BC Geological Survey
Assessment Report
33203b

APPENDIX I

ZTEM Survey

REPORT ON A HELICOPTER-BORNE Z-AXIS TIPPER ELECTROMAGNETIC (ZTEM) AND AEROMAGNETIC GEOPHYSICAL SURVEY

Lorn Property

Gold Bridge, British Columbia

For:

Royal Sapphire Corporation

By:

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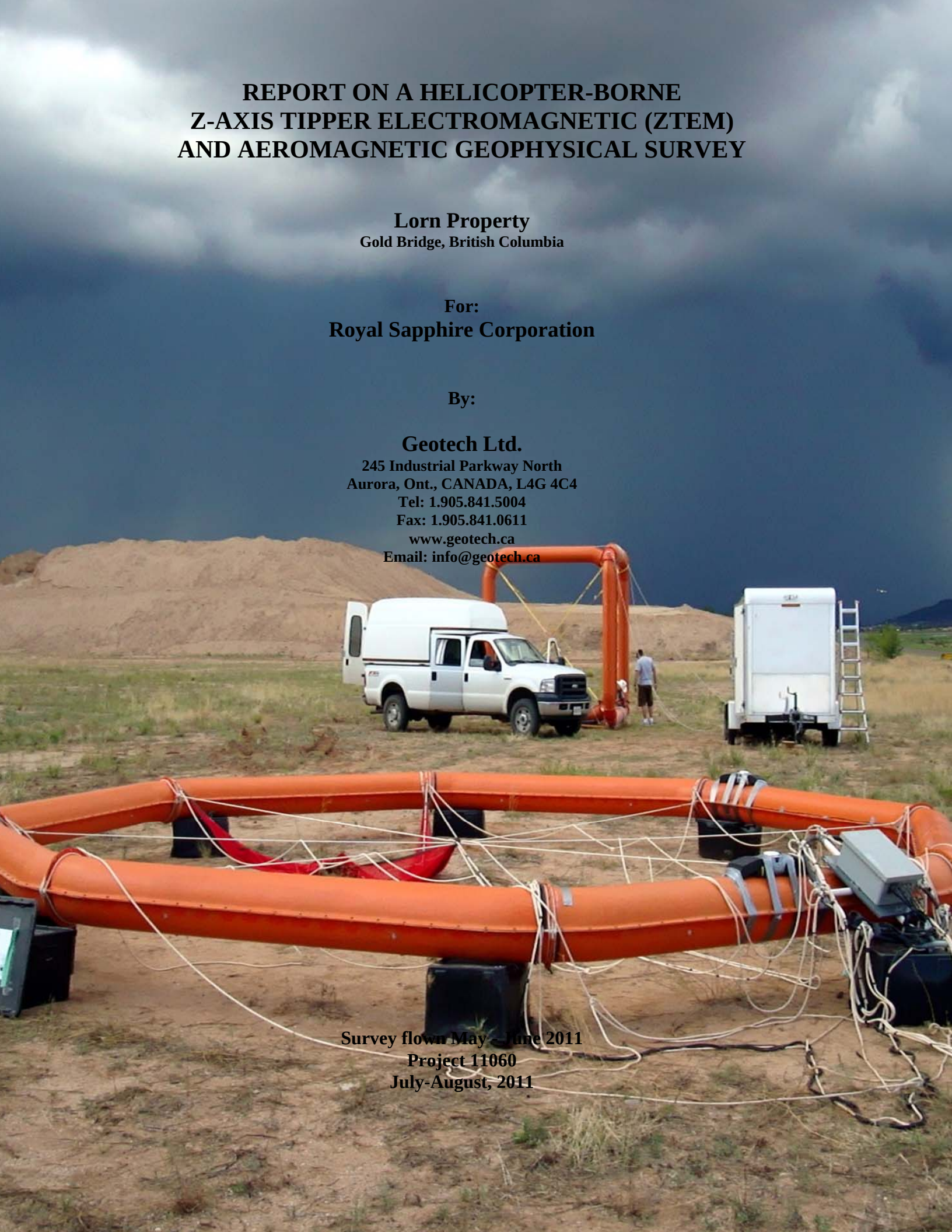

Survey flown May – June 2011
Project 11060
July-August, 2011

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REPORT ON A HELICOPTER-BORNE Z-AXIS, TIPPER ELECTROMAGNETIC (ZTEM) AND AREOMAGNETIC GEOPHYSICAL SURVEY

Lorn Property
Gold Bridge, British Columbia

Executive Summary

During May 31st to June 3rd 2011 Geotech Ltd. carried out a helicopter-borne geophysical survey for Royal Sapphire Corporation over the Lorn Property situated 28 kilometres Northwest of Gold Bridge, British Columbia, Canada.

Principal geophysical sensors included a Z-Axis Tipper electromagnetic (ZTEM) system, and a caesium magnetometer. Ancillary equipment included a GPS navigation system and a radar altimeter. A total of 260 line-kilometres of geophysical data were acquired during the survey.

The survey operations were based out of the town of Gold Bridge, BC. In-field data quality assurance and preliminary processing were carried out on a daily basis during the acquisition phase. Preliminary and final data processing, including generation of final digital data and map products were undertaken from the office of Geotech Ltd. in Aurora, Ontario.

The survey report describes the procedures for data acquisition, processing, final image presentation and the specifications for the digital data set. 2D inversions over two selected lines were performed in support of the ZTEM survey results.

1. INTRODUCTION

1.1 General Considerations

These services are the result of the Agreement made between Geotech Ltd. and Royal Sapphire Corporation to perform a helicopter-borne geophysical survey over the Lorn Property located 28 kilometres Northwest of Gold Bridge, BC. (Figure 1).

Balbir Johal represented Royal Sapphire Corp. during the data acquisition and data processing phases of this project.

The geophysical surveys consisted of helicopter borne AFMAG Z-axis Tipper electromagnetic (ZTEM) system and aero magnetics using a caesium magnetometer. A total of 260 line kilometres of geophysical data were acquired during the survey. The survey area is shown in Figure 2.

In a ZTEM survey, a single vertical-dipole air-core receiver coil is flown over the survey area in a grid pattern, similar to regional airborne EM surveys. Two orthogonal, air-core horizontal axis coils are placed close to the survey site to measure the horizontal EM reference fields. Data from the three coils are used to obtain the Tzx and Tzy Tipper (Vozoff, 1972) components at six frequencies in the 30 to 720 Hz band. The ZTEM is useful in mapping geology using resistivity contrasts and magnetometer data provides additional information on geology using magnetic susceptibility contrasts.

Figure 1 -Property Location

The crew was based out of Gold Bridge, BC, for the acquisition phase of the survey. Survey flying was started on May 31st 2011 and finished on June 3rd 2011.

Data quality control and quality assurance, and preliminary data processing were carried out on a daily basis during the acquisition phase of the project. Final reporting, data presentation and archiving were completed from the Aurora office of Geotech Ltd. in July, 2011.

1.2 Survey Location

The block is located approximately 28 kilometres Northwest of Gold Bridge, BC, as shown in Figure 2.

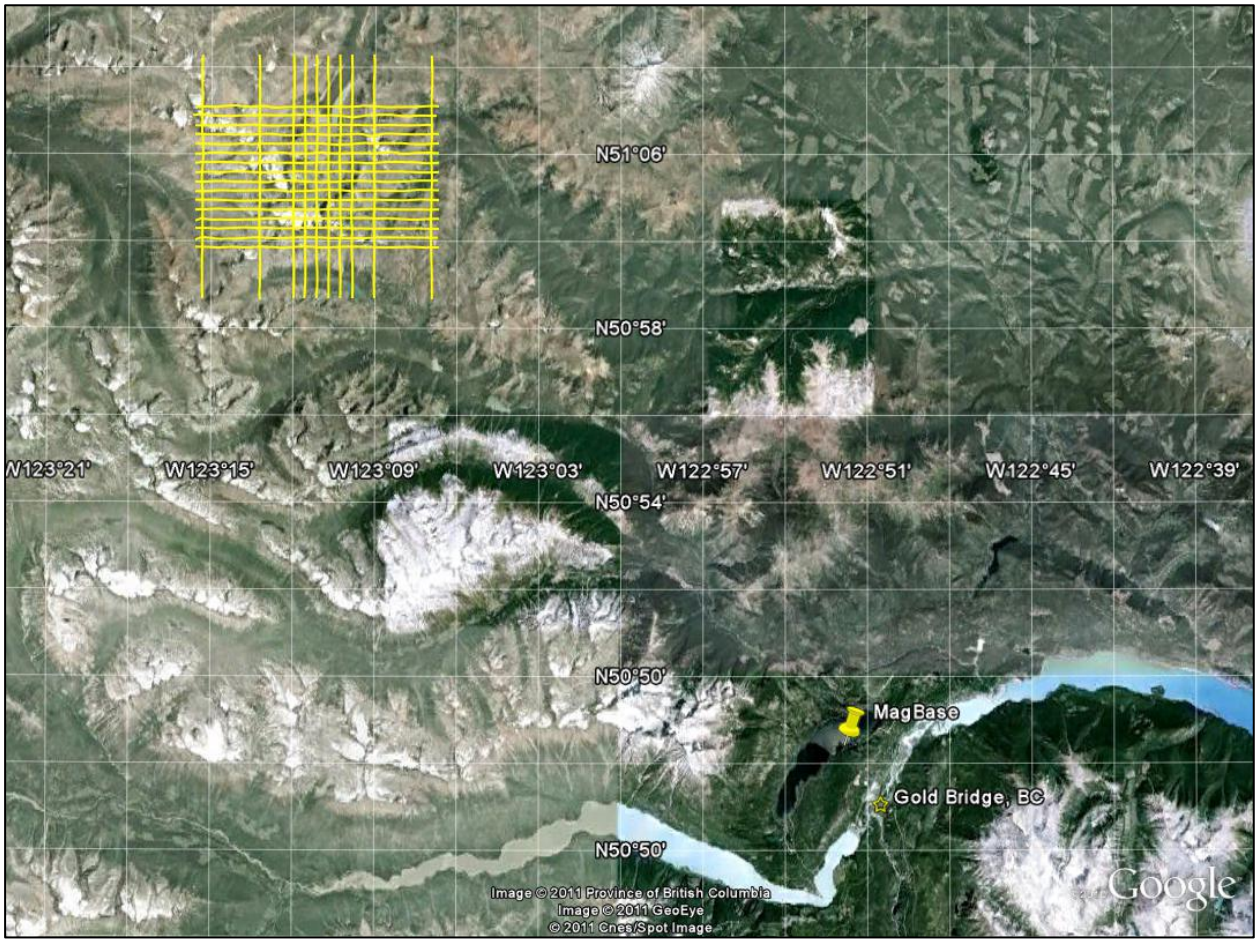

Figure 2 – The Block, with ZTEM and Magnetic Base Station Locations

The survey was flown in an east to west (N 90° E azimuth) direction, with a flight line spacing of 400 metres, as depicted in Figure 3. Tie lines were flown in a north to south (N 0° E azimuth), with a flight line spacing of 2450. For more detailed information on the flight spacing and direction see Table 1.

