Report on a Helicopter-Borne AeroTEM System Electromagnetic & Magnetic Survey

Aeroquest Job # 08130

Quest West
Central B.C., Canada

For

Geoscience BC

by

AEROQUEST SURVEYS

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Report date: January 2009

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- EM – AeroTEM off-time profiles and EM anomaly symbols.
- TAU – Late Time Decay Constant with line contours and EM anomaly symbols.
- FLIGHT PATH– Flight Path with line contours and EM anomaly symbols.

1. INTRODUCTION

This report describes a helicopter-borne geophysical survey carried out on behalf of Geoscience BC for the Quest West Project. The Quest West project covers an area of over 40,000 square kilometers from Vanderhoof and Fort St. James to Terrace and Kitimat in British Columbia.

The total survey coverage is 13,219.1 line-km (Appendix 1). The survey was made up of two blocks, Block 1 Zone 9 and Block 2 Zone 10 (12,539.8 line-km in total), with six infill areas (679.3 line-km in total) within the two blocks. The two blocks were flown at a 4,000 metre line spacing, and the infill areas were flown at a 200 metre line spacing (Table 3. Survey specifications summary). The survey flying described in this report took place from July 29th to October 23rd, 2008. This report describes the survey logistics, the data processing, the presentation of the final data, and provides the specifications of the survey.

Two identical AeroTEM systems were used to complete the survey flying. Table 2 summarizes the division of the work between the two systems. The principal geophysical sensor on both systems is the AeroTEM III electromagnetic system which is used in conjunction with a high-sensitivity caesium vapour magnetometer. Ancillary equipment includes a real-time differential GPS navigation system, radar altimeter, video recorder, and a base station magnetometer. Full-waveform streaming EM data is recorded at 36,000 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.

2. SURVEY AREA

The Project area (

Figure 1) is located in central British Columbia and covers an area that spans from Vanderhoof and Fort St. James to Terrace and Kitimat. The survey consists of two blocks, Block 1 Zone 9 (28, 459.9 km²) and Block 2 Zone 10 (20, 001.04 km²), with six infills, Morisson, Bell, Granisle, Equity Silver, Huckleberry, and Endako within the two blocks. Full details of mining claims either wholly or partially covered by the survey lines are in Appendix 2.

Block	NTS Number
Block 1 Zone 9	093E13-093E16, 093L01-093L16, 093M01,M02, M07, M08, 103I01-103I02, 103I06-103I16
Block 2 Zone 10	093F09-093F16, 093G12-093G13, 093J04, 093K01-093K15, 093N02-093N06
Morrison Infill	093M01
Bell Infill	093M01, 093L16

Block	NTS Number
Granisle Infill	093L16
Equity Silver Infill	093L01
Huckleberry Infill	093E11
Endako Infill	093F14, 093K03

