel is 26.04 microseconds. The streaming data was recorded on a removable hard-drive and was later backed-up onto DVD-ROM from the field processing computer.

The RMS Instruments DGR-33A data acquisition system ( was used to collect and record the analogue data stream, i.e. the positional and secondary geophysical data, including processed 6 channel EM, magnetics, radar altimeter, GPS position, and time. The data was recorded on 128Mb capacity FlashCard. The RMS output was also directed to a thermal chart recorder for on-board real-time QA/QC.



Figure 6. The AeroTEM II Instrument Rack

## 7. PERSONNEL

The following Aeroquest personnel were involved in the project:

- Manager of Operations: Bert Simon
- Manager of Processing and Interpretation: Jonathan Rudd
- Field Data Processors: Sean Scrivens, Rory Kutluoglu
- Field Operators: Marcus Watson, Victor Shevchenko
- Data Interpretation and Reporting: Jonathan Rudd, Gord Smith

The survey pilot, Paul Kendal was employed directly by the helicopter operator – Hi-Wood Helicopters Ltd.

## 8. DELIVERABLES

The report includes a set of four (4) geophysical maps plotted at a scale of 1:10,000. The survey area is covered by one (1) map plate. Four (4) geophysical data products are presented for each Plate (listed below).

- Map 1: Coloured Total Magnetic Intensity (TMI) with line contours and EM anomalies
- Map 2: Coloured Tilt Derivative of the TMI with line contours and EM anomalies
- Map 3: AeroTEM Off-Time Profiles (Z5-Z15) and EM anomalies (East-West lines)
- Map 4: AeroTEM Off-Time Profiles (Z5-Z15) and EM anomalies (North-South lines)

All the maps show flight path trace, skeletal topography, and conductor picks represented by an anomaly symbol classified according to calculated off-time conductance. The anomaly symbol is accompanied by postings denoting the calculated off-time conductance, a thick or thin classification and an anomaly identifier label. The anomaly symbol legend is given in the margin of the maps. The magnetic field data is presented as superimposed line contours with a minimum contour interval of 5nT. Bold contour lines are separated by 250nT.

The geophysical profile data is archived digitally in a Geosoft GDB binary format database. A description of the contents of the individual channels in the database can be found in Appendix 3. A copy of this digital data is archived at the Aeroquest head office in Milton.

## 9. DATA PROCESSING AND PRESENTATION

All in-field and post-field data processing was carried out using Aeroquest proprietary data processing software, and Geosoft Oasis montaj software. Maps were generated using a 42-inch wide Hewlett Packard ink-jet plotter.

### 9.1. Base Map

The geophysical maps accompanying this report are based on positioning in the NAD83 datum. The survey geodetic GPS positions have been projected using the Universal Transverse Mercator projection in Zone 9 north. A summary of the map datum and projection specifications is given following:

- Ellipse: GRS 1980
- Ellipse major axis: 6378137m eccentricity: 0.081819191
- Datum: North American 1983 - Canada Mean
- Datum Shifts (x,y,z) : 0, 0, 0 metres
- Map Projection: Universal Transverse Mercator Zone 9
- Central Scale Factor: 0.9996
- False Easting, Northing: 500,000m, 0m

For reference, the latitude and longitude in NAD83 are also noted on the maps. The skeletal topography was derived from the Federal Government's 1: 50,000 NTS map series.

## **9.2. Flight Path & Terrain Clearance**

The position of the survey helicopter was directed by use of the Global Positioning System (GPS). Positions were updated five times per second (5Hz) and expressed as WGS84 latitude and longitude calculated from the raw pseudo range derived from the C/A code signal. The instantaneous GPS flight path, after conversion to UTM co-ordinates, is drawn using linear interpolation between the x/y positions. The terrain clearance was maintained with reference to the radar altimeter. The raw Digital Terrain Model (DTM) was derived by taking the GPS survey elevation and subtracting the radar altimeter terrain clearance values. The calculated topography elevation values are relative and are not tied in to surveyed geodetic heights.

Each flight included at least two high elevation 'background' checks. During the high elevation checks, an internal 5 second wide calibration pulse in all EM channels was generated in order to ensure that the gain of the system remained constant and within specifications.

## **9.3. Electromagnetic Data**

The raw streaming data, sampled at a rate of 46,080 Hz (256 channels, 180 times per second) was reprocessed using a proprietary software algorithm developed and owned by Aeroquest Limited. Processing involves the compensation of the X and Z component data for the primary field waveform. Coefficients for this compensation for the system transient are determined and applied to the stream data. The stream data are then pre-filtered, stacked, binned to the 33 on and off-time channels and checked for the effectiveness of the compensation and stacking processes. The stacked data is then filtered, leveled and split up into the individual line segments. The filtering of the stacked data is designed to remove or minimize high frequency noise that can not be sourced from the geology. Further base level adjustments may be carried out at this stage.

The final field processing step was to merge the processed EM data with the other data sets into a Geosoft GDB file. The EM fiducial is used to synchronize the two datasets. The processed channels are presented in a Geosoft "array" channel format in the final GDB (Appendix 2) and are labeled in the database as Zon, Zoff, Xon, and Xoff.

Apparent bedrock EM anomalies were interpreted with the aid of an auto-pick from positive peaks and troughs in the on-time Z channel responses correlated with X channel responses. The auto-picked anomalies were reviewed and edited by a geophysicist on a line by line basis to discriminate between bedrock and conductive overburden sources as well as to determine the source type response (thin vs. thick – discussed later). Anomaly picks locations were migrated and removed as required. This process ensures the optimal representation of the conductor centres on the maps.

At each conductor pick, estimates of the on-time and off-time conductance have been generated based on calculation of the decay constant ( $\tau$ ) of the EM decay curves for those data points along the line where the response amplitude is sufficient to yield an acceptable estimate. Only channels that had a

minimum response of 15 nT/s were included in the tau calculation. A minimum of three channels responding above the 15 nT/s threshold were required to produce an acceptable tau estimate. The tau values were then windowed to exclude any values that had a correlation-coefficient less than 97%. Conductance values (in Siemens) were then directly calculated from tau values at each conductor pick. Each conductor pick was then classified according to a set of seven ranges of calculated off-time conductance values as indicated on the map legends (Figure 7). Each symbol is also given an identification letter label, unique to each flight line. Conductor picks that did not yield an acceptable estimate of off-time conductance were assigned a 'null' conductance value of "0.01", thus plotting as a low conductance source on the maps.

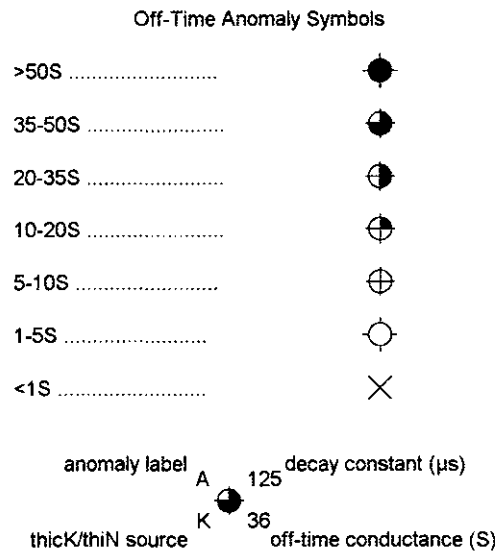


Figure 7. AeroTEM classified anomaly symbols.

**9.4. Magnetic Data**

Prior to any leveling the magnetic data was subjected to a lag correction of -0.1 seconds and a spike removal filter. The filtered aeromagnetic data were then corrected for diurnal variations using the magnetic base station and the intersections of the tie lines. No corrections for the regional reference field (IGRF) were applied. The corrected profile data were interpolated on to a grid using a random grid technique with a grid cell size of 20 metres. The final leveled TMI grid provided the basis for threading the presented contours which have a minimum contour interval of 5 nT.

In order to map shallow basement response a 'tilt' derivative product was calculated from the TMI grid. The Tilt Derivative (TDR) of the TMI enhances smaller wavelength magnetic features which define shallow basement structures as well as potential mineral exploration targets.

The TDR is defined as:

$$TDR = \arctan (VDR/THDR)$$



where VDR and THDR are first vertical and total horizontal derivatives, respectively, of the total magnetic intensity T.

$$VDR = dT/dz$$

$$THDR = \text{sqrt} ( (dT/dx)^2 + (dT/dy)^2 )$$

Due to the nature of the arctan trigonometric function in the filter, all amplitudes are restricted to  $+\pi/2$  and  $-\pi/2$  radians. This gives the Tilt derivative the added advantage of acting like an automatic gain control (AGC) filter. The calculated TDR grid is presented a colour sun-shaded image (illumination from the north-northeast). Line contours are also overlain which have a minimum contour interval of 0.5 radians.

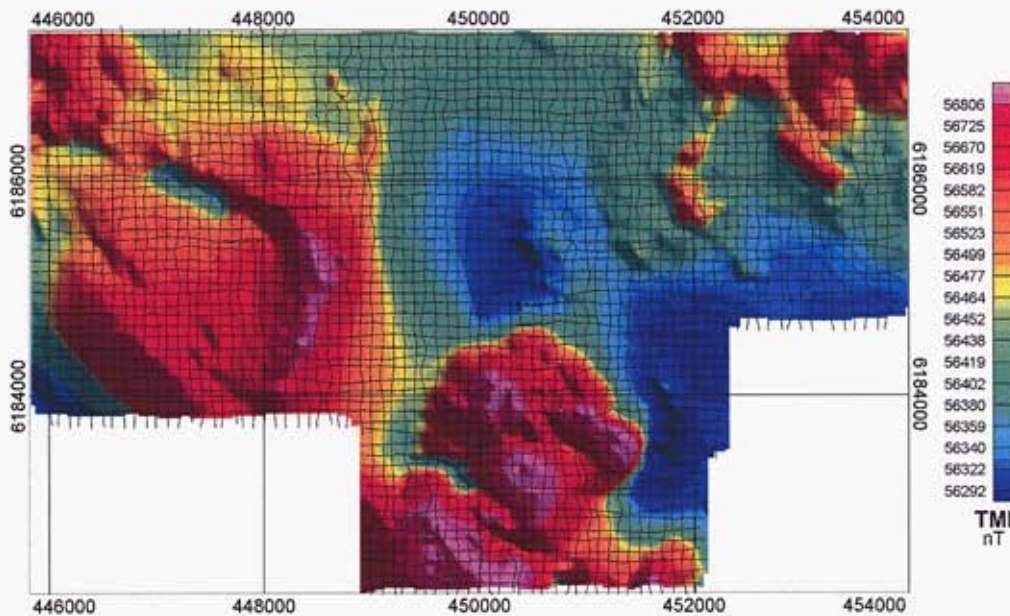
## 10. Results and Interpretation

The survey was successful in mapping the magnetic and conductive properties of the geology throughout the survey area. The following is a brief summary of the results. For a detailed interpretation of the survey data please contact Aeroquest Limited.

### 10.1. Magnetic Response

The magnetic data provide a high resolution map of the distribution of the magnetic mineral content of the survey area.

The magnetic data ranges from lows of 56540 nT to highs of up to 56666 nT with an average background of 56610 nT. Total Magnetic Field and Tilt Derivative features are illustrated in Figures 8 (a) and (b).