1.3 Topographic Relief and Cultural Features

Topographically, the block exhibits a high relief with an elevation ranging from1498 to 3107 metres above mean sea level over an area of 112 square kilometres (Figure 3). The survey area has various rivers and streams running throughout. There are no visible signs of culture throughout the survey, such as, roads running throughout the block.

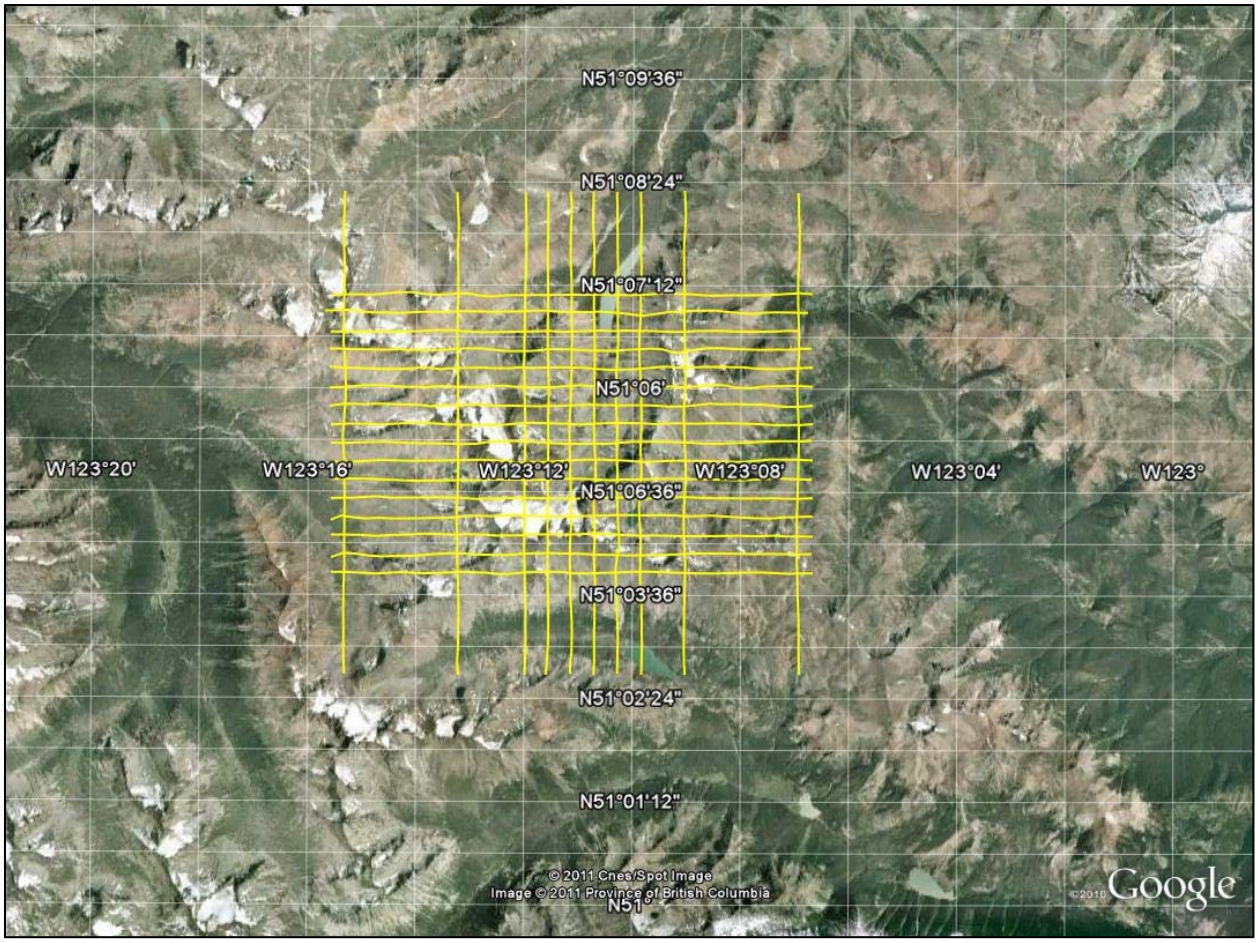

Figure 3 - Google Earth image of the block

2. DATA ACQUISITION

2.1 Survey Area

The survey block (see Location map in Appendix A and Figure 2) and general flight specifications are as follows:

Table 1 - Survey Specifications

Survey block	Traverse Line spacing (m)	Area (Km^2)	Planned Line-km	Actual[1] Line-km	Flight direction	Line numbers
Lorn Property	Traverse: 400	112	160	166.7	N 90° E / N 270° E	L1000 – L1150
	Tie: 2450		100	104	N 0° E / N 180° E	T1900 – T1940
TOTAL		**112**	**260**	**270.7**		

Survey block boundaries co-ordinates are provided in Appendix B.

2.2 Survey Operations

Survey operations were based out of Gold Bridge, BC on May 31st, 2011 until June 3rd, 2011. The following table shows the timing of the flying.

Table 2 - Survey schedule

Date	Flight #	Block	Crew location	Comments
31-May-2011	1,2	Lorn	Gold Bridge, BC	20km flown- System assembly & testing completed
1-Jun-2011			Gold Bridge, BC	No production due to weather
2-Jun-2011			Gold Bridge, BC	No production due to weather
3-Jun-2011	3,4	Lorn	Gold Bridge, BC	240km flown – flying completed

[1] Actual line-km represents the total line-km contained in the final databases. These line-km normally exceed the Planned line-km's, as indicated in the survey NAV files.

2.3 Flight Specifications

During the survey the helicopter was maintained at a mean height of 351 metres above the ground with a nominal survey speed of 80 km/hour for the survey block. This allowed for a nominal EM sensor terrain clearance of 281 metres and a magnetic sensor clearance of 296metres.

The on board operator was responsible for monitoring the system integrity. He also maintained a detailed flight log during the survey, tracking the times of the flight as well as any unusual geophysical or topographic feature.

On return of the aircrew to the base camp the survey data was transferred from a compact flash card (PCMCIA) to the data processing computer. The data were then uploaded via ftp to the Geotech office in Aurora for daily quality assurance and quality control by trained personnel.

2.4 Aircraft and Equipment

2.4.1 Survey Aircraft

The survey was flown using a Eurocopter Aerospatiale (Astar) 350 B3 helicopters, registration number C-GABH. The helicopter was operated by Bull Horn Helicopters. Installation of the geophysical and ancillary equipment was carried out by a Geotech Ltd crew.

2.4.2 Airborne Receiver

The airborne ZTEM receiver coil measures the vertical component (Z) of the EM field. The receiver coil is a Geotech Z-Axis Tipper (ZTEM) loop sensor which is isolated from most vibrations by a patented suspension system and is encased in a fibreglass shell. It is towed from the helicopter using an 85 metre long cable as shown in Figure 4. The cable is also used to transmit the measured EM signals back to the data acquisition system.

The coil has a 7.4 metre diameter with an orientation to the Vertical Dipole. The digitizing rate of the receiver is 2000 Hz. Attitudinal positioning of the receiver coil is enabled using 3 GPS antennas mounted on the coil. The output sampling rate is 0.4 seconds (see Section 2.4.7)

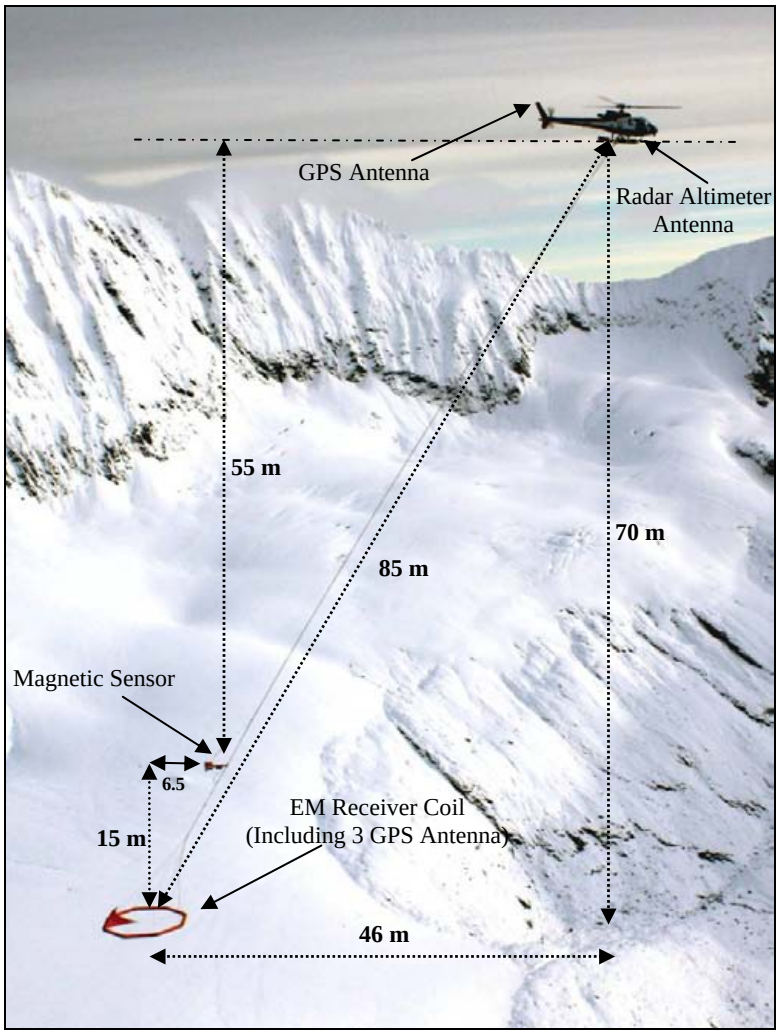

Figure 4 - ZTEM System Configuration

2.4.3 Base Station Receiver

The two Geotech ZTEM base station receiver coils measure the orthogonal, horizontal X and Y components of the EM reference field. They are set up perpendicular to each other and roughly oriented according to the flight line direction. The orientation of both units is not critical as the horizontal field can be further decomposed into the two orientations of the survey flight. The orientation of the base stations were measured using a compass.