Table 1. National Topographic System Sheet Numbers

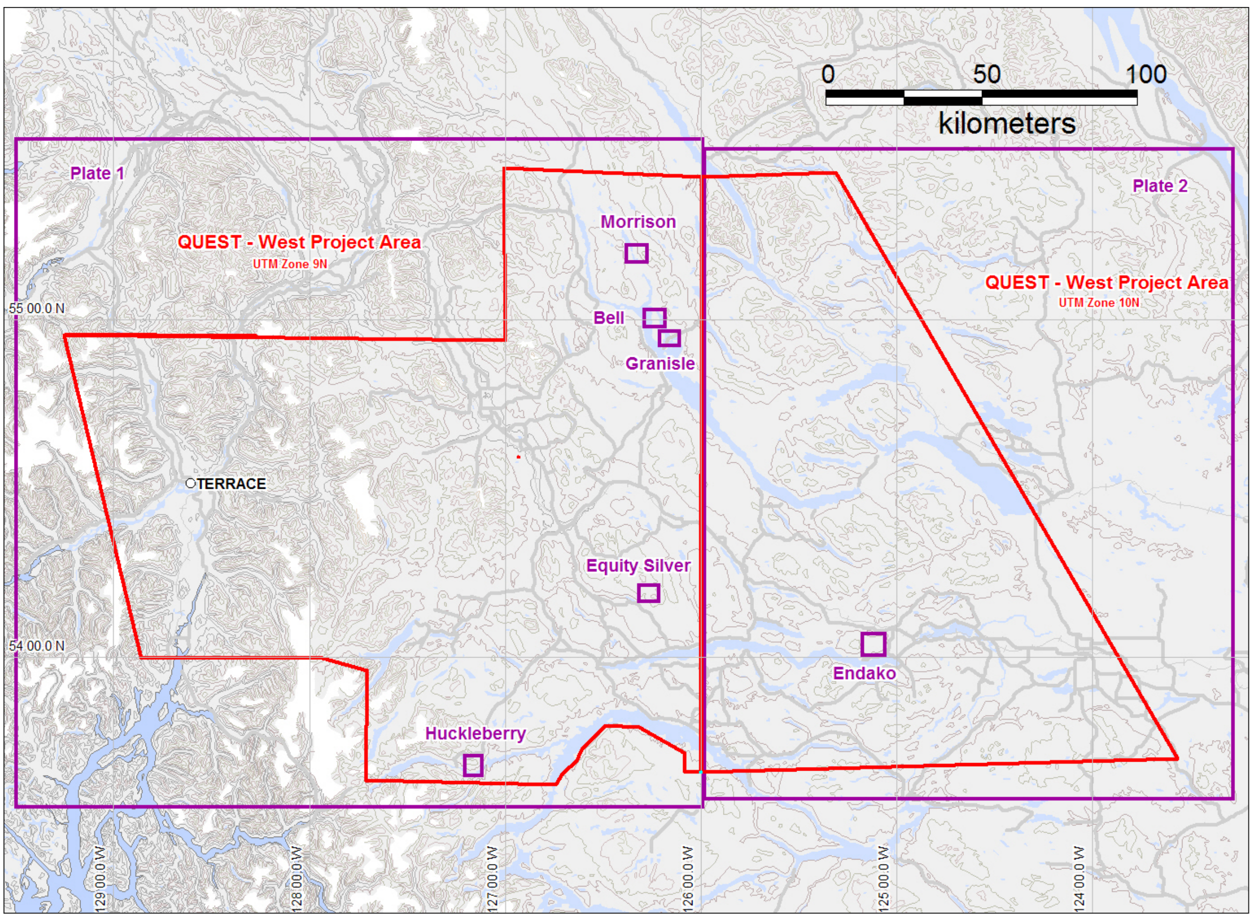

Figure 1. Project Area and infill blocks.

In order to survey an area this large efficiently it was necessary to move the base of operations throughout the course of the survey. Table 2 summarizes the different communities that were used as operational bases by the two survey crews during the course of surveying.

System	Base of Operation	Date	Block
Mike	Smithers	July 29, 2008 – August 1, 2008	Block 1
Mike	Terrace	August 2 – September 8, 2008	Block 1
Mike	New Hazelton	September 9, 2008 – September 12, 2008	Block 1
Mike	Smithers	September 13, 2008 – October 16, 2008	Block 1
Mike	Burns Lake	October 17, 2008 – October 18, 2008	Equity, Endako
November	Burns Lake	August 22, 2008 – September 13, 2008	Block1, Block 2
November	Vanderhoof	September 14, 2008 – September 20, 2008	Block 2
November	Fort St. James	September 21, 2008 – October 12, 2008	Block 1, Block 2
November	Granisle	October 13, 2008 – October 19, 2008	Block 1, Block 2, Granisle, Bell, Morrison
November	Burns Lake	October 20, 2008 – October 21, 2008	Block 1
November	Houston	October 22, 2008 – October 23, 2008	Block1, Huckleberry

Table 2. Summary of operational bases used during the survey.

3. SURVEY SPECIFICATIONS AND PROCEDURES

The survey specifications are summarised in the following table:

Block Name	Line Spacing (metres)	Line Direction	Survey Coverage (line-km)	Date flown
Block 1 Zone 9	4000	90º/270º	7389.6	July 29th – October 23rd, 2008
Block 2 Zone 10	4000	90º/270º	5150.2	August 22nd – October 19th, 2008
Morrison Infill	200	90º/270º	114.1	October 17, 2008

Block Name	Line Spacing (metres)	Line Direction	Survey Coverage (line-km)	Date flown
Bell Infill	200	90º/270º	113.8	October 16, 2008
Granisle Infill	200	90º/270º	113.8	October 16 - 17, 2008
Equity Silver Infill	200	90º/270º	111.4	October 17, 2008
Huckleberry Infill	200	0º/180º	113.9	October 23, 2008
Endako Infill	200	0º/180º	112.3	October 18, 2008

Table 3. Survey specifications summary

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 4,000 metres for Block 1 Zone 9, and Block 2 Zone 10, and a line spacing of 200 metres for the six infill blocks. The control (tie) lines were flown perpendicular to the survey lines which was spaced out for the six infill blocks, and no tie lines for the two main blocks.

The nominal EM bird terrain clearance is 30 metres, but can be higher in more rugged terrain due to safety considerations and the capabilities of the aircraft. The magnetometer sensor is mounted in a smaller bird connected to the tow rope 33 metres above the EM bird and 21 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 36,000 samples per second and is processed to generate final data at 10 samples per second. The 10 samples per second translate to a geophysical reading about every 1.5 to 2.5 metres along the flight path.

3.1. 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, and other ancillary data sets. 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 less than 3 metres. A recent static ground test of the Mid-Tech WAAS GPS yielded a standard deviation in x and y of less than 0.6 metres and for z less than 1.5 metres over a two-hour period.