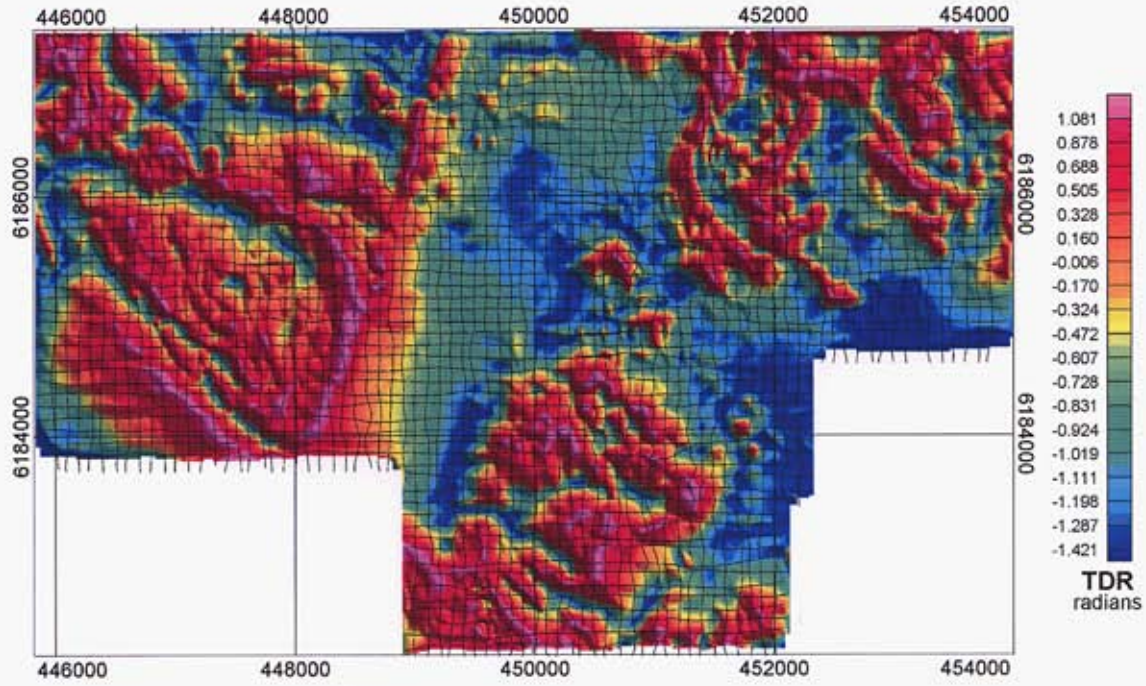


Figure 8. A. Shaded TMI colour map. B. Shaded TILT derivative magnetics.

## 10.2. EM Anomalies – General Comments

The EM anomalies on the maps are classified by conductance (as described earlier in the report) and also by the thickness of the source. A thin, vertically orientated source produces a double peak anomaly in the z-component response and a positive to negative crossover in the x-component response (Figure 9). For a vertically orientated thick source (say, greater than 10m), the response is a single peak in the z-component response and a negative to positive crossover in the x-component response (Figure 10). Because of these differing responses, the AeroTEM system provides discrimination of thin and thick sources and this distinction is indicated on the EM anomaly symbols (N = thin and K = thick). Where multiple, closely spaced conductive sources occur, or where the source has a shallow dip, it can be difficult to uniquely determine the type (thick vs. thin) of the source

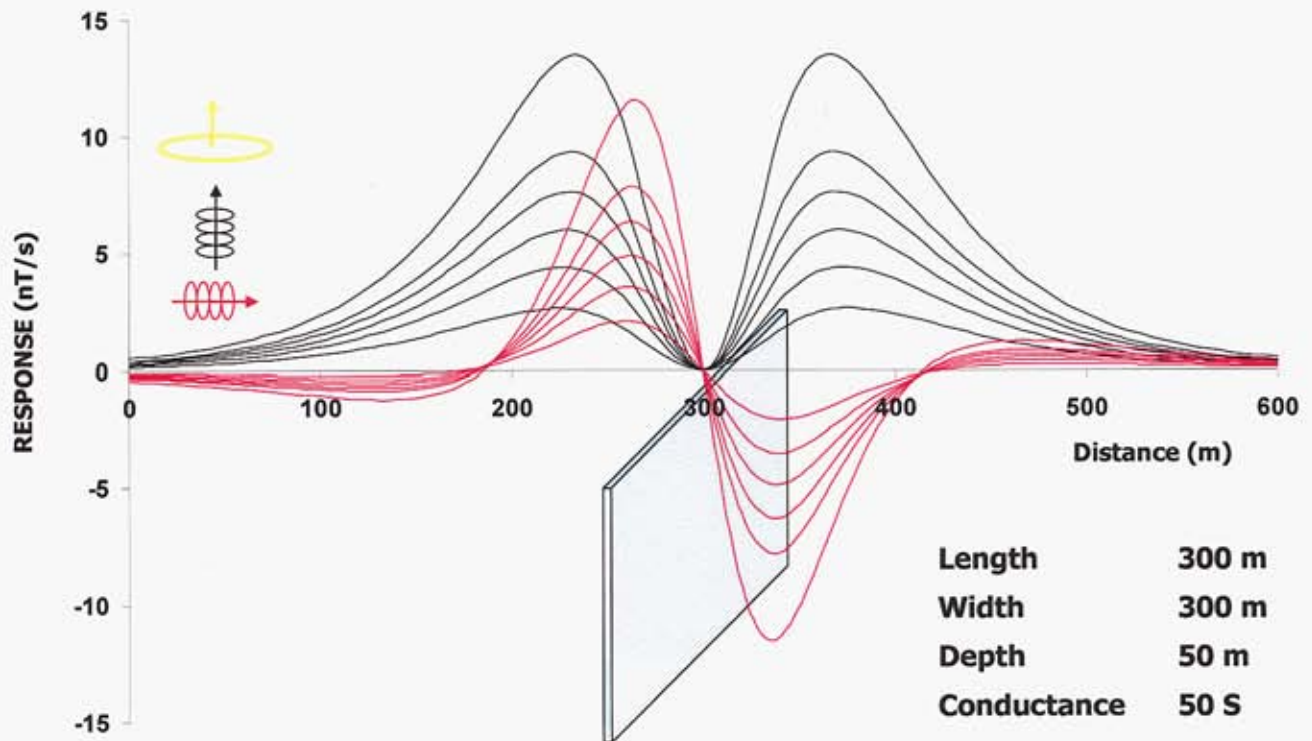


Figure 9. AeroTEM response to a 'thin' vertical conductor.

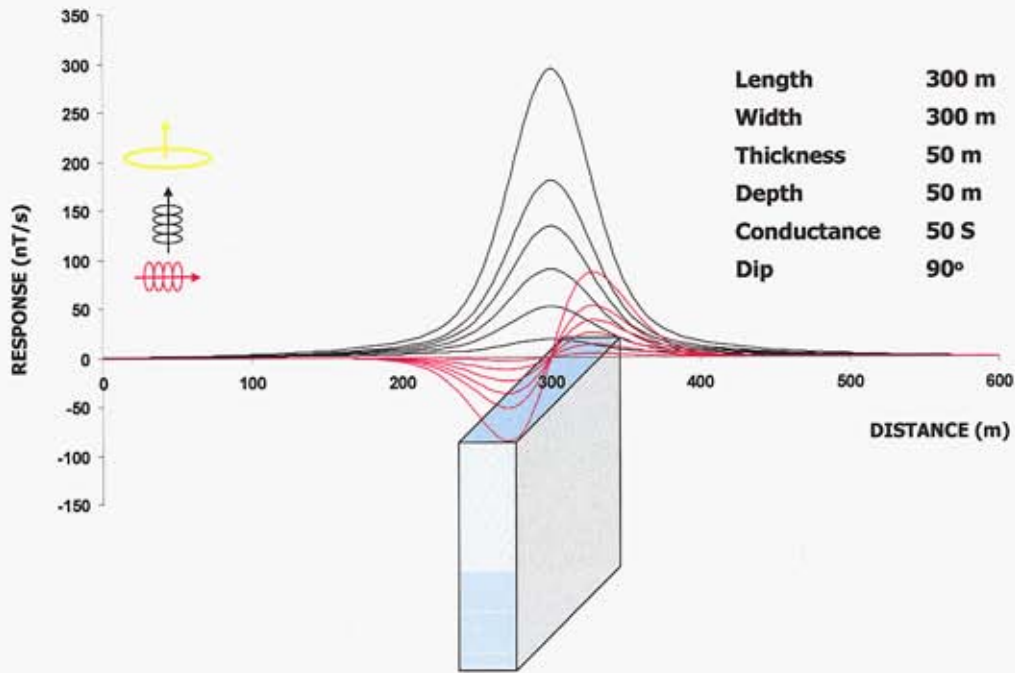


Figure 10. AeroTEM response for a 'thick' vertical conductor.

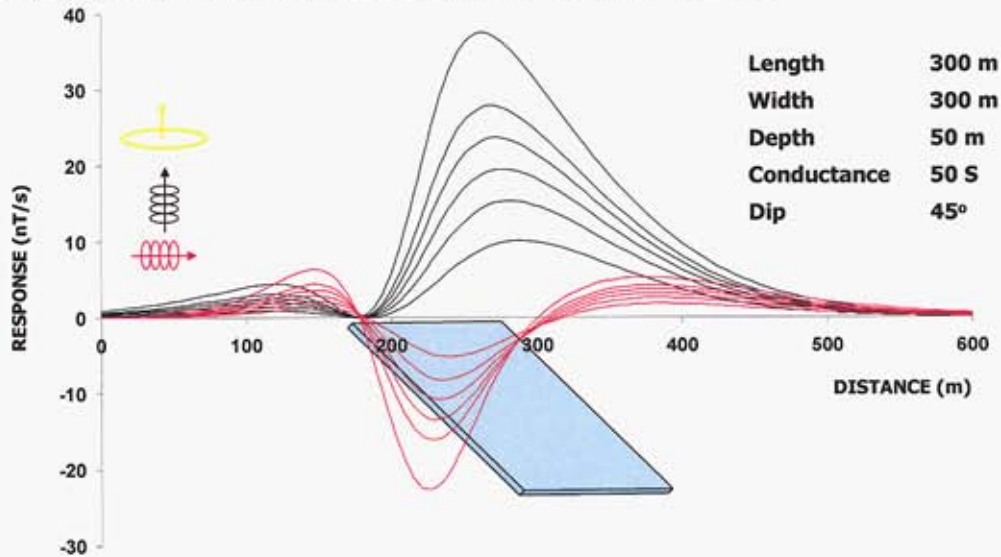


Figure 11. AeroTEM response over a 'thick' dipping conductor.

(Figure 11). In these cases both possible source types may be indicated by picking both thick and thin response styles. For shallow dipping conductors the ‘thin’ (N) pick will be located over the top edge of the source, whereas the ‘thick’ (K) pick will fall over the down-dip ‘heart’ of the anomaly.

### 10.3. EM Response

***“The AeroTEM survey on the Clone property was conducted using two orthogonal line orientations with a 100m line spacing in both directions. This dual line direction was flown because of the potential of mineralization in two orthogonal directions. A total 660.9 line-km was flown over this survey area.***

***The magnetic data set identifies a complex geologic environment with two dominant trends – NW/SE and NNE/SSW. The dominant magnetic features occur in the southern and western portions of the survey area. The roughly circular high in the south-central portion of the block is a known Tertiary intrusive. The sources for the other magnetic highs are not known based on the mapping to date. A dominant NNE trending magnetic high in the west central portion of the survey area may be related to a major structural feature of the same trend. The known SE trending Clone shear presents in the magnetic data as a magnetic low. Other magnetic lows through the area like the one which extends parallel to, and 800 m northeast of, the Clone shear must be considered as potential new shear zones. Another potential shear zone extends west of the Sutton Glacier and west of the Treble Zone with a SE trend.***

***The electromagnetic data identify a long zone of conductivity which extends from the north central border ESE to SE to the eastern border of the survey area. This feature is variable along strike in both conductivity and character. In some areas, the response is very limited and in others the zone interpreted to comprise multiple parallel conductive sources. Most of this conductive horizon coincides with a broad general magnetic low and, in fact, correlates locally with discrete magnetic lows. Near its northwestern extent the conductive feature appears to be correlated with weak magnetic highs. Where the glaciers transect the zone the response decreases in amplitude and the axis of the zone deflects towards the northeast, a deflection which is consistent with the interpreted northeast trend of the conductive sources which comprise the zone. It is possible that this zone is reflecting mineralization along a shear zone which parallels the Clone shear which occurs some 800 m to the southwest. Ground truthing to establish the source of the conductivity should be carried out. The best location for this is an area east of the Sutton Glacier and southeast of the saddle in the ridge through which this zone extends.***

***The response on line 4500 and 4490 indicates that there are three parallel conductive sources which comprise the zone in this vicinity. The two southwestern of these sources are interpreted to extend to surface owing to their relatively high amplitudes in the EM data. Ground truthing of these sources should be done in the vicinity of 451927 mE, 6184636 mN, and 451793 mE, 6184858 mN (these coordinates are in NAD83 UTM zone 10). If no source can be found or if a source is found and is favourable, drill testing of these zones should be carried out in this area.”***

***Jonathan Rudd, Aeroquest Limited***

All anomalies indicated on the maps and should be reviewed in conjunction with available geological or geochemical information. The ‘thick’ and ‘thin’ response styles must also be considered when analyzing the interpreted picks and prioritizing for follow-up. The highest priority EM targets should then be subjected to quantitative modeling prior to drill testing to determine the azimuth and dip of the source. Figure 12 illustrates the Z coil response (off-time) from channels 5 through 15 for this area.