The base station coils each have a diameter of 3.5 meters, with the coil orientations to the horizontal dipole, as shown in Figure 5.

The Block base station receiver coils were installed in valley near a river (50°93.82.29 N, 122°91.64.87W). The azimuth of the reference coil was N56^{o}E (named as A) and for the orthogonal component it was N146^{o}E (named as B). Angles A and B are taken into account together with the survey lines azimuth to calculate the in-line (Tzx) and cross-line (Tzy) field utilizing a proprietary software.

Figure 5 - ZTEM base station receiver coils.

2.4.4 Airborne magnetometer

The magnetic sensor utilized for the survey was a Geometrics split-beam optically pumped caesium vapour magnetic field sensor, mounted in a separate bird, and towed on a cable at a mean distance of 55 metres below the helicopter (Figure 4). The sensitivity of the magnetic sensor is 0.02 nanoTesla (nT) at a sampling interval of 0.1 seconds. The magnetometer will perform continuously in areas of high magnetic gradient with the ambient range of the sensor approximately 20k-100k nT. The Aerodynamic magnetometer noise is specified to be less than 0.5 nT. The magnetometer sends the measured magnetic field strength as nanoTesla to the data acquisition system via the RS-232 port.

2.4.5 Radar Altimeter

A Terra TRA 3000/TRI 40 radar altimeter was used to record terrain clearance. The antenna was mounted beneath the bubble of the helicopter cockpit.

2.4.6 GPS Navigation System

The navigation system used was a Geotech PC104 based navigation system utilizing a NovAtel CDGPS (Canada-Wide Differential Global Positioning System Correction Service) enabled Propak V3-RT20 GPS receiver. Geotech's Navigate software, using a full screen display with controls in front of the pilot, allows him to direct the flight.

5 NovAtel GPS antennas are utilized during the survey; one is mounted on the helicopter tail (Figure 4), one installed with the Receiver Base Station (Figure 5) and three are mounted on the airborne receiver (Figure 4). As many as 14 GPS and two CDGPS satellites may be monitored at any one time. The horizontal positional accuracy or circular error probability (CEP) is 1.8 m, with CDGPS active, it is 0.6 m. The co-ordinates of the block were set-up prior to the survey and the information was fed into the airborne navigation system.

2.4.7 Digital Acquisition System

The power supply and the data acquisition system are mounted on an equipment rack which is installed into the helicopter. Signal and power wires are run through the helicopter to connect on to the tow cable outside. The tow cable supports the ZTEM and magnetometer birds during flight via a safety shear pin connected to the helicopter hook. The major power and data cables have a quick disconnect safety feature as well. The installation was undertaken by the Geotech Ltd. crew and was certified before surveying.

A Geotech data acquisition system recorded the digital survey data on an internal compact flash card. Data is displayed on an LCD screen as traces to allow the operator to monitor the integrity of the system. The data type and sampling interval as provided in Table 3.

Table 3 - Acquisition and Processing Sampling Rates

DATA TYPE	ACQUISITION SAMPLING	PROCESSING SAMPLING
ZTEM Receiver	0.0005 sec	0.4 sec
Magnetometer	0.1 sec	0.4 sec
GPS Position	0.2 sec	0.4 sec
Radar Altimeter	0.2 sec	0.4 sec
ZTEM Base station	0.0005 sec	– –

2.4.8 Mag Base Station

A combined magnetometer/GPS base station was utilized on this project. A Geometrics Caesium split-beam vapour magnetometer was used as a magnetic sensor with a sensitivity of 0.001 nT. The base station was recording the magnetic field together with the GPS time at 1 Hz on a base station computer.

The base station magnetometer sensors for the block (50°52.5018 N, 122°51.6707 W) were installed in an open area behind the hotel away from electric transmission lines and moving ferrous objects such as motor vehicles. The base station data were backed-up to the data processing computer at the end of each survey day.

3. PERSONNEL

The following Geotech Ltd. personnel were involved in the project.

Field:

Project Manager:	Darren Tuck (Office)
Data QC:	Emilio Schein (Office)
Crew chief:	Joseph Florjancic
Operator:	Jonathan Yantho

The survey pilot and the mechanical engineer were employed directly by the helicopter operator – Bull Horn Helicopters.

Pilot:	Brook Pennington
Mechanical Engineer:	n/a

Office:

Preliminary Data Processing:	Lily Manoukian
Final Data Processing:	Lily Manoukian
Final Data QC:	Francis Tong/Ali Latrous
Interpretation/Inversions:	Ali Latrous
Reporting/Mapping:	Corrie Laver

Data acquisition phase was carried out under the supervision of Andrei Bagrianski, P. Geo, Chief Operating Officer. Processing and 2D Inversions phases were carried out under the supervision of Jean Legault, P. Geo, P. Eng, Chief Geophysicist (Interpretation). The overall contract management and customer relations were by Paolo Berardelli.

4. DATA PROCESSING AND PRESENTATION

Data compilation and processing were carried out by the application of Geosoft OASIS Montaj and programs proprietary to Geotech Ltd.

4.1 Flight Path

The flight path, recorded by the acquisition program as WGS 84 latitude/longitude, was converted into the WGS 84, UTM Zone 10 North coordinate system in Oasis Montaj.

The flight path was drawn using linear interpolation between x, y positions from the navigation system. Positions are updated every second and expressed as UTM easting's (x) and UTM northing's (y).

4.2 In-field Processing and Quality Control

In-Field data processing and quality control are done on a flight by flight basis by a qualified data processor (see Section 3.0). Processing steps and check up procedures are designed to assure the best possible final quality of ZTEM survey data. A general overview of those steps is presented in the following paragraphs.

The In-Field quality control can be separated into several phases:

a. GPS Processing Phase: GPS Data are first examined and evaluated during the GrafMov processing.
b. Raw data, ZTEM viewer phase:

   Data can be viewed, examined for consistency, individual channel spectra examined and overall noise estimated in the viewer provided by the ZTEM proprietary software, on the raw flight data and raw base station data separately, on the merged data, and finally on the data that have undergone ZTEM processing.
c. Field Geosoft phase:

   Magnetic data, Radar altimeter data, GPS positioning data are re-examined and processed in this phase. Prior to splitting the lines EM data are examined flight by flight and the effectiveness of applying the attitude correction evaluated. After splitting the lines, a set of grids are generate for each parameter and their consistency evaluated. Data profiles are also re-evaluated on a line to line basis. A power line monitor channel is available in order to identify power line noise.

4.3 GPS Processing

Three GPS sensor (mounted on the airborne receiving loop) measurements were differentially corrected using the Waypoint GrafMov^{TM} software in order to yield attitude corrections to recorded EM data.

4.4 ZTEM Electromagnetic Data

The ZTEM data were processed using proprietary software. Processing steps consist of the following preliminary and final processing steps:

4.4.1 Preliminary Processing

a. Airborne EM, Mag, radar altimeter and GPS data are first merged with EM base station data into one file.
b. Merged data are viewed and examined for consistency in an incorporated viewer
c. In the next, processing phase, the following entities are taken into account:
   - the Base station coils orientation with respect to the Magnetic North,
   - the Local declination of the magnetic field,
   - Suggested direction of the X coordinate (North or line direction),
   - Sensitivity coefficient that compensates for the difference in geometry between the base station and airborne coils.
   - Rejection filters for the 60 Hz and helicopter generated frequencies.
d. Six frequencies (30, 45, 90, 180, 360, and 720 Hz) are extracted from the airborne EM time-series coil response using windows of 0.4 seconds and the base station coils using windows of 1.0 seconds.
e. The real (In-Phase) and imaginary (Quadrature) parts of the tipper transfer functions are derived from the In-line (X or Tzx) and Cross-line (Y or Tzy) components.
f. Such processed EM data are then merged with the GPS data, magnetic base station data and exported into a Geosoft xyz file.

4.4.2 Geosoft Processing

Next stage of the preliminary data processing is done in a Geosoft ™ environment, using the following steps:

a. Import the output xyz file from the AFMAG processing, as well as the base Mag data into one database.
b. Split lines according to the recorded line channel,
c. GPS processing, flight path recovery (correcting, filtering, calculating Bird GPS coordinates, line splitting)
d. Radar altimeter processing, yielding the altitude values in metres.
e. Magnetic spike removal, filtering (applied to both airborne and base station data). Calculation of a base station corrected mag.
f. Apply preliminary attitude corrections to EM data (In phase and Quadrature), filter and make preliminary grids and profiles of all channels.

4.4.3 Final Processing

Final data processing and quality control were undertaken by Geotech Ltd headquarters in Aurora, Ontario by qualified senior data processing personnel.

A quality control step consisted of re-examining all data in order to validate the preliminary data processing and to allow for final adjustments to the data.

Attitude corrections were re-evaluated, and re-applied, on component by component, flight by flight, and frequency by frequency bases. Any remaining line to line system noise was removed by applying a mild additional levelling correction.

Due to the mountainous terrain, the flight elevations occasionally caused the aircraft's on-board radar to fall out of range. The absence of radar data resulted in no-values being recorded for the digital elevation model (DEM) and EM bird altitude (alt_b) channels. In such cases the "DEM" and "alt_b" data have been replaced by dummy (*) values.

To make up for their absence, for 2D inversion and other interpretation purposes, the digital elevation model was approximated using the available satellite radar topographic model "SRTM 90m World Elevation" from the Geosoft DAP server and the alt_b was then recalculated using the receiver bird on-board GPS . The resulting "SRTM_dem" and "SRTM_alt_b" channels have been added to the final database.

4.4.4 ZTEM Profile Sign Convention

Tzx and Tzy tipper components do not exhibit maxima or minima above conductors, resistors or at contacts; in fact they produce cross-over type anomalies (Ward, 1959; Vozoff, 1972; Labson, 1985). The crossover polarity sign convention for ZTEM is according to the right hand Cartesian rule (Z positive –up) that is commonly used for multi-component transient electromagnetic methods.

For the east to west lines of the Block the sign convention for the Tzx in-line component crossover is positive-negative pointing west to east for tabular conductors perpendicular to the profile (Figure 6). The corresponding Tzy component in-phase cross-over polarity is positive-negative pointing south to north (90 degrees counter clockwise to Tzx) according to the right hand Cartesian rule (Figure 7).

Conversely, tabular resistive bodies produce In-Phase cross-over's that are opposite in sign to conductors. A brief discussion of ZTEM and AFMAG, along with selected forward model responses is presented in Appendix D.