3.2. System Drift

Unlike frequency domain electromagnetic systems, the AeroTEM III 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.

3.3. FIELD QA/QC PROCEDURES

On return of the pilot and operator to the base, usually after each flight, the AeroDAS 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 reflown.

4. AIRCRAFT AND EQUIPMENT

4.1. AIRCRAFT

A SA 315B "Lama" with registration C-GWAO and two Eurocopter (Aerospatiale) AS350B2 "A-Star" helicopters with registration C-FPTG and C-GVIA were used as survey platforms. Helicopters C-GWAO and C-FPTG are owned and operated by Hi-Wood Helicopters, and helicopter C-GVIA is owned and operated by VIH Helicopters. Installation of the geophysical and ancillary equipment was carried out by Aeroquest Limited personnel in conjunction with a licensed aircraft maintenance engineer. The survey aircraft was flown at a nominal terrain clearance of 275 ft (83metres).

Figure 2. Helicopter of type SA 315B "Lama".

Figure 3. Helicopter of type Eurocopter (Aerospatiale) AS350B2 "A-Star".

4.2. MAGNETOMETER

The AeroTEM III airborne survey system employs the Geometrics G-823A caesium vapour magnetometer sensor installed in a two metre towed bird airfoil attached to the main tow line, 21 metres below the helicopter (

Figure 4). 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 61 metres (200 ft.). The magnetic data is recorded at 10 Hz by the RMS DGR-33.

4.3. ELECTROMAGNETIC SYSTEM

The electromagnetic system is an Aeroquest AeroTEM III time domain towed-bird system (

Figure 4). The AeroTEM III system was operated with a transmitter dipole moment of 180 kNIA. The AeroTEM bird is towed 53 metres (175 ft) below the helicopter. More technical details of the system may be found in Appendix 6.

The wave-form is triangular with a symmetric transmitter on-time pulse of 1.71 ms and a base frequency of 90 Hz (Figure 5). The current alternates polarity every on-time pulse. During every Tx on-off cycle (180 per second), 200 contiguous channels of raw X and Z component (and a transmitter current monitor, ITX) of the received waveform are measured. Each channel width is 27.78 microseconds starting at the beginning of the transmitter pulse. This 200 channel data is referred to as the raw streaming data.

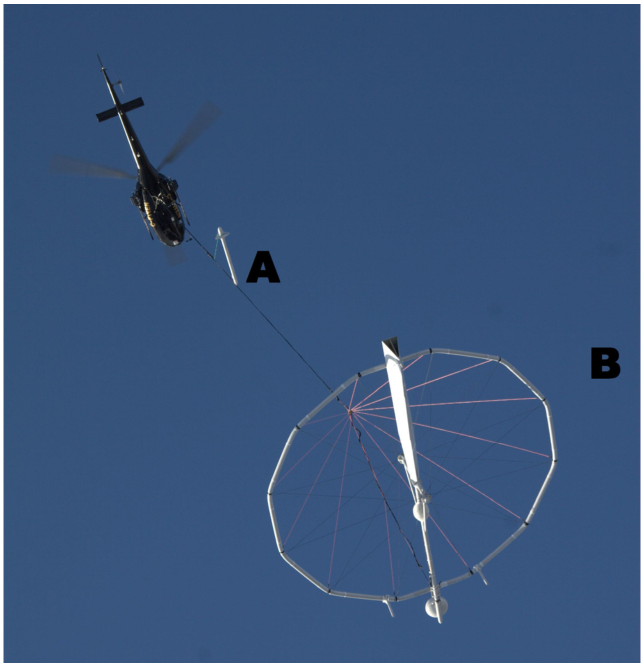

Figure 4. The magnetometer bird (A) and AeroTEM III EM bird (B)