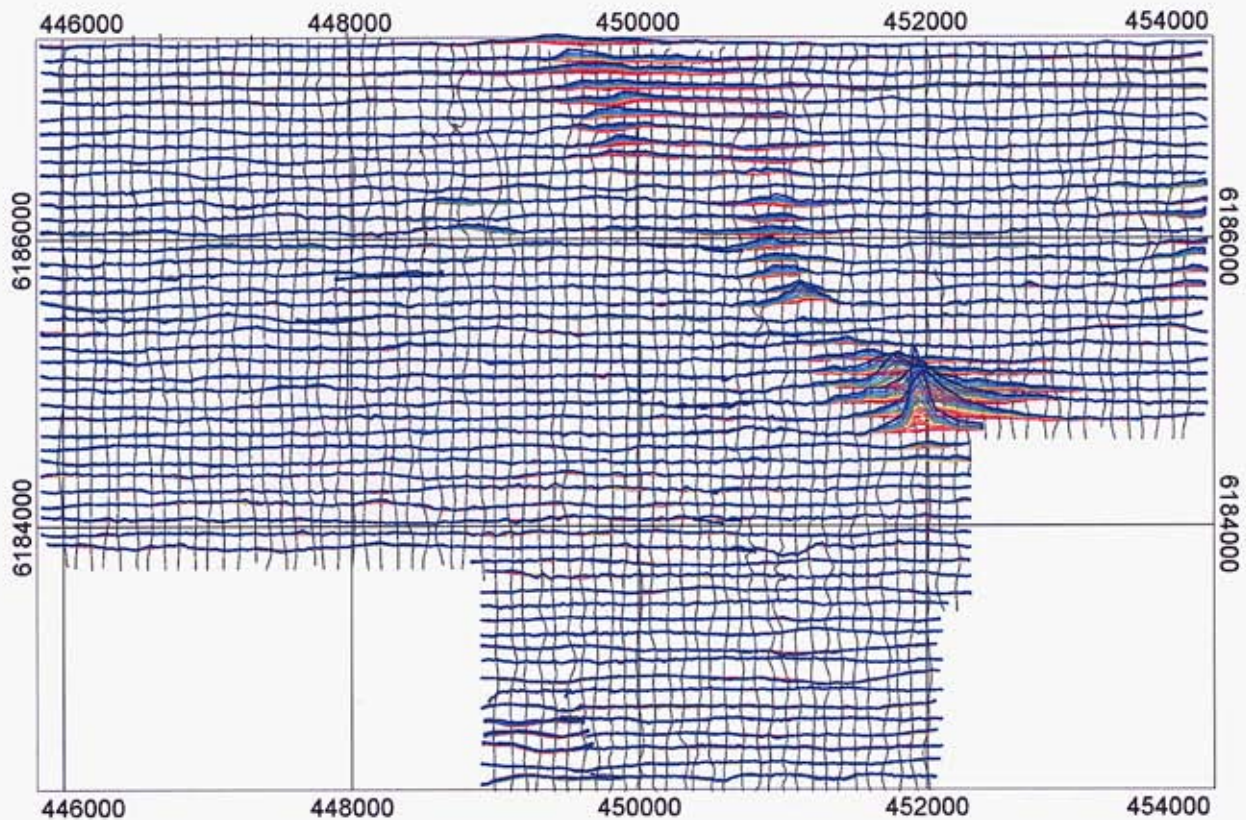


Figure 12 Off-time EM response over the survey area (Z coil, channels 5 through 15).

Respectfully submitted,

Gord Smith  
Aeroquest Limited  
April, 2006

## APPENDIX 1 – PROJECT CORNER COORDINATES

The 4J's Survey Block has a boundary which is defined in the following table. All geophysical data presented in this report have been windowed to this outline. Positions are in UTM Zone 9 – NAD83.

Easting (m)	Northing (m)
445950.0	6187250.0
453850.0	6187250.0
453850.0	6184700.0
452200.0	6184700.0
452200.0	6183500.0
452000.0	6183500.0
452000.0	6182250.0
449000.0	6182250.0
449000.0	6183800.0
445950.0	6183800.0

**APPENDIX 2 - Description of Database Fields**

The GDB file is a Geosoft binary database. In the database, the Survey lines and Tie Lines are prefixed with an "L" for "Line" and "T" for "Tie".

Database (Clone\_Final\_Client.gdb):

<b>Column</b>	<b>Units</b>	<b>Description</b>
Emfid		AERODAS Fiducial
utctime	hh:mm:ss.ss	UTC time
X	m	UTM Easting (NAD83, zone 9N)
Y	m	UTM Northing (NAD83, zone 9N)
Lat_wgs84	dd.dddddd	Raw WGS84 Latitude
Long_wgs84	dd.dddddd	Raw WGS84 Longitude
bheight	m	Terrain clearance of EM bird
Galtf	m	GPS altitude (WGS 84)
Dtmf	m	Digital Terrain Model
Magf	nT	Final leveled total magnetic intensity
basemagf	nT	Base station total magnetic intensity
Pwrline		Powerline monitor
Flight		Flight number
ZOn	nT/s	Processed Streaming On-Time Z component Channels 1-15
Zoff	nT/s	Processed Streaming Off-Time Z component Channels 1-16
XOn	nT/s	Processed Streaming On-Time X component Channels 1-15
XOff	nT/s	Processed Streaming Off-Time X component Channels 1-16
Anom_ID		Thick (K) or Thin (T) identifier
Anom_labels		Letter label of conductor pick (A,B,C, etc.)
On_tau	microseconds	On-time Decay constant at conductor pick
Off_tau	microseconds	Off-time Decay constant at conductor pick
On_con	S	On-time conductance
off_con	S	Off-time conductance
Grade		Classification from 1-7 based on conductance of conductor pick



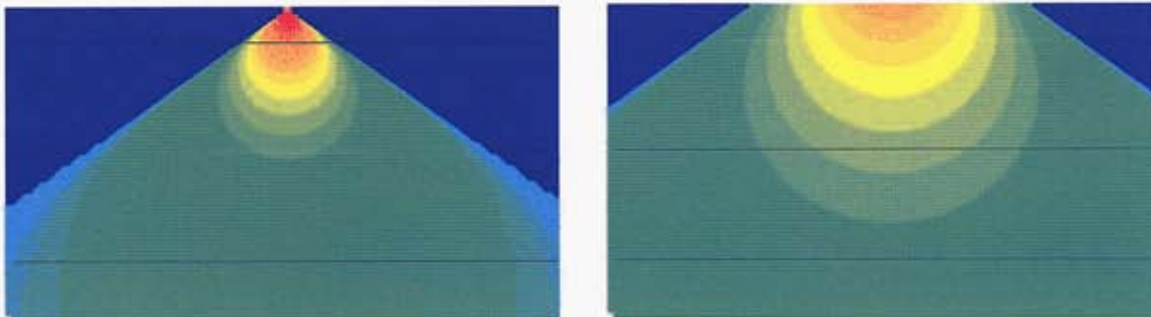
## APPENDIX 3: AeroTEM Design Considerations

### Design Considerations

Helicopter-borne EM systems offer an advantage that cannot be matched from a fixed-wing platform. The ability to fly at a slower speed and collect data with high spatial resolution, and with great accuracy, means that helicopter EM systems provide more detail than any other EM configuration, airborne or ground-based. Spatial resolution is especially important in areas of complex geology and in the search for discrete conductors. With the advent of helicopter-borne high-moment time domain EM systems the fixed-wing platforms are losing their *only* advantage – depth penetration.

### Advantage 1 – Spatial Resolution

The AeroTEM system is specifically designed to have a small footprint. This is accomplished through the use of concentric transmitter-receiver coils and a relatively small diameter transmitter coil (5 m). The result is a highly focused exploration footprint, which allows for more accurate "mapping" of discrete conductors. Consider the transmitter primary field images shown in Figure 1, for AeroTEM versus a fixed-wing transmitter. The footprint of AeroTEM at the earth's surface is the footprint of a fixed-wing system is roughly 150 m roughly 50 m on either side of transmitter. on either side of the transmitter.



**Figure 1. A comparison of the footprint between AeroTEM and a fixed-wing system, highlights the greater resolution that is achievable with a transmitter located closer to the earth's surface. The AeroTEM footprint is one third that of a fixed-wing system and is symmetric, while the fixed-wing system has even lower spatial resolution along the flight line because of the separated transmitter and receiver configuration.**

At first glance one may want to believe that a transmitter footprint that is distributed more evenly over a larger area is of benefit in mineral exploration. In fact, the opposite is true; by energizing a larger surface area, the ability to energize and detect discrete conductors is reduced. Consider, for example, a comparison between AeroTEM and a fixed-wing system over the Mesamax Deposit (1,450,000 tonnes of 2.1% Ni, 2.7% Cu, 5.2 g/t Pt/Pd). In a test survey over three flight lines spaced 100 m apart, AeroTEM detected the Deposit on all three flight lines. The fixed-wing system detected the Deposit only on two flight lines. In exploration programs that seek to expand the flight line spacing in an effort to reduce the cost of the airborne survey, discrete conductors such as the Mesamax Deposit can go undetected. The argument often put forward in favor of using fixed-wing systems is that because of their larger footprint, the flight line spacing can indeed be widened. Many fixed-wing surveys are flown at 200 m or 400 m. Much of the survey work performed by Aeroquest has been to survey in areas that were previously flown at these wider line spacings. One of the reasons for AeroTEM's impressive discovery record has been the strategy of flying closely spaced lines and finding all the discrete near-surface conductors. These higher resolution surveys are being flown within existing mining camps, areas that improve the chances of discovery.