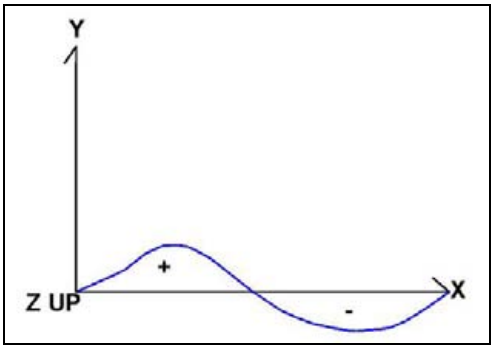

Figure 6 - ZTEM Crossover Polarity Convention for East to West lines

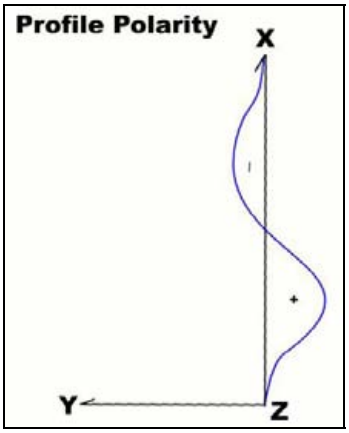

Figure 7 - ZTEM Crossover Polarity Convention for North to South lines

4.4.5 ZTEM Quadrature Sign Dependence

One important note regarding the sign of the ZTEM Quadrature, relative to the In-Phase component, particularly with regards to computer modeling and inversion.

The sign of the magnetotelluric Quadrature relative to the In-Phase tipper transfer function component pertains to the Fourier transformation of the time series to give frequency domain spectra. There are two widely used conventions for time dependence in the transformations, **exp(+iωt)** and **exp(-iωt).** That which is implemented largely is a matter of personal preference and precedent. The importance of the In-Phase and Quadrature sign convention is not critical, provided that it is known and documented.

In ZTEM, the data processing code used for the Fourier transformation the time-series data to frequency domain spectra adopts a **exp(-iωt)** time dependence (J. Dodds, Geo Equipment Manufacturing, pers. comm., Nov-2009). Whereas in the forward modeling and inversion program Zvert2d, the sign of the Quadrature relative to the In-Phase transfer function assumes an **exp(+iωt)** dependence[2].

As a result, for users interested in computer modeling and inversion of ZTEM data, the sign of the Quadrature will need to be reversed, relative to the In-Phase component, in order to provide a proper result (Figure 8). Indeed this reverse Quadrature polarity convention is assumed in all forward modeling and inversion of ZTEM data, as described in Figures 5-7 in Appendix D.

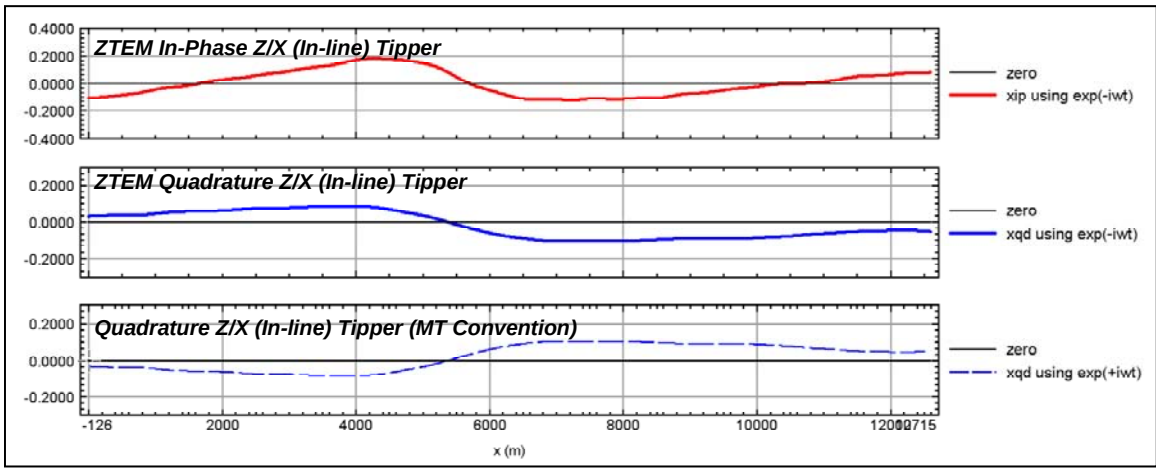

Figure 8 - Illustration of ZTEM In-Phase & Quadrature Tipper transfer function polarity convention (e-iωt) relative to equivalent MT Tipper Quadrature polarity convention (e+iωt) for a graphitic conductor in Athabasca Basin, SK.

2 Phillip E. Wannamaker (2009): Two-dimensional Inversion of ZTEM data: Synthetic Model Study and Test Profile Images, Internal Geotech technical report by Emblem Exploration Services Inc., January 22, 2009, 32 pp.

4.4.6 Total Divergence and Phase Rotation Processing

In a final processing step DT (Total Divergence) and PR (Phase Rotation) processing are applied to the multi-frequency In-phase and Quadrature ZTEM data. This is due to the crossover nature of the Tipper Responses; these additional processing steps are applied to convert them into local maxima for easier interpretation.

To present the data from both tipper components into one image, the Total Divergence parameter, termed the DT is calculated from the horizontal derivatives of the Tzx and Tzy tippers (Lo and Zang, 2008). It is analogous to the "Peaker" parameter in VLF (Pedersen, 1998).

Total Divergence DT:	***DT = DIV (Tzx, Tzy)*** ***= d(Tzx)/dx+d(Tzy)/dy***

This DT parameter was introduced by Petr Kuzmin (Milicevic, 2007, p. 13) and is derived for each of the In Phase and Quadrature components at individual frequencies. These in turn allow for minima over conductors and maxima over resistive zones. DT grids for each of the extracted frequencies were generated accordingly, using a reverse colour scheme with warm colours over conductors and cool colours over resistors.

The DT gives a clearer image of conductor's location and shape but, as a derivative, it does not preserve some of the long wavelength information and is also sensitive to noise.

As an alternative, a 90 degree Phase Rotation (PR) technique is also applied to the grids of each individual component (Tzx and Tzy). It transforms bipolar (cross over) anomalies into single pole anomalies with a maximum over conductors, while preserving long wavelength information (Lo et al., 2009). The two orthogonal grids are then usually added to obtain a Total Phase Rotated (TPR) grid for the In-Phase and Quadrature.

Total Phase-Rotation TPR:	***= PR (Tzx) + PR (Tzy)***

A presentation of the ZTEM test survey results over unconformity uranium deposits that illustrates DT and TPR examples, as documented by Lo et al. (2009) is provided in Appendix E.

4.4.7 2D EM Inversion

2d inversions of the ZTEM results were performed over selected lines using the Geotech Av2dtopo software developed by Phil Wannamaker, U. of Utah, for Geotech Ltd. The inversion algorithm is based on the 2D inversion code with Jacobians of de Lugao and Wannamaker (1996), the 2D forward code of Wannamaker et al (1987), and the Gauss-Newton parameter step equations of Tarantola (1987). Av2dtopo has been developed/modified for use with our ZTEM platform by taking into account the ground topography and the air-layer between the receiver bird and the ground surface.

The 2D code only considers the In-Line (Tzx) data and assumes that the strike lengths of bodies are infinite and orthogonal to the profile. The code is designed to account for the ZTEM vertical coil receiver and fixed base station reference measurements. The inversion uses a model-mesh consisting of 440 cells laterally and 112 cells vertically. Typically the ZTEM data are de-sampled to 192 pts, in order to allow the inversion to run in 20 minutes or less. Typically, between 1-2% errors are added to the In-line in-phase (XIP) and Quadrature (XQD) data obtained at 30,45,90,180,360 & 720Hz. Errors are adjusted until numerical convergence (<1.0 rms) is attained in 5 iterations or less. All inversions are based on an apriori homogeneous starting half-space model, usually between 100 – 1000ohm metres, as determined by the interpreter.

4.5 Magnetic Data

The processing of the total magnetic field intensity (TMI) data involved the correction for diurnal variations by using the digitally recorded ground base station magnetic values. The base station magnetometer data was edited and merged into the Geosoft GDB database on a daily basis. The aeromagnetic data was corrected for diurnal variations by subtracting the observed magnetic base station deviations.

Tie line levelling was carried out by adjusting intersection points along traverse lines. A micro-levelling procedure was applied to remove persistent low-amplitude components of flight-line noise remaining in the data.

The corrected magnetic data was interpolated between survey lines using a random point gridding method to yield x-y grid values for a standard grid cell size of 100 metres. The Minimum Curvature algorithm was used to interpolate values onto a rectangular regular spaced grid.

5. DELIVERABLES

5.1 Survey Report

The survey report describes the data acquisition, processing, and final presentation of the survey results. The survey report is provided in two paper copies and digitally in PDF format.

5.2 Maps

Final maps were produced at scale of 1:20,000. The coordinate/projection system used was WGS84, UTM Zone 10 North. All maps show the flight path trace and topographic data; latitude and longitude are also noted on maps.

The preliminary and final results of the survey are presented as profile plans for the EM data that were generated for individual real (In-Phase) and imaginary parts (Quadrature) of the Tzx and Tzy components. Colour contour maps of the corresponding DT (Total Divergence) or TPR (Total Phase Rotated) grids for three of the five frequencies, (30, 45, 90, 180 and 360Hz), as well as for corresponding Phase Rotated Grids for individual components.

3D views have been constructed by plotting the either DT or TPR grids at their respective penetration depths using a 1000 ohm-m half space, using the Bostick skin depth rule (Bostick, 1977) see Appendix D.

Final maps were chosen, in consultation with the client, to represent all collected data, are listed in Section 5.3.

Sample maps of the related 3D view, Magnetic and Total Phase Rotated are included in this report and presented in Appendix C.

5.3 Digital Data

- Two copies of the data and maps on a DVD were prepared to accompany the report. Each DVD contains a digital file of the line data in GDB Geosoft Montaj.

- DVD structure.

  There are two (2) main directories;

  Data contains databases and grids, as described below.

  Report contains a copy of the report and appendices in PDF format.

  Databases in Geosoft GDB format, containing the channels listed in Table 4.