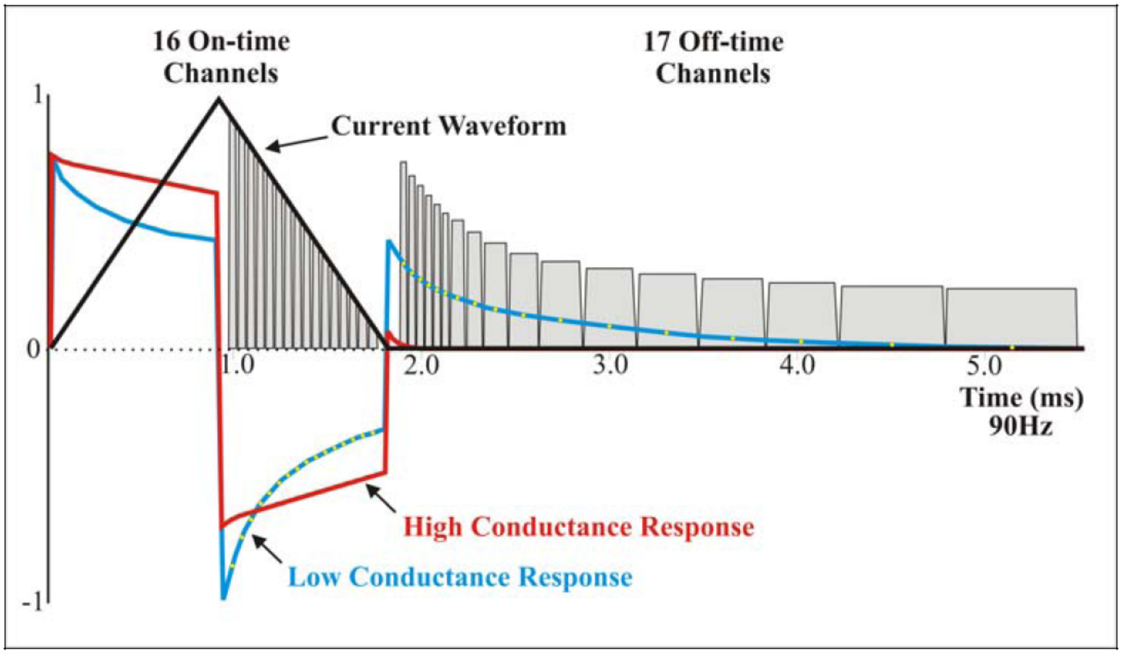

Figure 5. Schematic of Transmitter and Receiver waveforms

4.4. AERODAS ACQUISITION SYSTEM

The 200 channels of raw streaming data are recorded by the AeroDAS acquisition system (

Figure 6) 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:

```
Average TxOn      -9.0965 us
Average TxSwitch  881.1546 us
Average TxOff     1702.8853 us
```

Channel	Sample Range	Time Width (us)	Time Center (us)	Time After TxOn (us)
On1	4 - 4	27.778	97.222	106.319
On2	5 - 5	27.778	125.000	134.096
On3	6 - 6	27.778	152.778	161.874
On4	7 - 7	27.778	180.556	189.652
On5	8 - 8	27.778	208.333	217.430
On6	9 - 9	27.778	236.111	245.208
On7	10 - 10	27.778	263.889	272.985
On8	11 - 11	27.778	291.667	300.763
On9	12 - 12	27.778	319.444	328.541
On10	13 - 13	27.778	347.222	356.319
On11	14 - 14	27.778	375.000	384.097
On12	15 - 15	27.778	402.778	411.874
On13	16 - 16	27.778	430.556	439.652
On14	17 - 17	27.778	458.333	467.430
On15	18 - 18	27.778	486.111	495.208
On16	19 - 19	27.778	513.889	522.985

Channel	Sample Range	Time Width (us)	Time Center (us)	Time After TxOff (us)
Off0	65 - 65	27.778	1791.667	88.781
Off1	66 - 66	27.778	1819.444	116.559
Off2	67 - 67	27.778	1847.222	144.337
Off3	68 - 68	27.778	1875.000	172.115
Off4	69 - 69	27.778	1902.778	199.893
Off5	70 - 70	27.778	1930.556	227.670
Off6	71 - 73	83.333	1986.111	283.226
Off7	74 - 76	83.333	2069.444	366.559
Off8	77 - 79	83.333	2152.778	449.893
Off9	80 - 82	83.333	2236.111	533.226
Off10	83 - 87	138.889	2347.222	644.337
Off11	88 - 92	138.889	2486.111	783.226
Off12	93 - 99	194.444	2652.778	949.893
Off13	100 - 109	277.778	2888.889	1186.004
Off14	110 - 124	416.667	3236.111	1533.226
Off15	125 - 148	666.667	3777.778	2074.893
Off16	149 - 186	1055.556	4638.889	2936.004

4.5. RMS DGR-33 ACQUISITION SYSTEM

In addition to the magnetics, altimeter and position data, six channels of real time processed off-time EM decay in the Z component direction and one in the X component 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 (µs)	End time (µs)	Width (µs)	Streaming Channels
Z1, X1	1269.8	1322.8	52.9	48-50
Z2	1322.8	1455.0	132.2	50-54
Z3	1428.6	1587.3	158.7	54-59
Z4	1587.3	1746.0	158.7	60-65
Z5	1746.0	2063.5	317.5	66-77
Z6	2063.5	2698.4	634.9	78-101

Figure 6. AeroTEM III Instrument Rack

4.6. Magnetometer Base Station

The base magnetometer was a Geometrics G-859 caesium vapour magnetometer system with integrated GPS. 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.

4.7. 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.

4.8. Video Tracking and Recording System

A high resolution digital colour 8 mm 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.

Figure 7. Digital video camera typical mounting location.

4.9. 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 less than 3 metres.

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 9, and UTM zone 10 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.