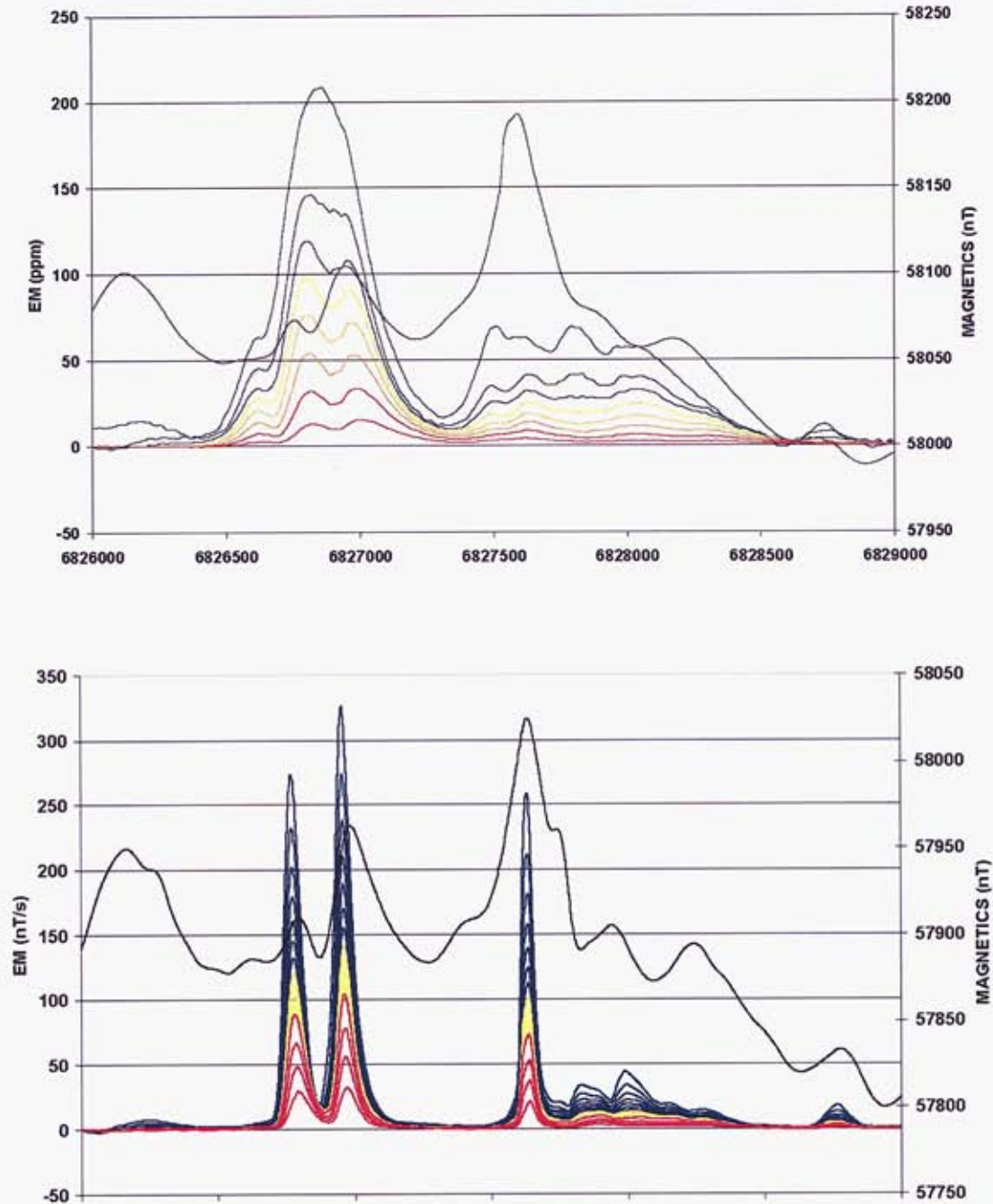
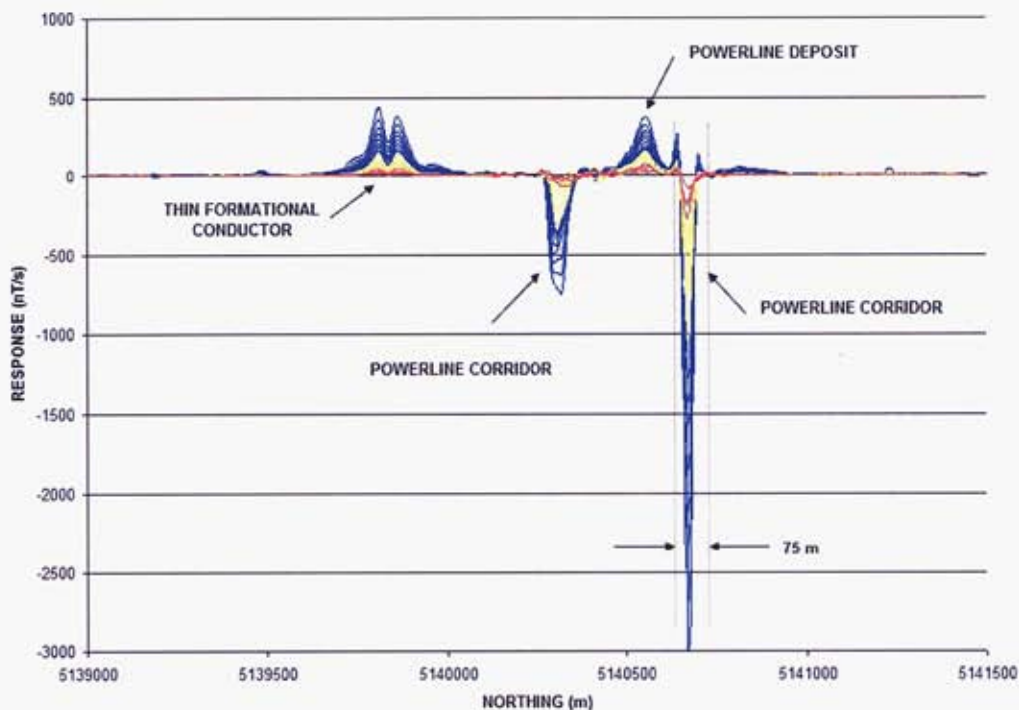


Figure 2. Fixed-wing (upper) and AeroTEM (lower) comparison over the eastern limit of the Mesamax Deposit, a Ni-Cu-PGE zone located in the Raglan nickel belt and owned by Canadian Royalties. Both systems detected the Deposit further to the west where it is closer to surface.

The small footprint of AeroTEM combined with the high signal to noise ratio (S/N) makes the system more suitable to surveying in areas where local infrastructure produces electromagnetic noise, such as power lines and railways. In 2002 Aeroquest flew four exploration properties in the Sudbury Basin that were under option by FNX Mining Company Inc. from Inco Limited. One such property, the Victoria Property, contained three major power line corridors.

The resulting AeroTEM survey identified all the known zones of Ni-Cu-PGE mineralization, and detected a response between two of the major power line corridors but in an area of favorable geology. Three boreholes were drilled to test the anomaly, and all three intersected sulphide. The third borehole encountered 1.3% Ni, 6.7% Cu, and 13.3 g/t TPMs over 42.3 ft. The mineralization was subsequently named the Powerline Deposit.

The success of AeroTEM in Sudbury highlights the advantage of having a system with a small footprint, but also one with a high S/N. This latter advantage is achieved through a combination of a high-moment (high signal) transmitter and a rigid geometry (low noise). Figure 3 shows the Powerline Deposit response and the response from the power line corridor at full scale. The width of power line response is less than 75 m.



**Figure 3.** The Powerline Deposit is located between two major power line corridors, which make EM surveying problematic. Despite the strong response from the power line, the anomaly from the Deposit is clearly detected. Note the thin formational conductor located to the south. The only way to distinguish this response from that of two closely spaced conductors is by interpreting the X-axis coil response.

**Advantage 2 – Conductance Discrimination**

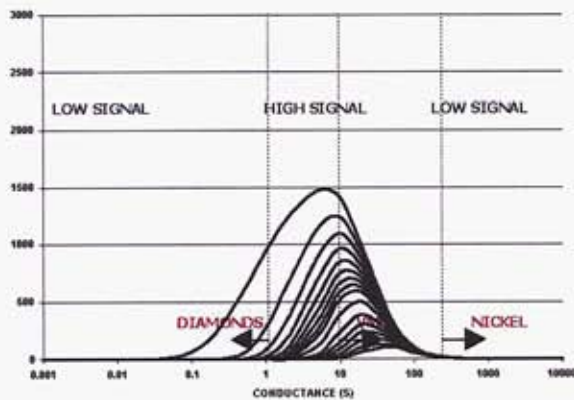
The AeroTEM system features full waveform recording and as such is able to measure the on-time response due to high conductance targets. Due to the processing method (primary field removal), there is attenuation of the response with increasing conductance, but the AeroTEM on-time measurement is still superior to systems that rely on lower base frequencies to detect high conductance targets, but do not measure in the on-time.

The peak response of a conductive target to an EM system is a function of the target conductance and the EM system base frequency. For time domain EM systems that measure only in the off-time, there is a drop in the peak response of a target as the base frequency is lowered for all conductance values below the peak system response. For example, the AeroTEM peak response occurs for a 10 S conductor in the early off-time and 100 S in the late off-time for a 150 Hz base frequency. Because base frequency and conductance form a linear relationship when considering the peak response of any EM system, a drop in base frequency of 50% will double the conductance at which an EM system shows its peak response. If the base frequency were lowered from 150 Hz to 30 Hz there would be a fivefold increase in conductance at which the peak response of an EM occurred.

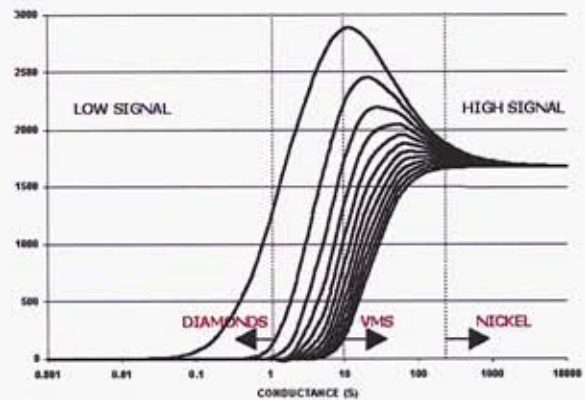
However, in the search for highly conductive targets, such as pyrrhotite-related Ni-Cu-PGM deposits, a fivefold increase in conductance range is a high price to pay because the signal level to lower conductance targets is reduced by the same factor of five. For this reason, EM systems that operate with low base frequencies are not suitable for general exploration unless the target conductance is more than 100 S, or the target is covered by conductive overburden.

Despite the excellent progress that has been made in modeling software over the past two decades, there has been little work done on determining the optimum form of an EM system for mineral exploration. For example, the optimum configuration in terms of geometry, base frequency and so remain unknown. Many geophysicists would argue that there is no single ideal configuration, and that each system has its advantages and disadvantages. We disagree.

When it comes to detecting and discriminating high-conductance targets, it is necessary to measure the pure inphase response of the target conductor. This measurement requires that the measured primary field from the transmitter be subtracted from the total measured response such that the secondary field from the target conductor can be determined. Because this secondary field is in-phase with the transmitter primary field, it must be made while the transmitter is turned on and the transmitter current is changing. The transmitted primary field is several orders of magnitude larger than the secondary field. AeroTEM uses a bucking coil to reduce the primary field at the receiver coils. The only practical way of removing the primary field is to maintain a rigid geometry between the transmitter, bucking and receiver coils. This is the main design consideration of the AeroTEM airframe and it is the only time domain airborne system to have this configuration.



The off-time AeroTEM response for the 16 channel configuration.

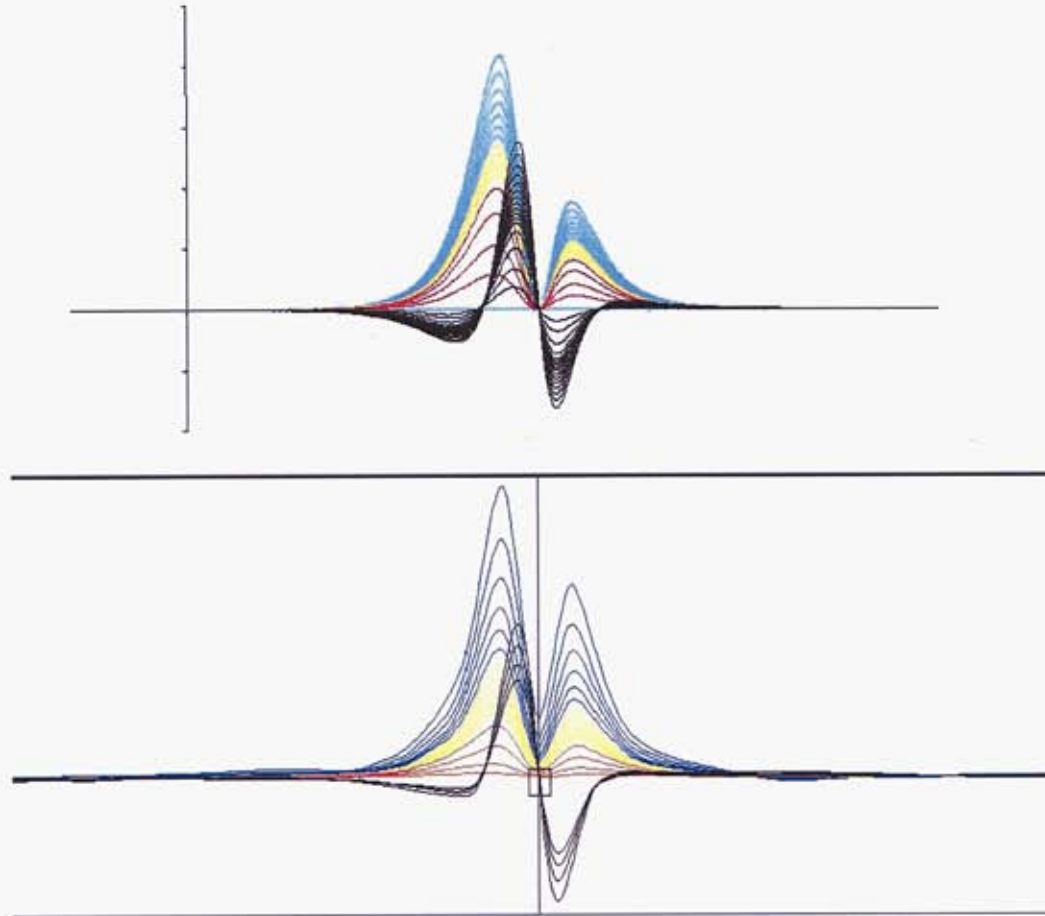


The on-time response assuming 100% removal of the measured primary field.