Table 4 - Geosoft GDB Data Format

Column	Description
X:	UTM Easting WGS84 Zone 10N, (Centre of the ZTEM loop) (metres)
Y:	UTM Northing WGS84 Zone 10N, (Centre of the ZTEM loop) (metres)
Longitude:	Longitude – NAD83 (Centre of the ZTEM loop) (Decimal degree)
Latitude	Latitude – NAD83 (Centre of the ZTEM loop) (Decimal degree)
Z:	Elevation - (Centre of the ZTEM loop) (metres)
Radar:	Helicopter terrain clearance from radar altimeter (metres - AGL)
Alt_B:	Calculated ZTEM Bird terrain clearance (metres)
DEM	Digital Elevation Model (above mean sea level, meters)
SRTM_dem	Digital Elevation Model calculated from SRTM (above mean sea level, meters)
SRTM_alt_b	Calculated ZTEM Bird terrain clearance from SRTM (metres)
Gtime	UTC Time (seconds of the day)
basemag	Magnetic base station data, nT
Mag1	Measured total magnetic field, nT
Mag2	Diurnally corrected total magnetic field, nT
Mag3:	Levelled total magnetic field, nT
xIp_030Hz:	Tzx In-Phase 30 Hz final corrected
xIp_045Hz:	Tzx In-Phase 45 Hz final corrected
xIp_090Hz:	Tzx In-Phase 90 Hz final corrected
xIp_180Hz:	Tzx In-Phase 180 Hz final corrected
xIp_360Hz:	Tzx In-Phase 360 Hz final corrected
xIp_720Hz:	Tzx In-Phase 720 Hz final corrected
xQd_030Hz:	Tzx Quadrature 30 Hz final corrected
xQd_045Hz:	Tzx Quadrature 45 Hz final corrected
xQd_090Hz:	Tzx Quadrature 90 Hz final corrected
xQd_180Hz:	Tzx Quadrature 180 Hz final corrected
xQd_360Hz:	Tzx Quadrature 360 Hz final corrected
xQd_720Hz:	Tzx Quadrature 720 Hz final corrected
yIp_030Hz:	Tzy In-Phase 30 Hz final corrected
yIp_045Hz:	Tzy In-Phase 45 Hz final corrected
yIp_090Hz:	Tzy In-Phase 90 Hz final corrected
yIp_180Hz:	Tzy In-Phase 180 Hz final corrected
yIp_360Hz:	Tzy In-Phase 360 Hz final corrected
yIp_720Hz:	Tzy In-Phase 720 Hz final corrected
yQd_030Hz:	Tzy Quadrature 30 Hz final corrected
yQd_045Hz:	Tzy Quadrature 45 Hz final corrected
yQd_090Hz:	Tzy Quadrature 90 Hz final corrected
yQd_180Hz:	Tzy Quadrature 180 Hz final corrected
yQd_360Hz:	Tzy Quadrature 360 Hz final corrected
yQd_720Hz:	Tzy Quadrature 720 Hz final corrected
PLM:	Power Line Monitor (60Hz)

- Grids in Geosoft GRD format, as follows:

MAG:	Total Magnetic Intensity
DEM:	Digital Elevation Model
SRTM_DEM:	Digital Elevation Model from SRTM
PLM:	Power Line Monitor
RTP:	Reduced to Pole of Total Magnetic Intensity
XIP_30Hz_PR:	Tzx In-Phase Component Phase Rotated grid at 30 Hz
XIP_45Hz_PR:	Tzx In-Phase Component Phase Rotated grid at 45 Hz
XIP_90Hz_PR:	Tzx In-Phase Component Phase Rotated grid at 90 Hz
XIP_180Hz_PR:	Tzx In-Phase Component Phase Rotated grid at 180 Hz
XIP_360Hz_PR:	Tzx In-Phase Component Phase Rotated grid at 360 Hz
XQd_30Hz_PR:	Tzx Quadrature component Phase Rotated grid at 30 Hz
XQd_45Hz_PR:	Tzx Quadrature component Phase Rotated grid at 45 Hz
XQd_90Hz_PR:	Tzx Quadrature component Phase Rotated grid at 90 Hz
XQd_180Hz_PR:	Tzx Quadrature component Phase Rotated grid at 180 Hz
XQd_360Hz_PR:	Tzx Quadrature component Phase Rotated grid at 360 Hz
YIP_30Hz_PR:	Tzy In-Phase Component Phase Rotated grid at 30 Hz
YIP_45Hz_PR:	Tzy In-Phase Component Phase Rotated grid at 45 Hz
YIP_90Hz_PR:	Tzy In-Phase Component Phase Rotated grid at 90 Hz
YIP_180Hz_PR:	Tzy In-Phase Component Phase Rotated grid at 180 Hz
YIP_360Hz_PR:	Tzy In-Phase Component Phase Rotated grid at 360 Hz
YQd_30Hz_PR:	Tzy Quadrature component Phase Rotated grid at 30 Hz
YQd_45Hz_PR:	Tzy Quadrature component Phase Rotated grid at 45 Hz
YQd_90Hz_PR:	Tzy Quadrature component Phase Rotated grid at 90 Hz
YQd_180Hz_PR:	Tzy Quadrature component Phase Rotated grid at 180 Hz
YQd_360Hz_PR:	Tzy Quadrature component Phase Rotated grid at 360 Hz
XIP_30Hz:	Tzx In-Phase Component grid at 30 Hz
XIP_45Hz:	Tzx In-Phase Component grid at 45 Hz
XIP_90Hz:	Tzx In-Phase Component grid at 90 Hz
XIP_180Hz:	Tzx In-Phase Component grid at 180 Hz
XIP_360Hz:	Tzx In-Phase Component grid at 360 Hz
XQd_30Hz:	Tzx Quadrature component grid at 30 Hz
XQd_45Hz:	Tzx Quadrature component grid at 45 Hz
XQd_90Hz:	Tzx Quadrature component grid at 90 Hz
XQd_180Hz:	Tzx Quadrature component grid at 180 Hz
XQd_360Hz:	Tzx Quadrature component grid at 360 Hz
YIP_30Hz:	Tzy In-Phase Component grid at 30 Hz
YIP_45Hz:	Tzy In-Phase Component grid at 45 Hz
YIP_90Hz:	Tzy In-Phase Component grid at 90 Hz
YIP_180Hz:	Tzy In-Phase Component grid at 180 Hz
YIP_360Hz:	Tzy In-Phase Component grid at 360 Hz
YQd_30Hz:	Tzy Quadrature component grid at 30 Hz
YQd_45Hz:	Tzy Quadrature component grid at 45 Hz
YQd_90Hz:	Tzy Quadrature component grid at 90 Hz
YQd_180Hz:	Tzy Quadrature component grid at 180 Hz

YQd_360Hz: Tzy Quadrature component grid at 360 Hz
IP_30Hz_DT: Total Divergence grid from In-phase components at 30 Hz
IP_45Hz_DT: Total Divergence grid from In-phase components at 45 Hz
IP_90Hz_DT: Total Divergence grid from In-phase components at 90 Hz
IP_180Hz_DT: Total Divergence grid from In-phase components at 180 Hz
IP_360Hz_DT: Total Divergence grid from In-phase components at 360 Hz
QD_30Hz_DT: Total Divergence grid from Quadrature components at 30 Hz
QD_45Hz_DT: Total Divergence grid from Quadrature components at 45 Hz
QD_90Hz_DT: Total Divergence grid from Quadrature components at 90 Hz
QD_180Hz_DT: Total Divergence grid from Quadrature components at 180 Hz
QD_360Hz_DT: Total Divergence grid from Quadrature components at 360 Hz
IP_30Hz_TPR: Total Phase Rotated grid from In-phase components at 30 Hz
IP_45Hz_TPR: Total Phase Rotated grid from In-phase components at 45 Hz
IP_90Hz_TPR: Total Phase Rotated grid from In-phase components at 90 Hz
IP_180Hz_TPR: Total Phase Rotated grid from In-phase components at 180 Hz
IP_360Hz_TPR: Total Phase Rotated grid from In-phase components at 360 Hz
QD_30Hz_TPR: Total Phase Rotated grid from Quadrature components at 30 Hz
QD_45Hz_TPR: Total Phase Rotated grid from Quadrature components at 45 Hz
QD_90Hz_TPR: Total Phase Rotated grid from Quadrature components at 90 Hz
QD_180Hz_TPR: Total Phase Rotated grid from Quadrature components at 180 Hz
QD_360Hz_TPR: Total Phase Rotated grid from Quadrature components at 360 Hz

A Geosoft .GRD file has a .GI metadata file associated with it, containing grid projection information. A grid cell size of 100 metres was used.

- Maps at 1:20,000 scale in Geosoft MAP format, as follows:

11060_20K_3D_IP_DT: 3D view of In-Phase Total Divergence versus Skin Depth (30-360Hz)
11060_20K_TMI: Total Magnetic Intensity (TMI)
11060_20K_30Hz_IP_DT: 30Hz In-Phase Total Divergence Grid
11060_20K_90Hz_IP_DT: 90Hz In-Phase Total Divergence Grid
11060_20K_360Hz_IP_DT: 360Hz In-Phase Total Divergence Grid
11060_20K_XIP_profiles_90Hz_XIP_PR3: Tzx (In-line) In-Phase Profiles over 90Hz Phase Rotated In-Phase Grid
11060_20K_XQD_profiles_90Hz_XQD_PR: Tzx (In-line) Quadrature Profiles over a 90Hz Phase Rotated Quadrature Grid.
11060_20K_YIP_profiles_90Hz_YIP_PR: Tzy(Cross-line) In-Phase Profiles over 90Hz Phase Rotated In-Phase Grid
11060_20K_YQD_profiles_90Hz_YQD_PR: Tzy (Cross-line) Quadrature Profiles over a 90Hz Phase Rotated Quadrature Grid.

3 Note: The profile maps are split according to line direction for easier representation and comprehension of the data.

- 2D Resistivity Inversion maps:

  11060_L1030_res: resistivity inversion of line 1030
  11060_L1060_res: resistivity inversion of line 1060

- Maps are also presented in PDF format.

- 1:50,000 topographic vectors were taken from the NRCAN Geogratis database at; http://geogratis.gc.ca/geogratis/en/index.html.

- A Google Earth file *"11060_RoyalSapphire.kml"* is included, showing the flight path of each block. Free versions of Google Earth software from: http://earth.google.com/download-earth.html.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

A helicopter-borne ZTEM and aeromagnetic geophysical survey has been completed over the Lorn Property located near Gold Bridge, British Columbia.

The total area coverage is 112 km^2. Total survey line coverage is 260 line kilometres. The principal sensors included a Z-Axis Tipper electromagnetic (ZTEM) system and a caesium magnetometer. Results have been presented as stacked profiles and contour colour images at a scale of 1:20,000.

There is no summary interpretation included in this report, however 2D inversions over selected lines have been provided in Appendix F.

6.2 Recommendations

Based on the geophysical results obtained, a number of interesting conductive structures were identified across the property. The magnetic results also contain worthwhile information in support of exploration targets of interest. We therefore recommend a more detailed interpretation of the available geophysical data, including additional 2D or 3D inversion in conjunction with the geology, prior to ground follow up and drill testing.