4.10. Digital Acquisition System

The AeroTEM received waveform sampled during on and off-time at 200 channels per decay, 180 times per second, was logged by the proprietary AeroDAS data acquisition system. 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 DGR33A data acquisition system was used to collect and record the analogue data stream, i.e. the positional and secondary geophysical data, including processed 6 channels EM, magnetics, radar altimeter, GPS position, and time. The data was recorded on 128 Mb capacities FlashCard. The RMS output was also directed to a thermal chart recorder.

5. PERSONNEL

The following Aeroquest personnel were involved in the project:

- Manager of Operations: Duncan Wilson
- Project Operations Management: Troy Will
- Manager of Data Processing: Gord Smith
- Field Data Processor: Dary Ly, Thomas Wade, Greg Roman, Ali Latrous, Geoff Plastow, Alec Ogden
- Field Operator: Terry Martin, Gabriel Genier, Tomas Szumigaj, Mark Andrews, Victor Shevchenko, Jim Buchanan, Doug Spence
- Data Interpretation and Reporting: Sean Walker, Doug Garrie, Sandro Camilli, Marion Bishop, Liz Johnson

The survey pilots, Paul Kendall, Ted Slavin, Abe Neudorf, Chad Goddyn, Joel Reavie, were employed directly by the helicopter operator – Hi Wood Helicopters, and the survey pilot, Rick Klassen was employed directly by the helicopter operator – VIH Helicopters

6. DELIVERABLES

6.1. Hardcopy Deliverables

The report includes a set of six 1:20,000 scale maps of the infill blocks, a set of two 1:250,000 scale maps of the main blocks. The following five geophysical data products are included:

- TMI – Coloured Total Magnetic Intensity (TMI) with line contours and EM anomaly symbols.
- ZOFF1– AeroTEM Z1 Off-time with line contours, and EM anomaly symbols.
- EM – AeroTEM off-time profiles and EM anomaly symbols.
- TAU – Late Time Decay Constant with line contours and EM anomaly symbols.
- FLIGHT PATH– Flight Path with line contours and EM anomaly symbols.

The coordinate/projection system for the maps are NAD83 – UTM Zone 9 for Block 1 Zone 9, Morrison infill, Bell infill, Granisle infill, Equity Silver infill, and Huckleberry infill, and NAD83 – UTM Zone 10 for Block2 Zone 10, and Endako infill. For reference, the latitude and longitude in WGS84 are also noted on the maps.

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 and survey specifications are displayed on the left margin of the maps.

6.2. Digital Deliverables

6.2.1. Final Database of Survey Data (.GDB)

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 Mississauga.

6.2.2. Geosoft Grid files (.GRD)

Levelled Grid products used to generate the geophysical map images.

- Total Magnetic Intensity from Mag sensor on the tow cable (magu_[*blockname*].grd)
- AeroTEM Z Offtime Channel 1 (zoff1_[*blockname*].grd)
- Late Time Tau (tau_[*blockname*].grd

6.2.3. Digital Versions of Final Maps (.MAP, .PDF)

Map files in Geosoft .map and Adobe PDF format.

6.2.4. Google Earth Files (.kmz)

Flight navigation lines, EM Anomalies and geophysical grids in Google earth kmz format. Double click to view in Google Earth.

6.2.5. Free Viewing Software (.EXE)

- Geosoft Oasis Montaj Viewing Software
- Adobe Acrobat Reader
- Google Earth Viewer

6.2.6. Digital Copy of this Document (.PDF)

Adobe PDF format of this document.

7. 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 36-inch and 42-inch wide Hewlett Packard ink-jet plotters.

7.1. 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, and Zone 10 North. A summary of the map datum and projection specifications is given following:

- Ellipse: GRS 1980
- Datum: North American 1983 - Canada Mean
- Datum Shifts (x,y,z) : 0, 0, 0 metres

- Map Projection: Universal Transverse Mercator Zone 9 (Central Meridian 129ºW) and Zone 10 (Central Meridian 123ºW)
- Central Scale Factor: 0.9996
- False Easting, Northing: 500,000m, 0m

For reference, the latitude and longitude in WGS84 are also noted on the maps.

The background vector topography was sourced from Natural Resources Canada 1:250000 National Topographic Data Base data and the background shading were derived from NASA Shuttle Radar Topography Mission (SRTM) 90 metre resolution DEM data.

7.2. 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 (5 Hz) 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. These high elevation checks are to ensure that the gain of the system remained constant and within specifications.

7.3. ELECTROMAGNETIC DATA

The raw streaming data, sampled at a rate of 36,000 Hz (200 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, levelled and split up into the individual line segments. Further base level adjustments may be carried out at this stage. The filtering of the stacked data is designed to remove or minimize high frequency noise that cannot be sourced from the geology.

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 merged into ‘array format; channels in the final Geosoft 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 off-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 thin and thick conductor types. Anomaly picks locations were moved and removed as required. This process ensures the optimal representation of the conductor centres on the maps.