**Figure 4. The off-time and on-time response nomogram of AeroTEM for a base frequency of 150 Hz. The on-time response is much stronger for higher conductance targets and this is why on-time measurements are more important than lower frequencies when considering high conductance targets in a resistive environment.**

### Advantage 3 – Multiple Receiver Coils

AeroTEM employs two receiver coil orientations. The Z-axis coil is oriented parallel to the transmitter coil and both are horizontal to the ground. This is known as a maximum coupled configuration and is optimal for detection. The X-axis coil is oriented at right angles to the transmitter coil and is oriented along the line-of-flight. This is known as a minimum coupled configuration, and provides information on conductor orientation and thickness. These two coil configurations combined provide important information on the position, orientation, depth, and thickness of a conductor that cannot be matched by the traditional geometries of the HEM or fixed-wing systems. The responses are free from a system geometric effect and can be easily compared to model type curves in most cases. In other words, AeroTEM data is very easy to interpret. Consider, for example, the following modeled profile:



**Figure 5. Measured (lower) and modeled (upper) AeroTEM responses are compared for a thin steeply dipping conductor. The response is characterized by two peaks in the Z-axis coil, and a cross-over in the X-axis coil that is centered between the two Z-axis peaks. The conductor dips toward the higher amplitude Z-axis peak. Using the X-axis cross-over is the only way of differentiating the Z-axis response from being two closely spaced conductors.**

### HEM versus AeroTEM

Traditional helicopter EM systems operate in the frequency domain and benefit from the fact that they use narrowband as opposed to wide-band transmitters. Thus all of the energy from the transmitter is concentrated in a few discrete frequencies. This allows the systems to achieve excellent depth penetration (up to 100 m) from a transmitter of modest power. The Aeroquest Impulse system is one implementation of this technology.

The AeroTEM system uses a wide-band transmitter and delivers more power over a wide frequency range. This frequency range is then captured into 16 time channels, the early channels containing the high frequency information and the late time channels containing the low frequency information down to the system base frequency. Because frequency domain HEM systems employ two coil configurations (coplanar and coaxial) there are only a maximum of three comparable frequencies per configuration, compared to 16 AeroTEM off-time and 12 AeroTEM on-time channels.

Figure 6 shows a comparison between the Dighem HEM system (900 Hz and 7200 Hz coplanar) and AeroTEM (Zaxis) from surveys flown in Raglan, in search of highly conductive Ni-Cu-PGM sulphide. In general, the AeroTEM peaks are sharper and better defined, in part due to the greater S/N ratio of the AeroTEM system over HEM, and also due to the modestly filtered AeroTEM data compared to HEM. The base levels are also better defined in the AeroTEM data. AeroTEM filtering is limited to spike removal and a 5-point smoothing filter. Clients are also given copies of the raw, unfiltered data.

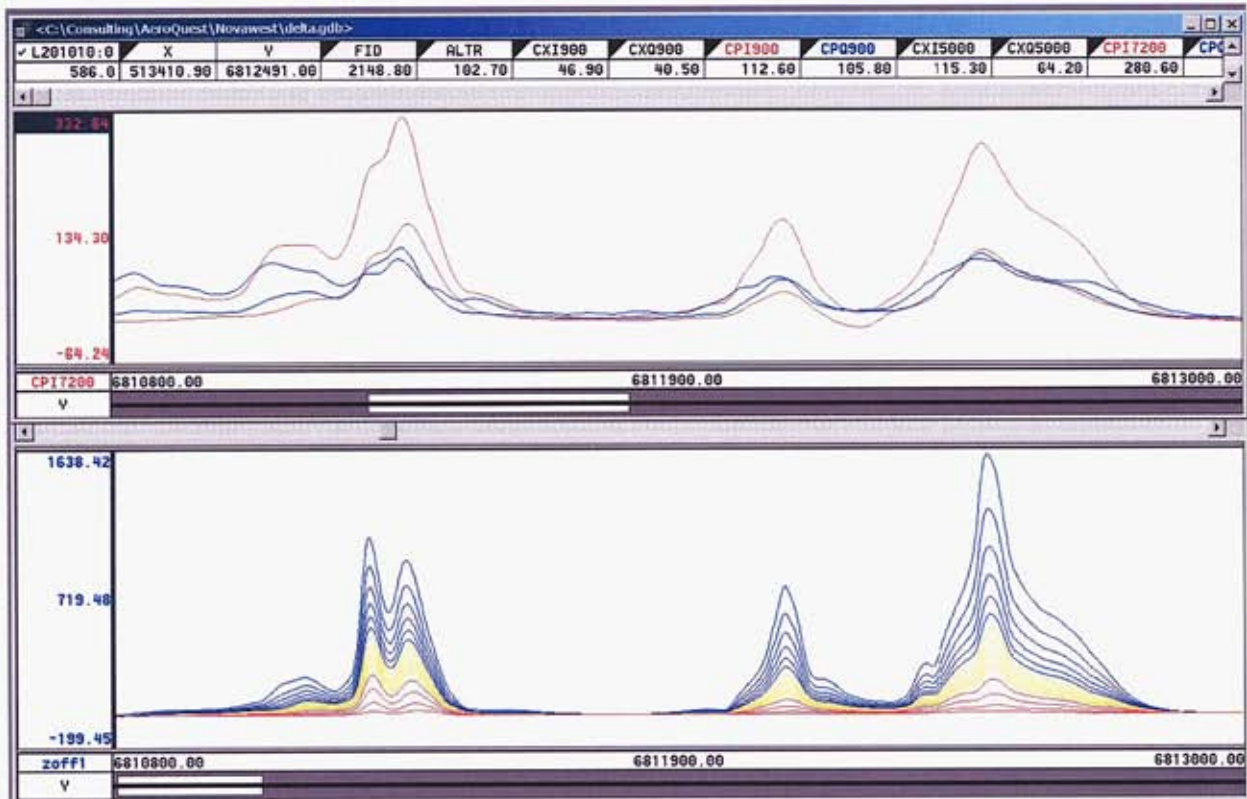


Figure 6. Comparison between Dighem HEM (upper) and AeroTEM (lower) surveys flown in the Raglan area. The AeroTEM responses appear to be more discrete, suggesting that the data is not as heavily filtered as the HEM data. The S/N advantage of AeroTEM over HEM is about 5:1.

Aeroquest Limited is grateful to the following companies for permission to publish some of the data from their respective surveys: Wolfden Resources, FNX Mining Company Inc, Canadian Royalties, Nova West Resources, Aurogin Resources, Spectrem Air. Permission does not imply an endorsement of the AeroTEM system by these companies.

**APPENDIX 4: AeroTEM Instrumentation Specification Sheet****AEROTEM Helicopter Electromagnetic System****System Characteristics**

- Transmitter: Triangular Pulse Shape Base Frequency 30 or 150 Hz
- Tx On Time - 5,750 (30Hz) or 1,150 (150Hz)  $\mu$ s
- Tx Off Time - 10,915 (30Hz) or 2,183 (150Hz)  $\mu$ s
- Loop Diameter - 5 m
- Peak Current - 250 A
- Peak Moment - 38,800 NIA
- Typical Z Axis Noise at Survey Speed = 8 ppb peak
- Sling Weight: 270 Kg
- Length of Tow Cable: 40 m
- Bird Survey Height: 30 m or less nominal

**Receiver**

- Three Axis Receiver Coils (x, y, z) positioned at centre of transmitter loop
- Selectable Time Delay to start of first channel 21.3 , 42.7, or 64.0 ms

**Display & Acquisition**

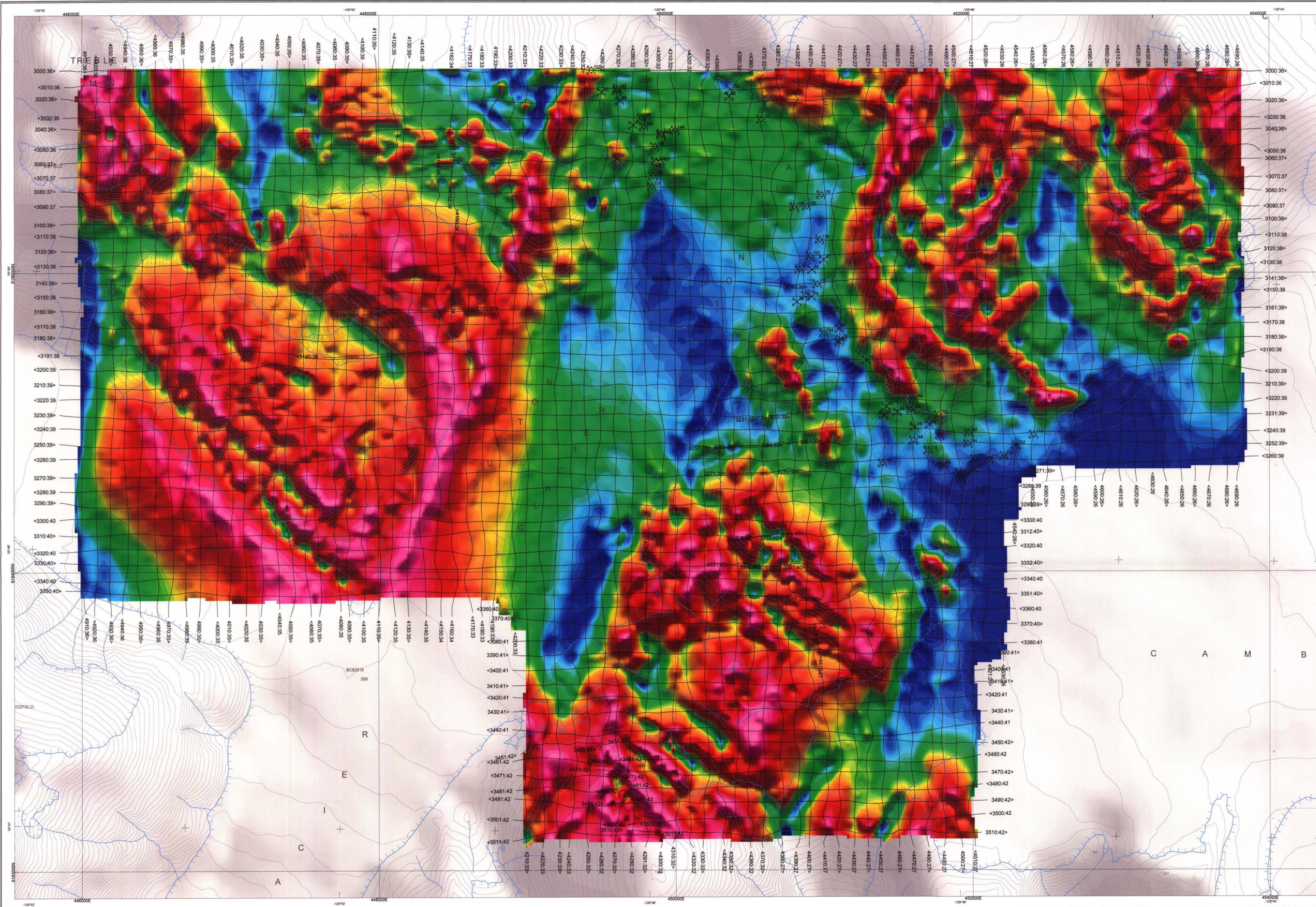
- PROTODAS Digital recording at 126 samples per decay curve at a maximum of 300 curves per second (26.455  $\mu$ s channel width)
- RMS Channel Widths: 52.9, 132.3, 158.7, 158.7, 317.5, 634.9  $\mu$ s
- Recording & Display Rate = 10 readings per second.
- On-board display - six channels Z-component and 1 X-component