Respectfully submitted[6],

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Lily Manoukian
Geotech Ltd.

Ali Latrous
Geotech Ltd.

August 2011

[6]Final data processing of the EM and magnetic data were carried out by Lily Manoukian and Francis Tong. 2Dinversions were carried out by Ali Latrous from the office of Geotech Ltd. in Aurora, Ontario, under the supervision of Jean Legault, P. Geo, P. Eng, Chief Geophysicist (Interpretation)

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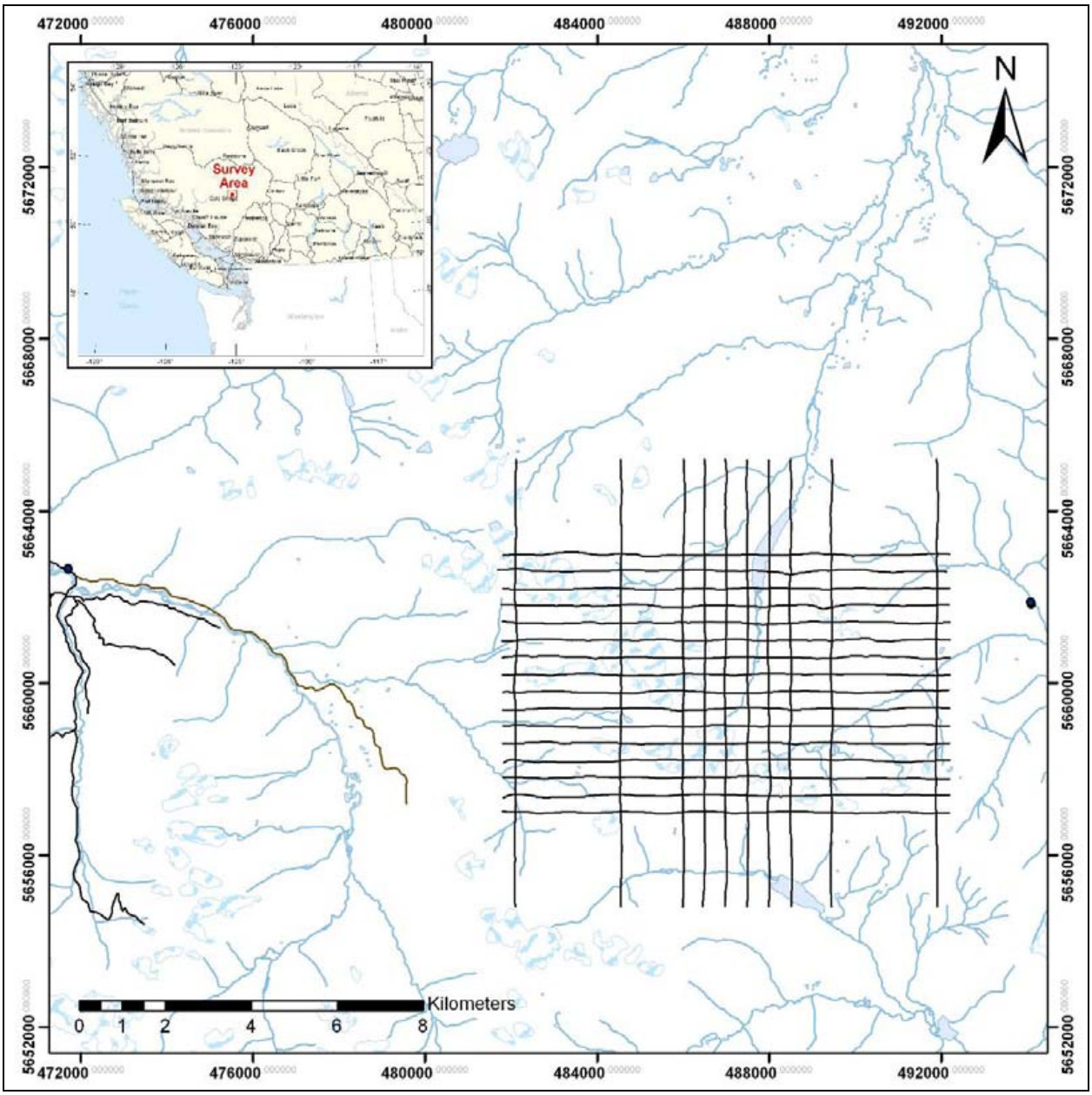
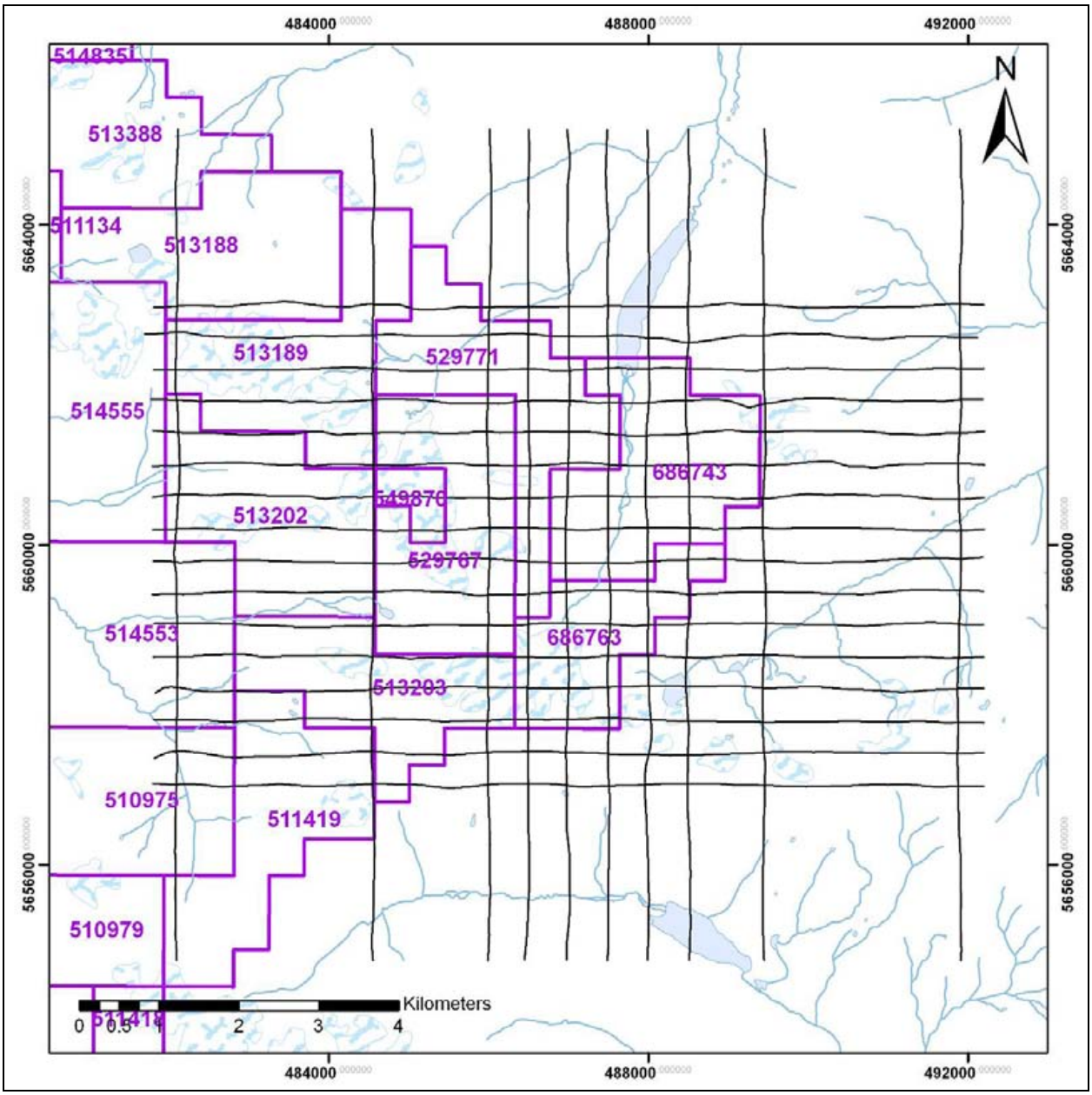
APPENDIX A

SURVEY BLOCK LOCATION MAP



Survey Overview Location Map



Mining Claims

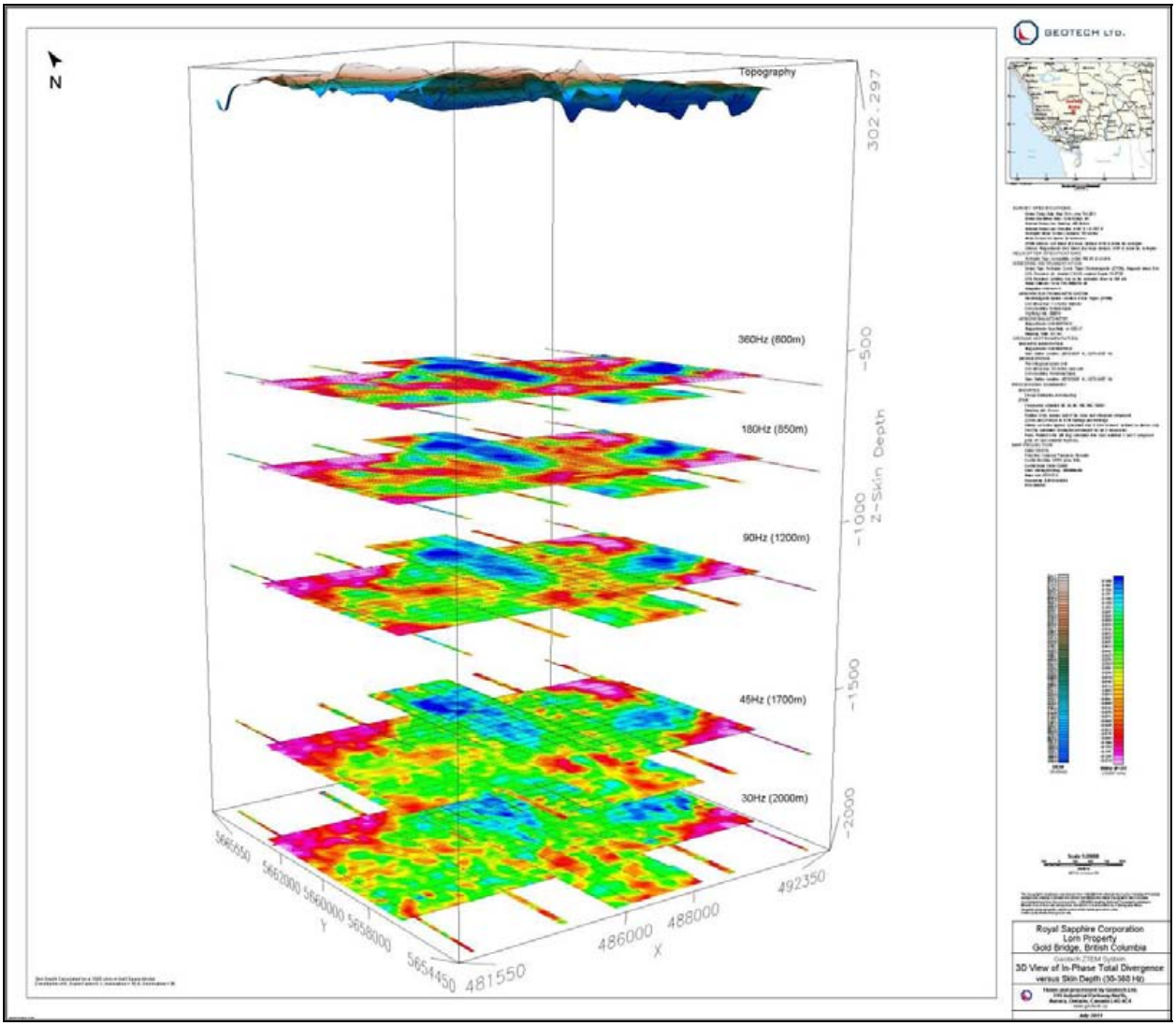
APPENDIX B

SURVEY BLOCK COORDINATES

(WGS84 Zone 10N)