At each conductor pick, estimates of the off-time conductance have been generated based on a horizontal plate source model for those data points along the line where the response amplitude is sufficient to yield an acceptable estimate. Some of the EM anomaly picks do not display a Tau value; this is due to the inability to properly define the decay of the conductor usually because of low signal amplitudes. Each conductor pick was then classified according to a set of seven ranges of calculated off-time conductance values. 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 due to a low amplitude response were classified as a low conductance source. Please refer to the anomaly symbol legend located in the margin of the maps.

7.4. Magnetic Data

Prior to any levelling 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 bi-directional grid technique with a grid cell size of 20 metres. The final levelled grid provided the basis for threading the presented contours.

8. GENERAL COMMENTS

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

8.1. Magnetic Response

The magnetic data provide a high resolution map of the distribution of the magnetic mineral content of the survey area. This data can be used to interpret the location of geological contacts and other structural features such as faults and zones of magnetic alteration. The sources for anomalous magnetic responses are generally thought to be predominantly magnetite because of the relative abundance and strength of response (high magnetic susceptibility) of magnetite over other magnetic minerals such as pyrrhotite.

8.2. Late Time Tau

The amplitude of an exponentially decaying value at time t is given by the equation

$$r = Ae^{\frac{-t}{\tau}},$$

where r is the amplitude of the response, t is time, A is the amplitude at time t = 0, and τ is the decay constant. The τ (tau) value of an EM response can be described as the time required for the amplitude to decay to 1/e (or approximately 37%) of its original value. Because in EM exploration, we are often interested in mapping the more conductive geologic features, the decay constant is computed in the latest possible portion of the EM response decay. To accomplish this, the algorithm takes the last three data points in the decay which are above the stated system noise levels and computes the decay constant using these points. This approach is sometimes referred to as an adaptive tau since the algorithm adapts to perform the calculation at the latest possible portion of the decay.

8.3. EM ANOMALIES

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 8. AeroTEM response to a 'thin' vertical conductor.). For a vertically orientated thick source (say, greater than 10 metres), the response is a single peak in the z-component response and a negative to positive crossover in the x-component response (Figure 9. AeroTEM response for a 'thick' vertical conductor.). 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 10. AeroTEM response over a 'thin' dipping conductor.). In these cases both possible source types may be indicated by picking both thick and thin response styles. For shallow dipping conductors the 'thin' pick will be located over the edge of the source, whereas the 'thick' pick will fall over the downdip 'heart' of the anomaly.

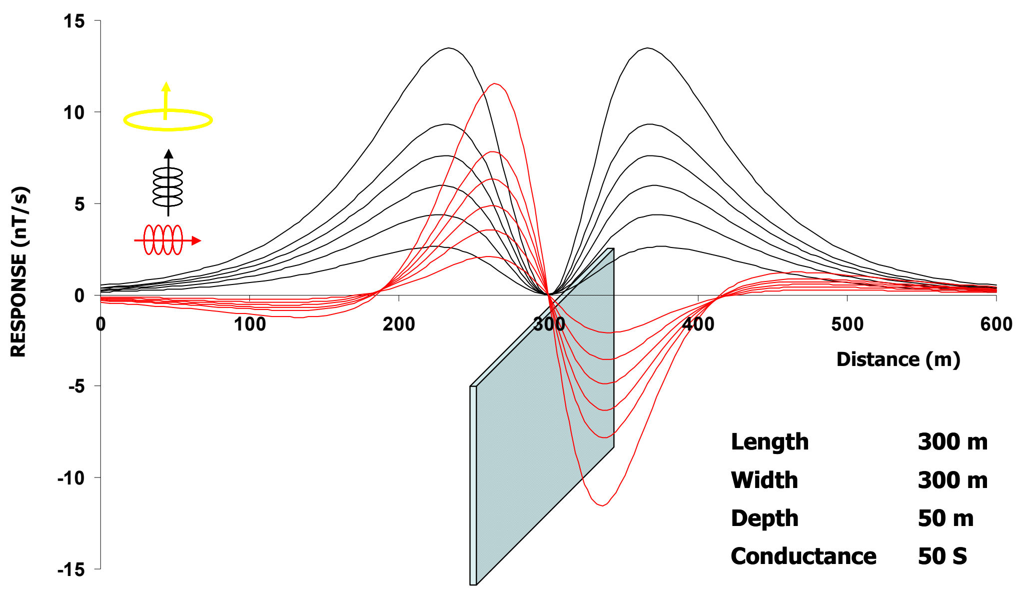

Figure 8. AeroTEM response to a 'thin' vertical conductor.