**System Considerations**

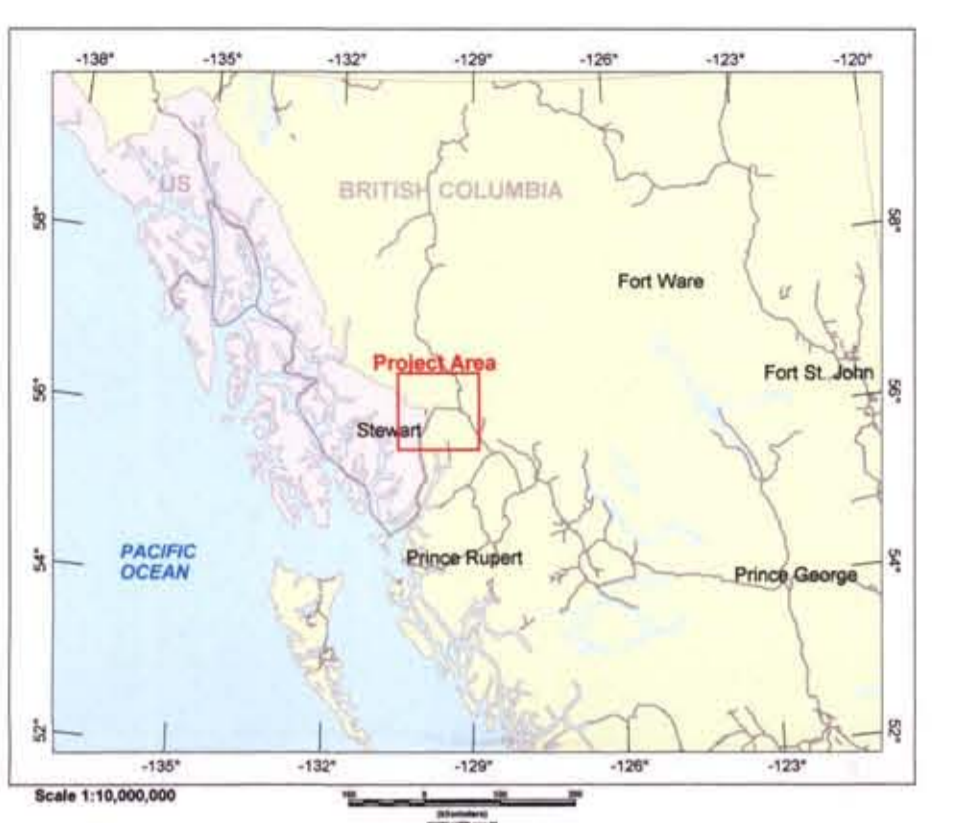
Comparing a fixed-wing time domain transmitter with a typical moment of 500,000 NIA flying at an altitude of 120 m with a Helicopter TDEM at 30 m, notwithstanding the substantial moment loss in the airframe of the fixed wing, the same penetration by the lower flying helicopter system would only require a sixty-fourth of the moment. Clearly the AeroTEM system with nearly 40,000 NIA has more than sufficient moment. The airframe of the fixed wing presents a response to the towed bird, which requires dynamic compensation. This problem is non-existent for AeroTEM since transmitter and receiver positions are fixed. The AeroTEM system is completely portable, and can be assembled at the survey site within half a day.

**Tel: +1 905 878-5616. Fax: +1 905 876-0193.**

**Email: [sales@aeroquestsurveys.com](mailto:sales@aeroquestsurveys.com)**

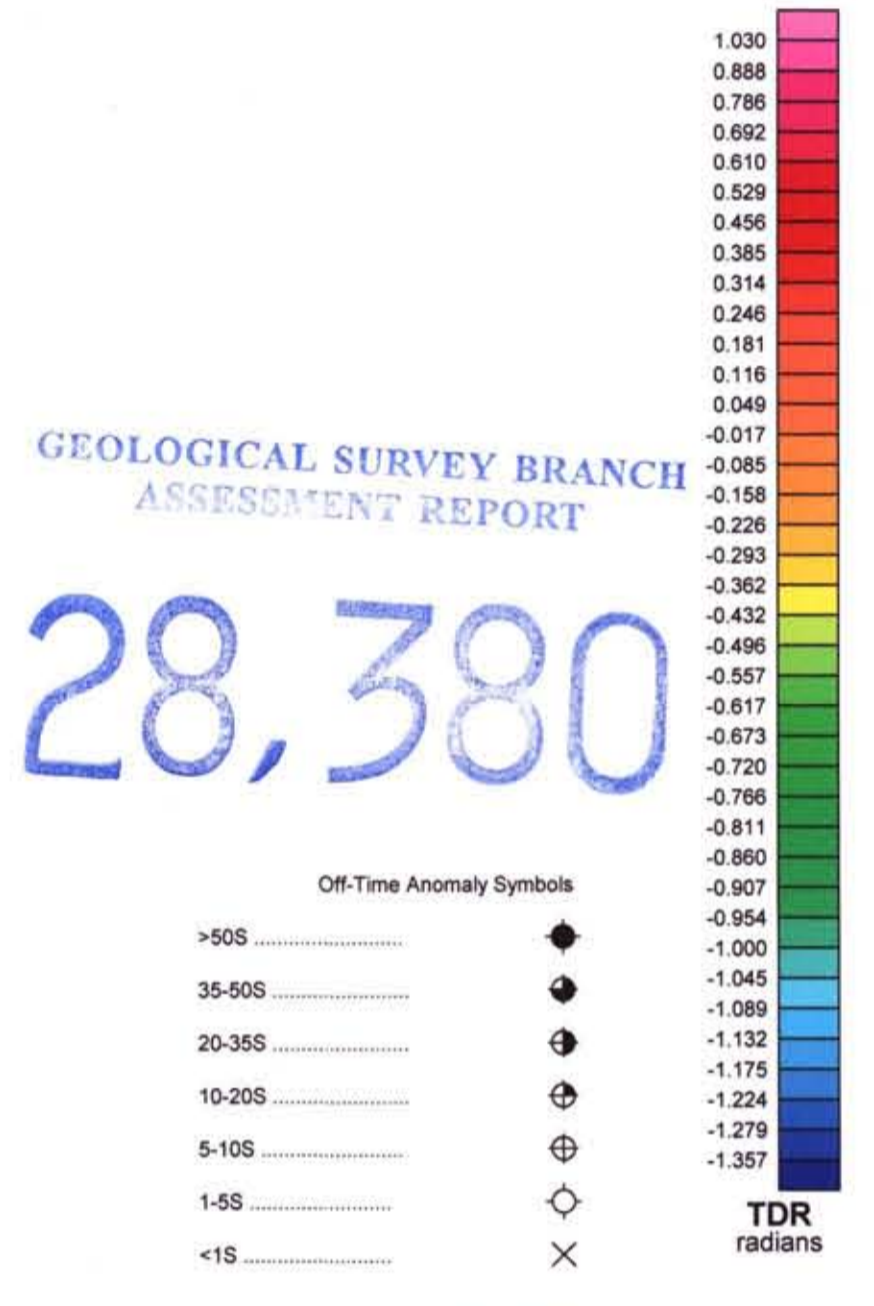


The topographic data base was based on 1:20000 BC TRM data supplied by the client.  
 Inset data derived from Natural Resources Canada 'Atlas of Canada Base Map'.  
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GEOLOGICAL SURVEY BRANCH  
 ASSESSMENT REPORT

28,380



Off-Time Anomaly Symbols

- >50S
- 35-50S
- 20-35S
- 10-20S
- 5-10S
- 1-5S
- <1S

anomaly label A, decay constant (s) K, thick/Thin source K, off-time conductance (S)

**SURVEY SPECIFICATIONS**  
 Survey flown: Feb 17, 19, 2006  
 Traverse line spacing: 100 metres  
 Traverse line direction: E-W (90°)  
 Nominal EM bird height: 30 metres  
 Aircraft: Aerospaciale A-Star 350BA (C-GMBC)

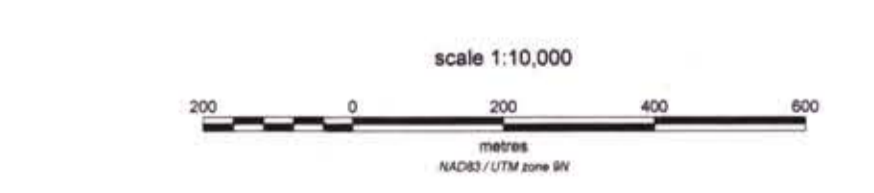
**INSTRUMENTATION**  
 Data acquisition: ADAS & RMS DGR-33  
 Magnetometer: Geometrics G-823A cesium vapour  
 Installation: Towed bird 17 m above EM bird  
 Sensitivity: 501 nanoTesla  
 Electromagnetics: AeroTEM II System (ECHO)  
 Configuration: Towed bird

**NAVIGATION:**  
 Navigation: Differential Global Positioning System (DGPS)  
 Navigation equipment: AGNAV with MID-TECH RX400p receiver  
 Radar Altimeter: Terra TRA3000TRI-30

**DATA PROCESSING**  
 Magnetics: diurnal, belline and micro-leveling corrections

**POSITIONING**  
 Datum: NAD83  
 Major Axis: 6378137.000  
 Eccentricity: 0.081819191

**MAP PROJECTION**  
 Projection: Universal Transverse Mercator  
 Central Meridian: 129°W (Zone 9)  
 Central Scale Factor: 0.9999  
 False Easting/Northing: 500,000m/0m



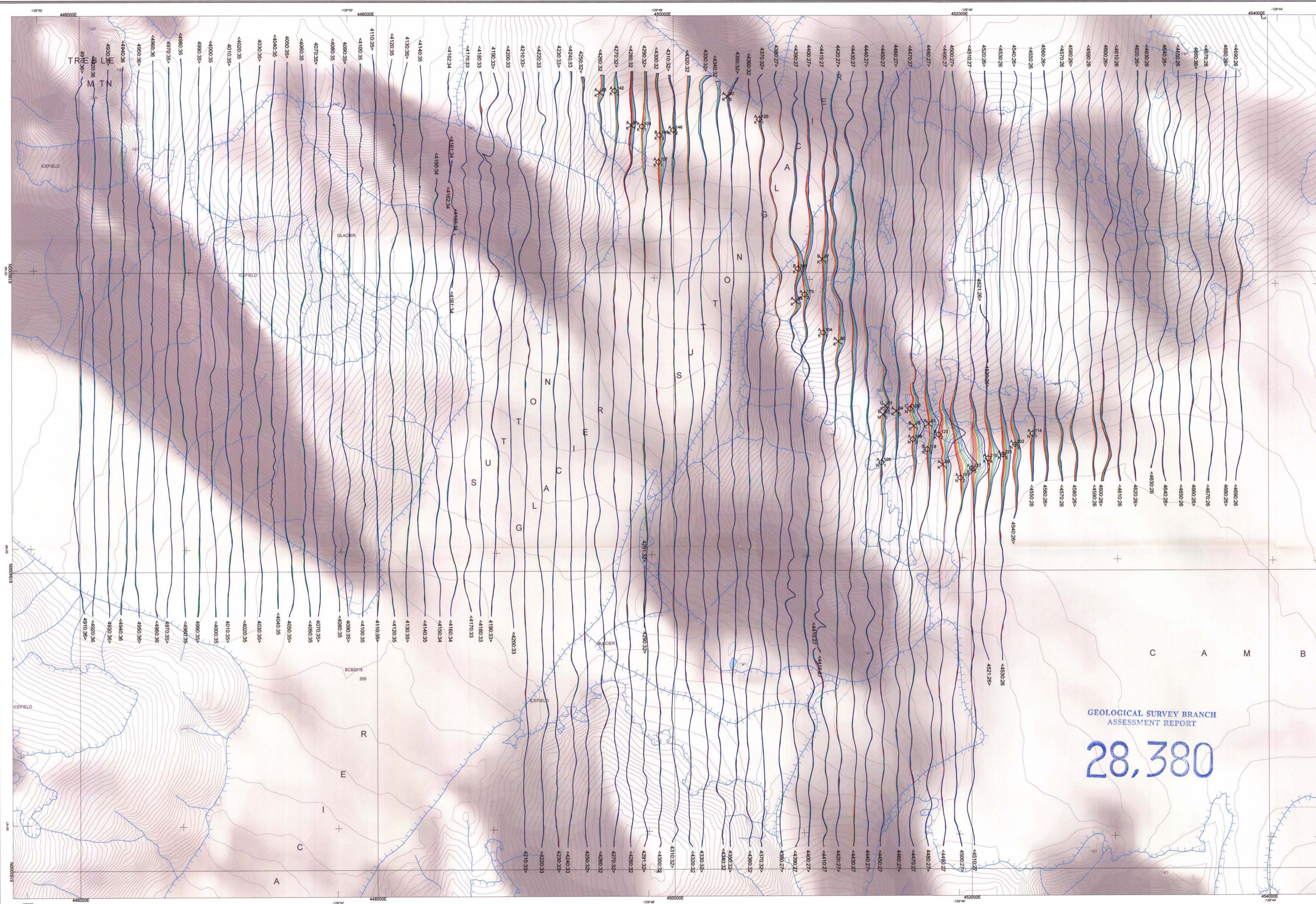
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 Stewart Area, British Columbia