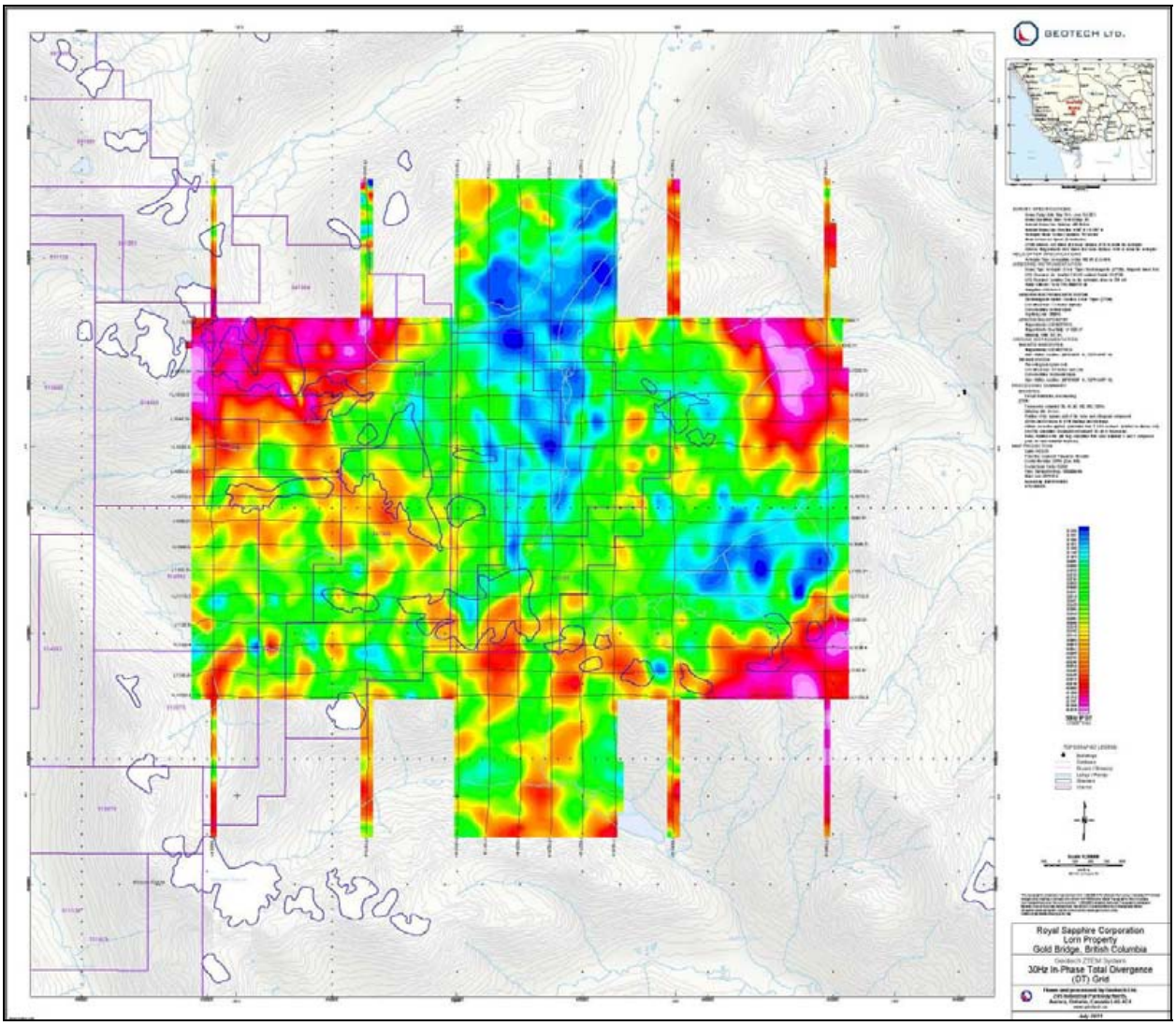
WGS84 UTM Zone 10N	
X	Y
482000	5657000
482000	5663000
492000	5663000
492000	5657000

APPENDIX C
GEOPHYSICAL MAPS[1]

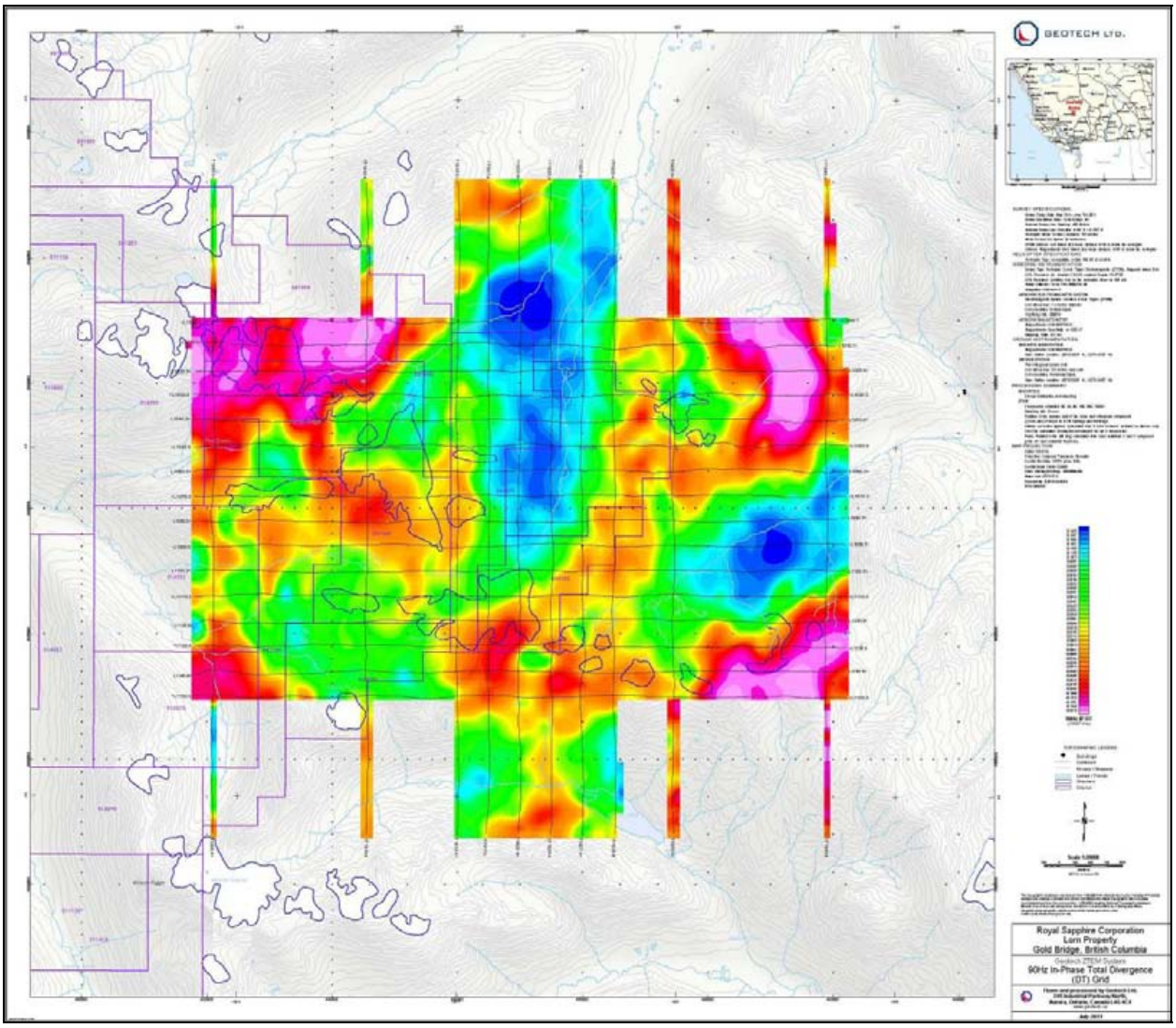


3D View of In-Phase, Total Divergence (DT) grids versus Skin Depth (30 Hz – 360 Hz)