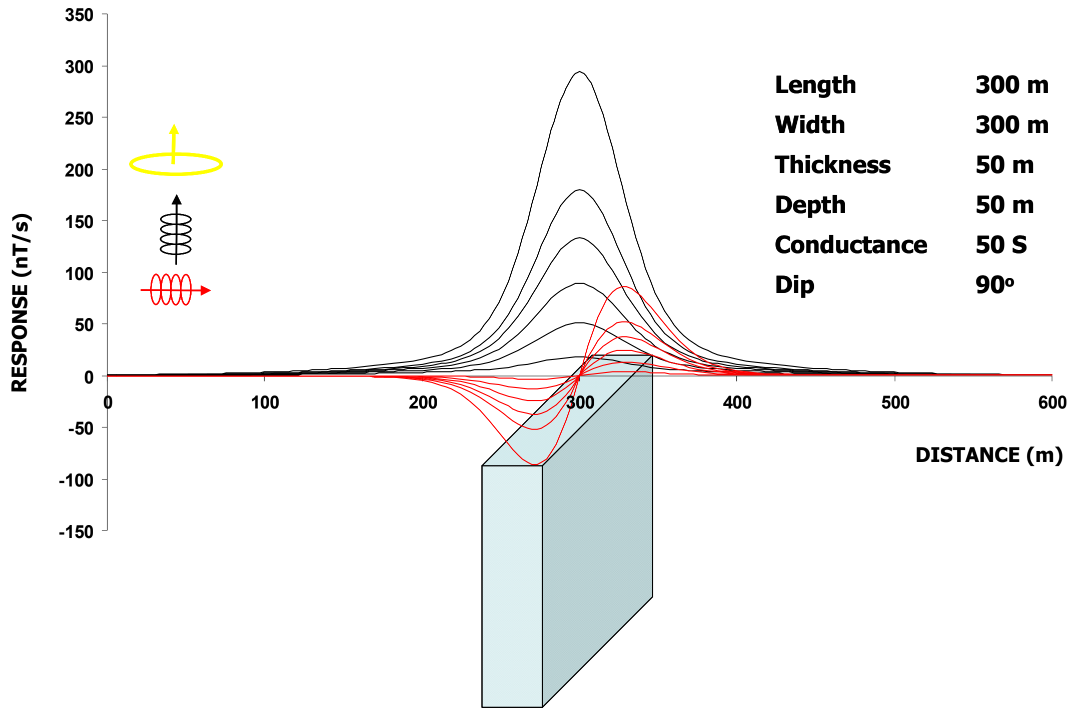

Figure 9. AeroTEM response for a 'thick' vertical conductor.

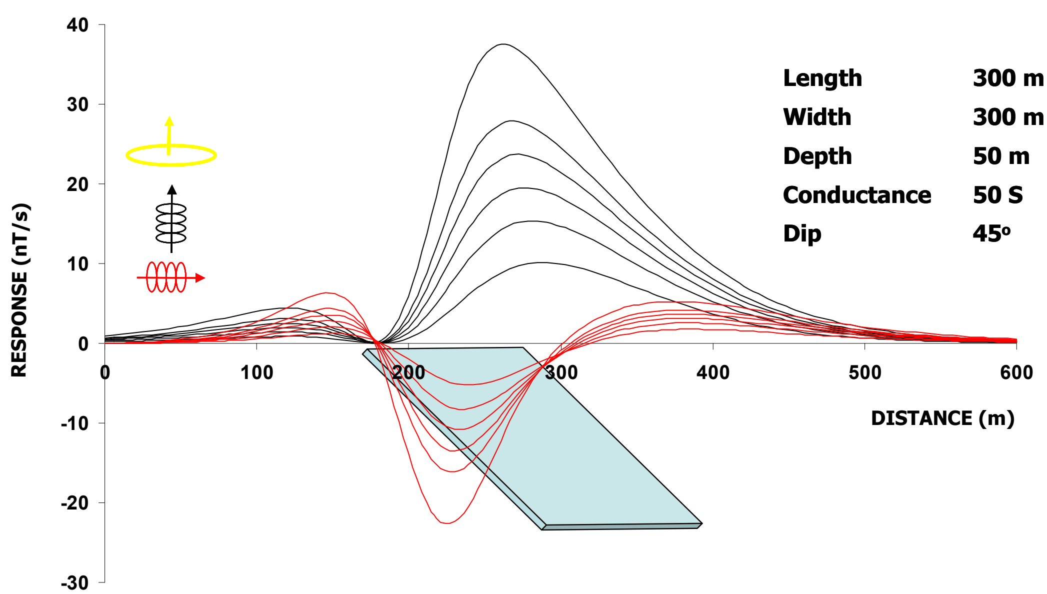

Figure 10. AeroTEM response over a 'thin' dipping conductor.

All cases should be considered when analyzing the interpreted picks and prioritizing for follow-up. Specific anomalous responses which remain as high priority should be subjected to numerical modeling prior to drill testing to determine the dip, depth and probable geometry of the source.