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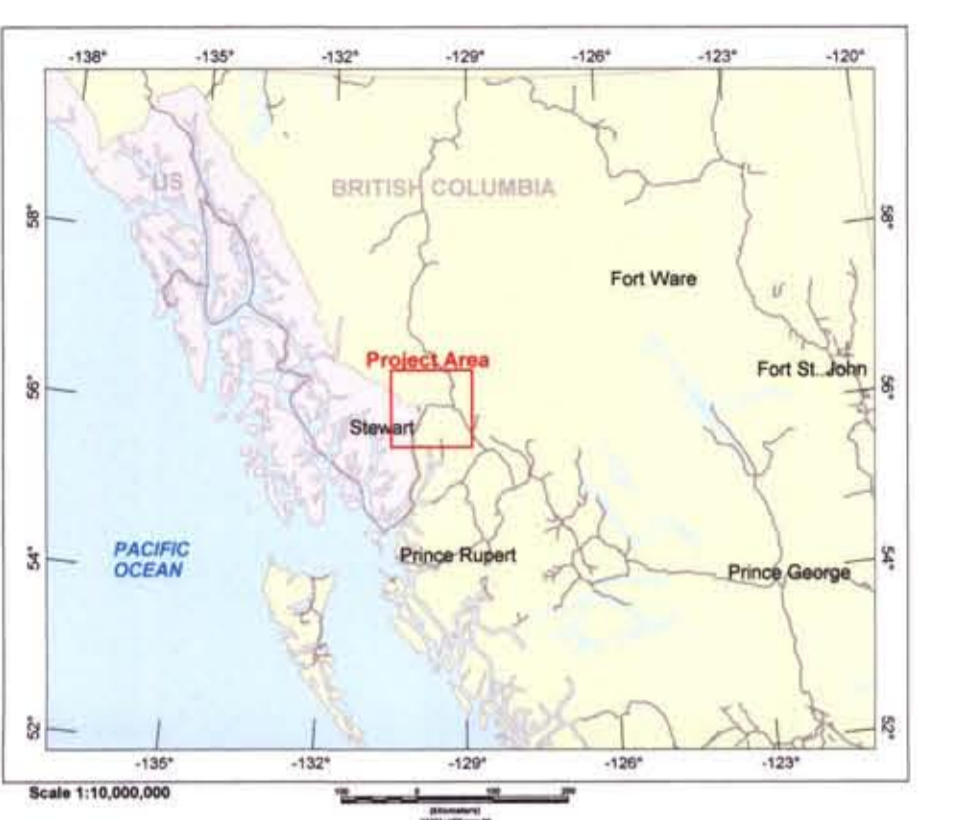
Clone  
 NTS 103P13

**AEROQUEST LIMITED**  
 4-845 Main St. East  
 Milton, Ont., CANADA L9T 3Z3  
 Tel: (905) 876-8128 Fax: (905) 876-8128  
 www.aeroquest.com  
 March 2006





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 Grid North  
 NAD83-Zone9



- AerOTEM Profiles**  
 positive excursion to top and right, 1mm=10nT/s
- 25 Off-Time Channel
  - 26 Off-Time Channel
  - 27 Off-Time Channel
  - 28 Off-Time Channel
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- Off-Time Anomaly Symbols**
- >50S
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  - 20-35S
  - 10-20S
  - 5-10S
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  - <1S
- anomaly label A decay constant (µs)  
 thick/thin source K off-time conductance (S)

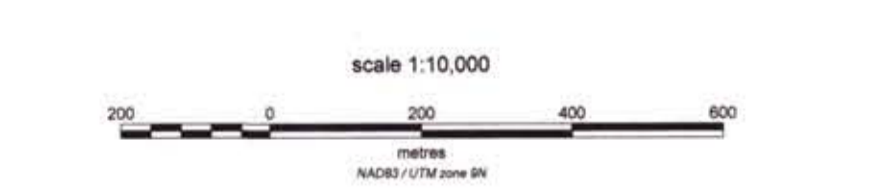
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 Survey flown: Feb 17, 19, 2006  
 Traverse line spacing: 100 metres  
 Traverse line direction: E-W (90°)  
 Nominal EM bird height: 30 metres  
 Aircraft: Aerospasiale A-Star 300BA (C-GMBC)

**INSTRUMENTATION:**  
 Data acquisition: ADAS & RMS DGR-33  
 Magnetometer: Geometrics G-823A cesium vapour  
 Installation: Towed bird 17 m above EM bird  
 Sensitivity: 0.01 nano Tesla  
 Electromagnetics: AerOTEM II System (ECHO)  
 Configuration: Towed bird

**NAVIGATION:**  
 Navigation: Differential Global Positioning System (DGPS)  
 Navigation equipment: AGNAV II with MID-TECH FR400p receiver  
 Radar Altimeter: Terra TRA3000/TRI-30

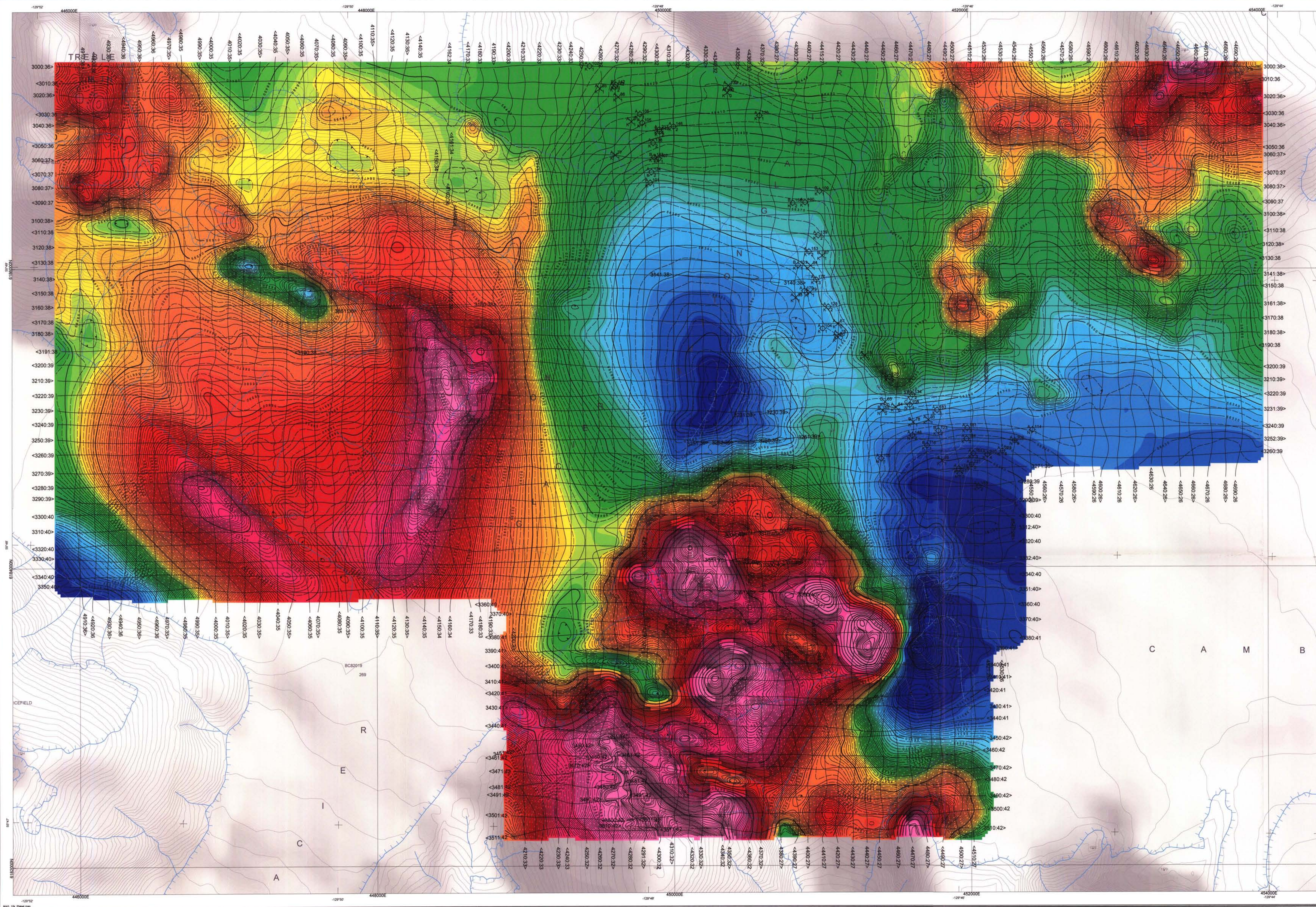
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 Magnetics: diurnal, tide and micro-leveling corrections

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 False Easting/Northing: 500,000m/0m

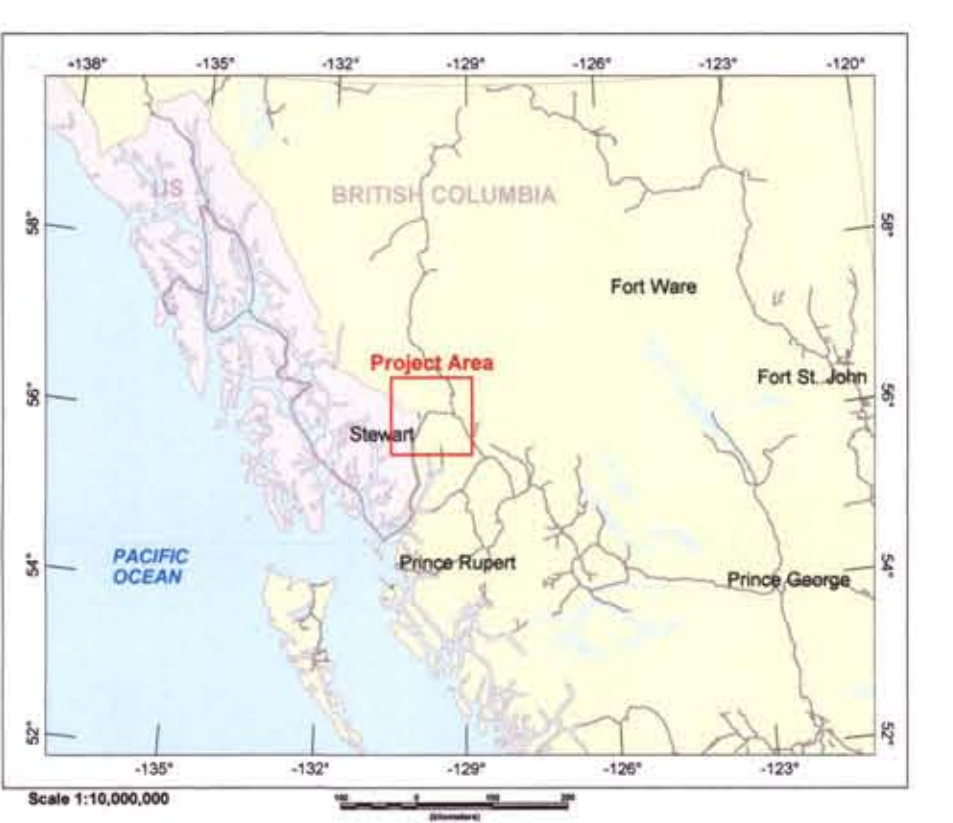


Teuton Resources Corporation  
 Stewart Area, British Columbia  
**AEROTEM OFF-TIME  
 PROFILES**  
 Clone  
 NTS 103P13