Respectfully submitted,

Sean Walker
Aeroquest Limited
January 2009

Reviewed By:

Doug Garrie
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January 2009

APPENDIX 1: SURVEY BOUNDARIES

The following table presents the Extension block boundaries. All geophysical data presented in this report have been windowed to 100m outside of these boundaries.

X and Y positions are in metres: NAD83 UTM Zone 9N.

Block 1 Zone 9

X	Y
625872.76	6146564.32
690022.98	6145832.98
698411.10	5950007.21
692628.65	5950005.26
692393.00	5956000.00
676777.00	5964000.01
665387.00	5964000.01
657716.00	5956000.00
655952.00	5952000.00
651655.00	5948000.00
649133.00	5944000.00
585000.00	5944000.00
585000.00	5980000.00
569899.29	5983834.36
509310.51	5983235.95
483838.57	6089723.85
627829.14	6089795.14
625872.76	6146564.32
625872.76	6146564.32

Morrison infill

X	Y
674316.10	6011786.40
674316.10	6011786.40
674316.10	6011786.40
674316.10	6011786.40
674316.10	6011786.40

Bell infill

X	Y
674500.00	6011786.40
674500.00	6011786.40
679499.98	6011786.40
679499.98	6011786.40
674500.00	6011786.40

Granisle infill

X	Y
679500.00	6011786.40
679500.00	6011786.40
682669.90	6011786.40
682669.90	6011786.40
679500.00	6011786.40

Equity Silver infill

X	Y
676000.03	6010130.02
681000.00	6010130.01
681000.00	6005870.00
676000.02	6005870.02
676000.03	6010130.02

Huckleberry infill

X	Y
674316.10	6004197.60
674316.10	6004197.60
674316.10	6004197.60
674316.10	6004197.60
674316.10	6004197.60

X and Y positions are in metres: NAD83 UTM Zone 10N.

Block 2 Zone 10

X	Y
310310.45	6145818.60
352862.68	6145615.31
461822.76	5950283.02
301564.25	5949998.91
310310.45	6145818.60
310310.45	6145818.60

Endako infill

X	Y
359279.31	5992100.19
363519.31	5992100.19
363519.31	5987100.18
359279.31	5987100.18
359279.31	5992100.19

APPENDIX 2: MINING CLAIMS

See DVD for the list of mining claims in the survey area.

APPENDIX 3: 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".

COLUMN	UNITS	DESCRIPTOR
line		Line number
flight		Flight #
emfid		AERODAS Fiducial
utctime	hh:mm:ss.ss	UTC time
x	m	UTM Easting (NAD83, Zone 10)
y	m	UTM Northing (NAD83, Zone 10)
galt	m	GPS elevation of magnetometer bird
ralt	m	Helicopter radar altimeter (height above terrain)
bheight	m	Terrain clearance of EM bird
Basemag	nT	Base station total magnetic intensity
MagU	nT	Final levelled total magnetic data.
dtm	m	Digital Terrain Model
Zon	nT/s	EM On-Time Z component Channels 1-16
Zoff	nT/s	EM Off-Time Z component Channels 0-16
Xon	nT/s	EM On-Time X component Channels 1-16
Xoff	nT/s	EM Off-Time X component Channels 0-16
pwrline		powerline monitor data channel
Grade		Classification from 1-7 based on conductance of conductor pick
Anom_Labels		Letter label of conductor pick (Unique per flight line)
Off_Con	S	Off-time conductance at conductor pick
Off_Tau	μs	Off-time decay constant at conductor pick
Anom_ID		EM Anomaly response style (K= thicK, N = thiN)
Tau	μs	Late time decay constant
TranOff	ms	Transmitter turn off time
TranOn	ms	Transmitter turn on time
TranPeak	A	Transmitter peak current
TranSwitch	ms	Transmitter peak current time
Off_Pick		Anomaly pick channel

APPENDIX 4: AEROTEM ANOMALY LISTING

See DVD for the list of EM anomalies in the survey area.

APPENDIX 5: AEROTEM INSTRUMENTATION SPECIFICATION SHEET

AEROTEM Helicopter Electromagnetic System

System Characteristics

- Transmitter: Triangular Pulse Shape Base Frequency 90 Hz
- Tx On Time – 1,833 (90 Hz) µs
- Tx Off Time – 3,667 (90 Hz) µs
- Loop Diameter - 10 m
- Peak Current - 455 A
- Peak Moment – 183,131 NIA
- Typical Z Axis Noise at Survey Speed = 5 nT/s peak to peak
- Sling Weight: 1000 lb
- Length of Tow Cable: 53 m
- Bird Survey Height: 30 m nominal

Receiver

- Two Axis Receiver Coils (x, 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

- AERODAS Digital recording at 200 samples per decay curve at a maximum of 180 curves per second (27.778 µs channel width)
- RMS Channel Widths: 52.9,132.3, 158.7, 158.7, 317.5, 634.9 µs
- 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 183.131 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.