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 Milton, Ont., CANADA L9T 3Z3  
 Tel: (905) 883-0228 Fax: (905) 883-0228  
 www.aerogeomatics.com  
 March 2006

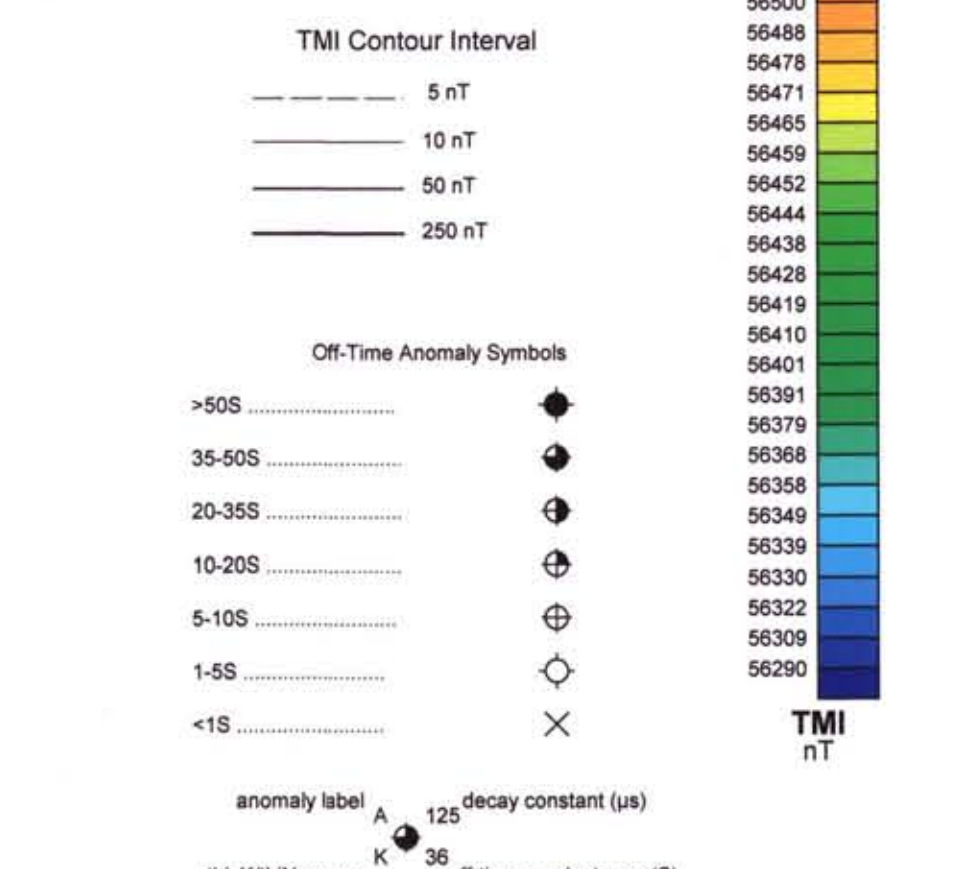


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**GEOLOGICAL SURVEY BRANCH  
 ASSESSMENT REPORT**

**28,380**



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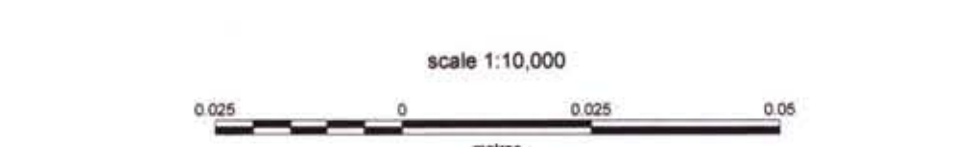
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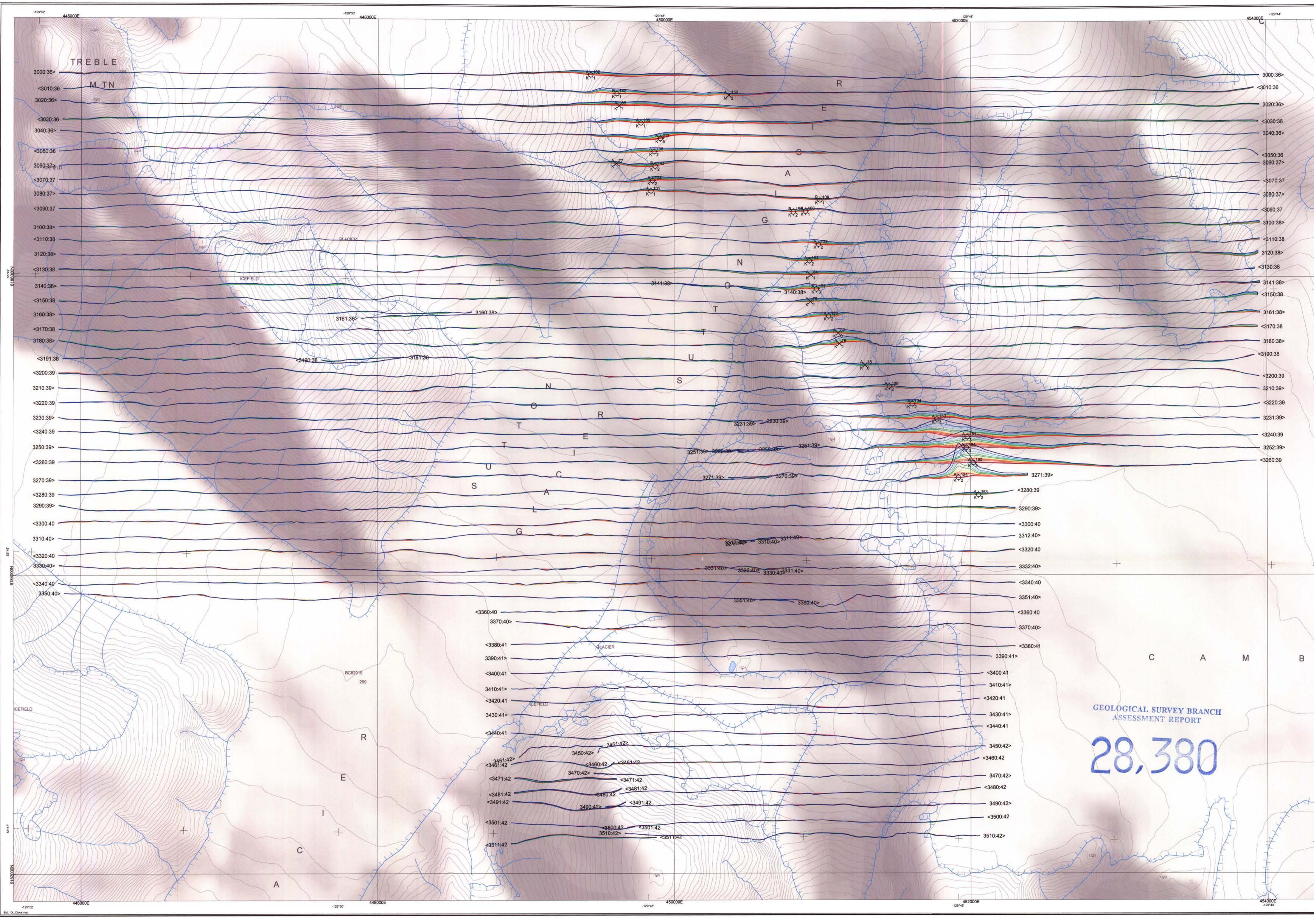
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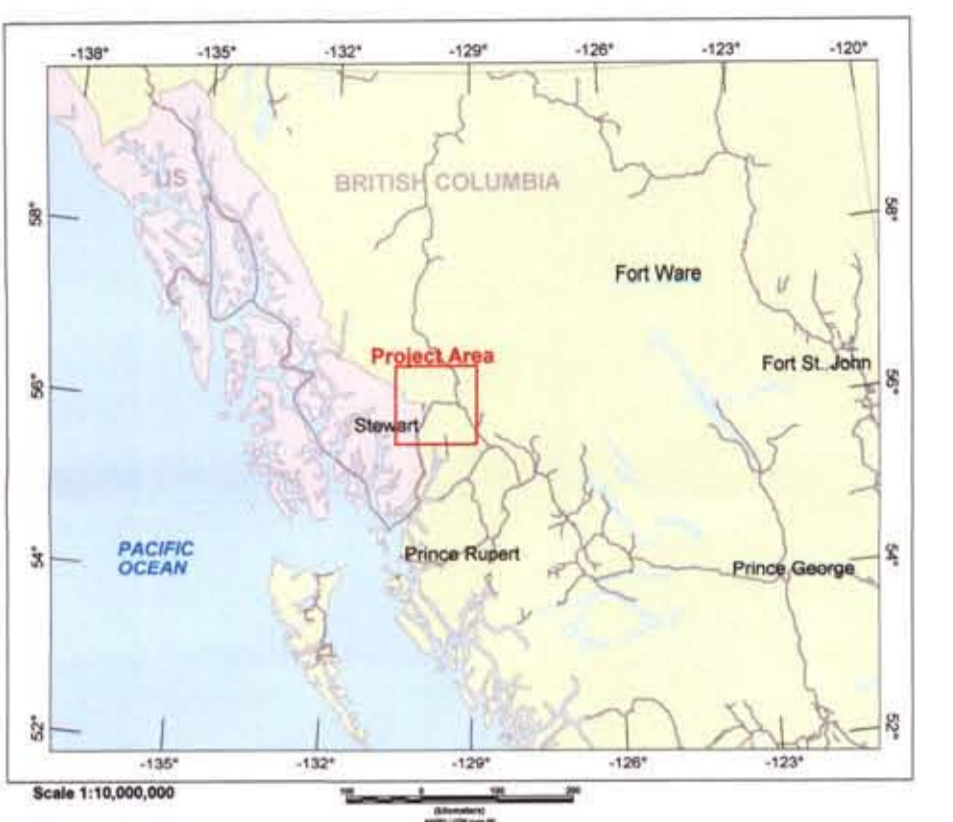
Teuton Resources Corporation  
 Stewart Area, British Columbia

**TOTAL MAGNETIC INTENSITY**  
**Clone**  
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  - Z7 Off-Time Channel
  - Z8 Off-Time Channel
  - Z9 Off-Time Channel
  - Z10 Off-Time Channel
  - Z11 Off-Time Channel
  - Z12 Off-Time Channel
  - Z13 Off-Time Channel
  - Z14 Off-Time Channel
  - Z15 Off-Time Channel

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  - 20-35S
  - 10-20S
  - 5-10S
  - 1-5S
  - <1S
- anomaly label A, decay constant (s) 125  
 thick thin source K, off-time conductance (S) 36

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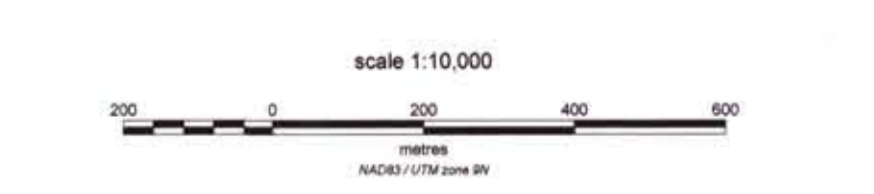
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 Navigation equipment: AGNAV with MID-TECH RX400p receiver  
 Radar Altimeter: Terra TRA3000TRI-30

**DATA PROCESSING**  
 Magnetics: diurnal, sideline and micro-leveling corrections

**POSITIONING**  
 Datum: NAD83  
 Major Axis: 6378137.000  
 Eccentricity: 0.081819191

**MAP PROJECTION**  
 Projection: Universal Transverse Mercator  
 Central Meridian: 129°W (Zone 9)  
 Central Scale Factor: 0.9996  
 False Easting/Northing: 500,000m/0m



GEOLOGICAL SURVEY BRANCH  
 ASSESSMENT REPORT  
 28,380

Teuton Resources Corporation  
 Stewart Area, British Columbia  
**AEROTEM OFF-TIME  
 PROFILES**  
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 NTS 103P13

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