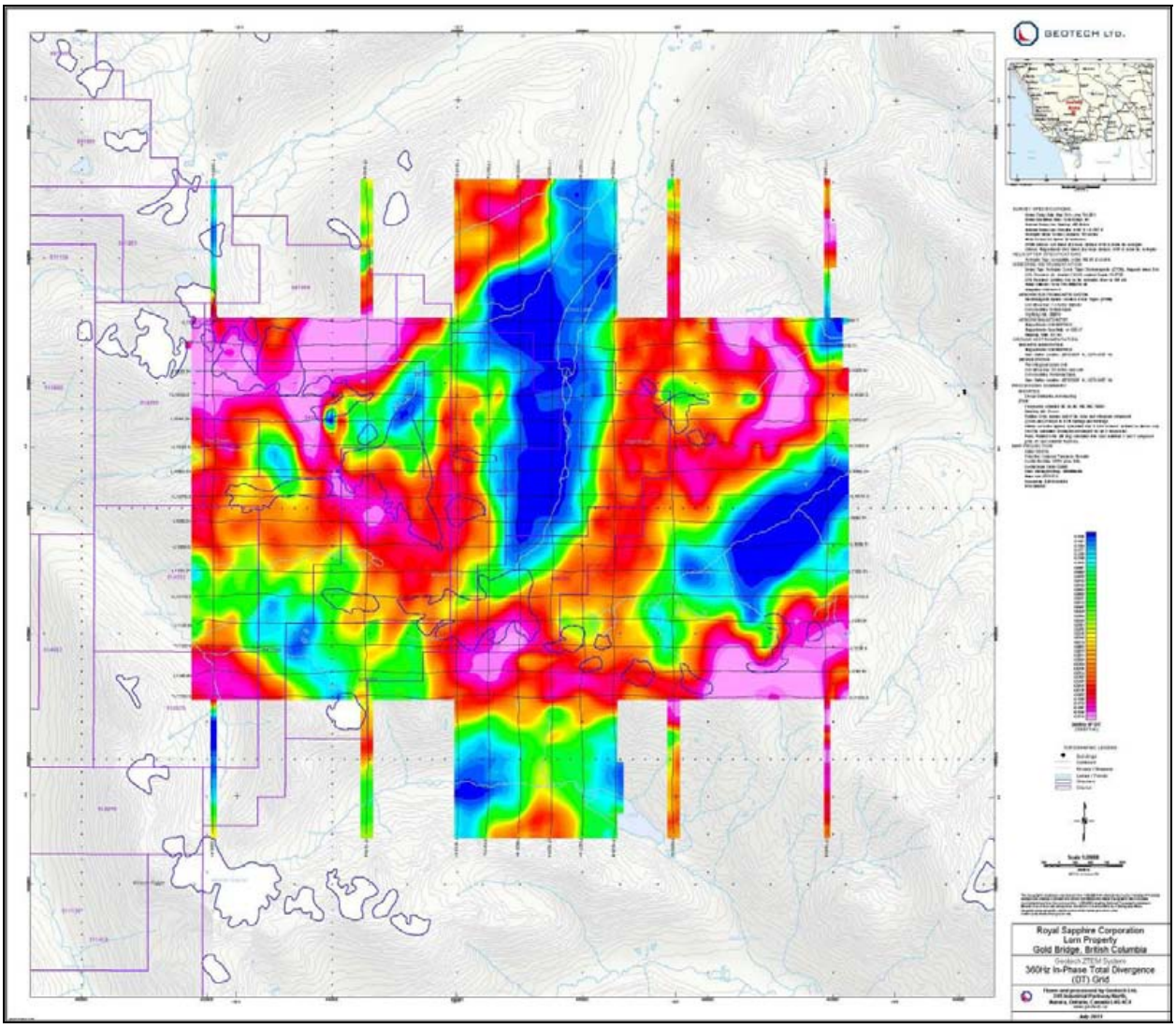
[1] Full size geophysical maps are also available in PDF format on the final DVD



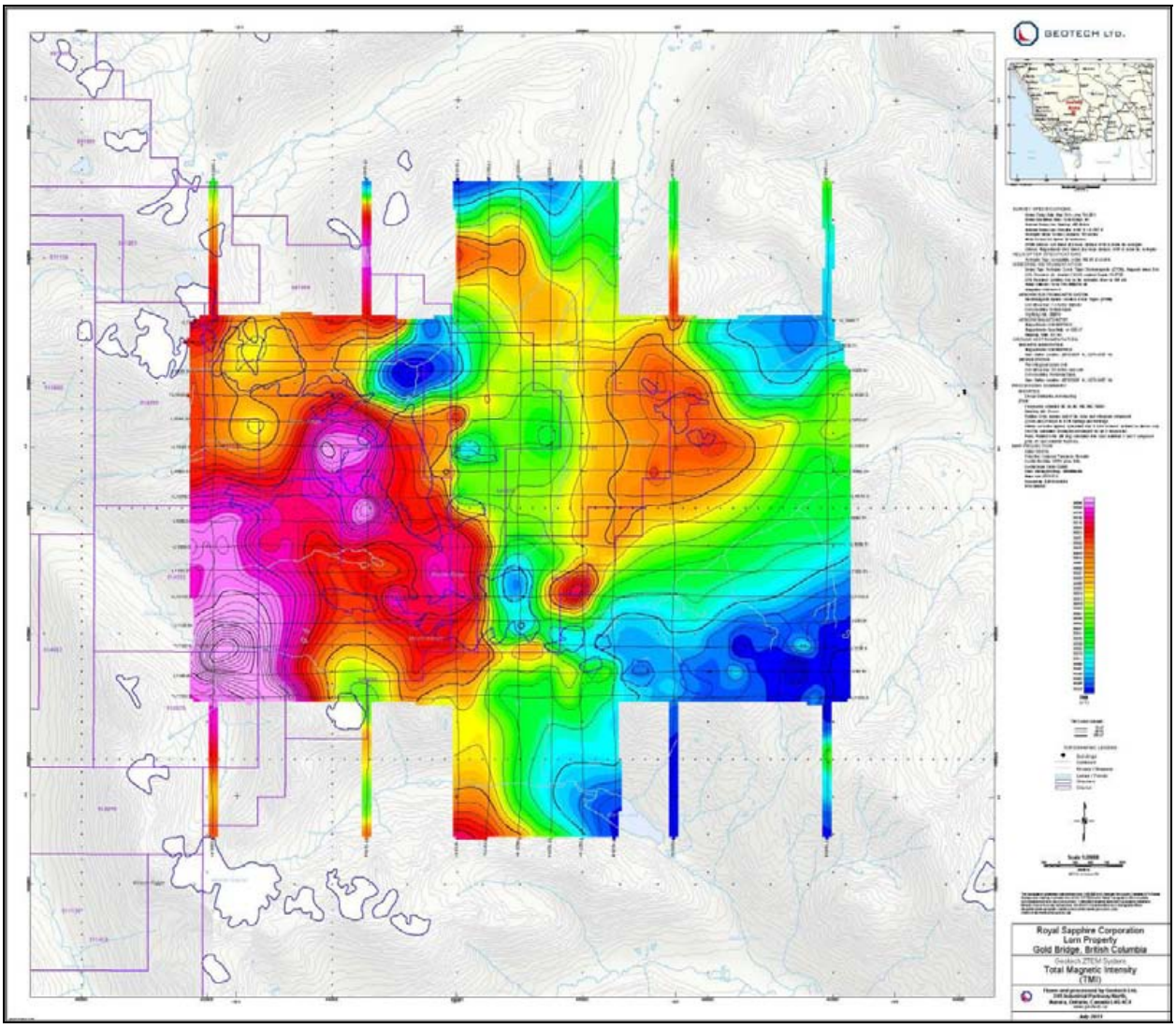
30Hz Total Divergence In-Phase (DT) Grid



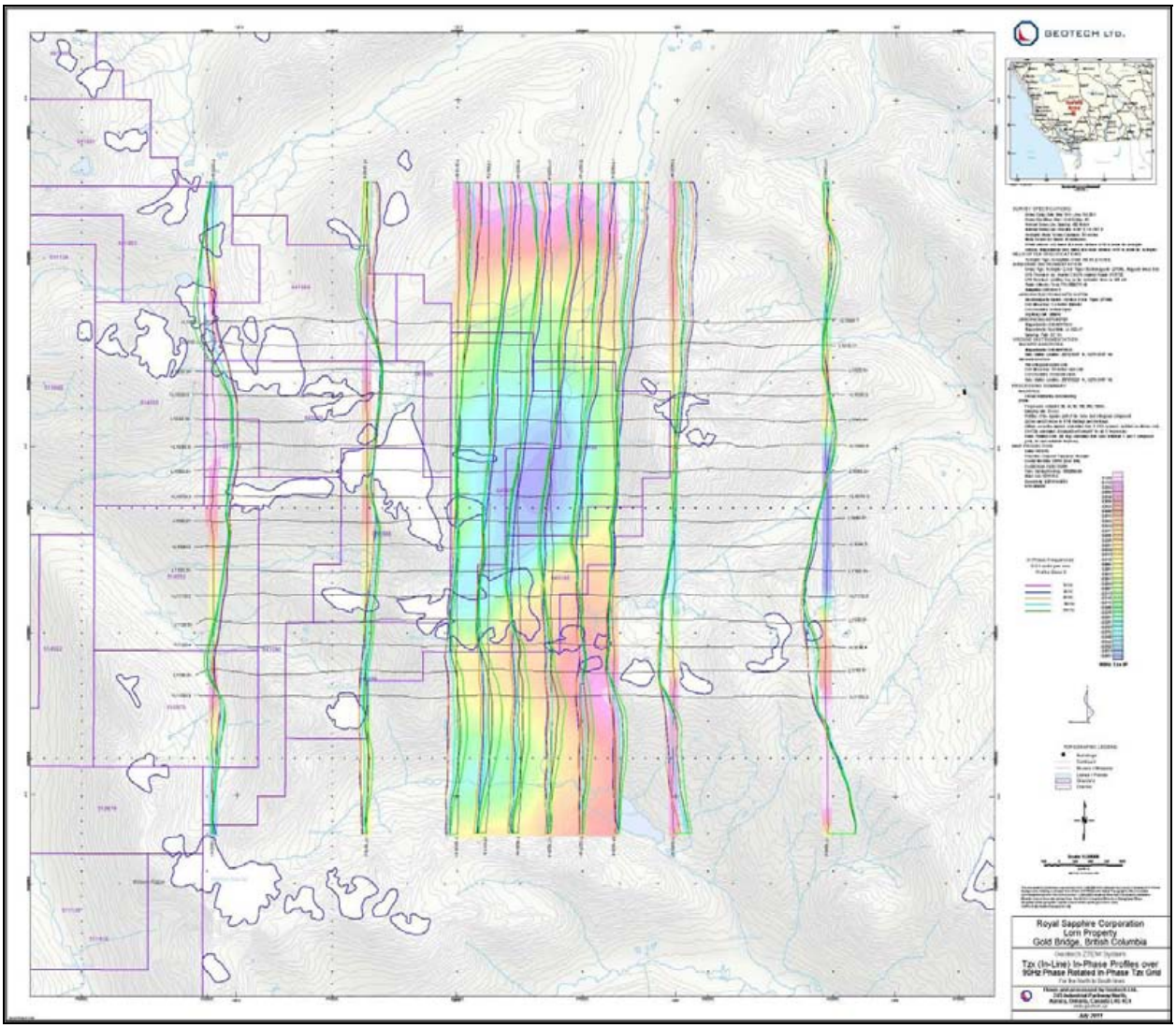
90Hz Total Divergence In-Phase (DT) Grid



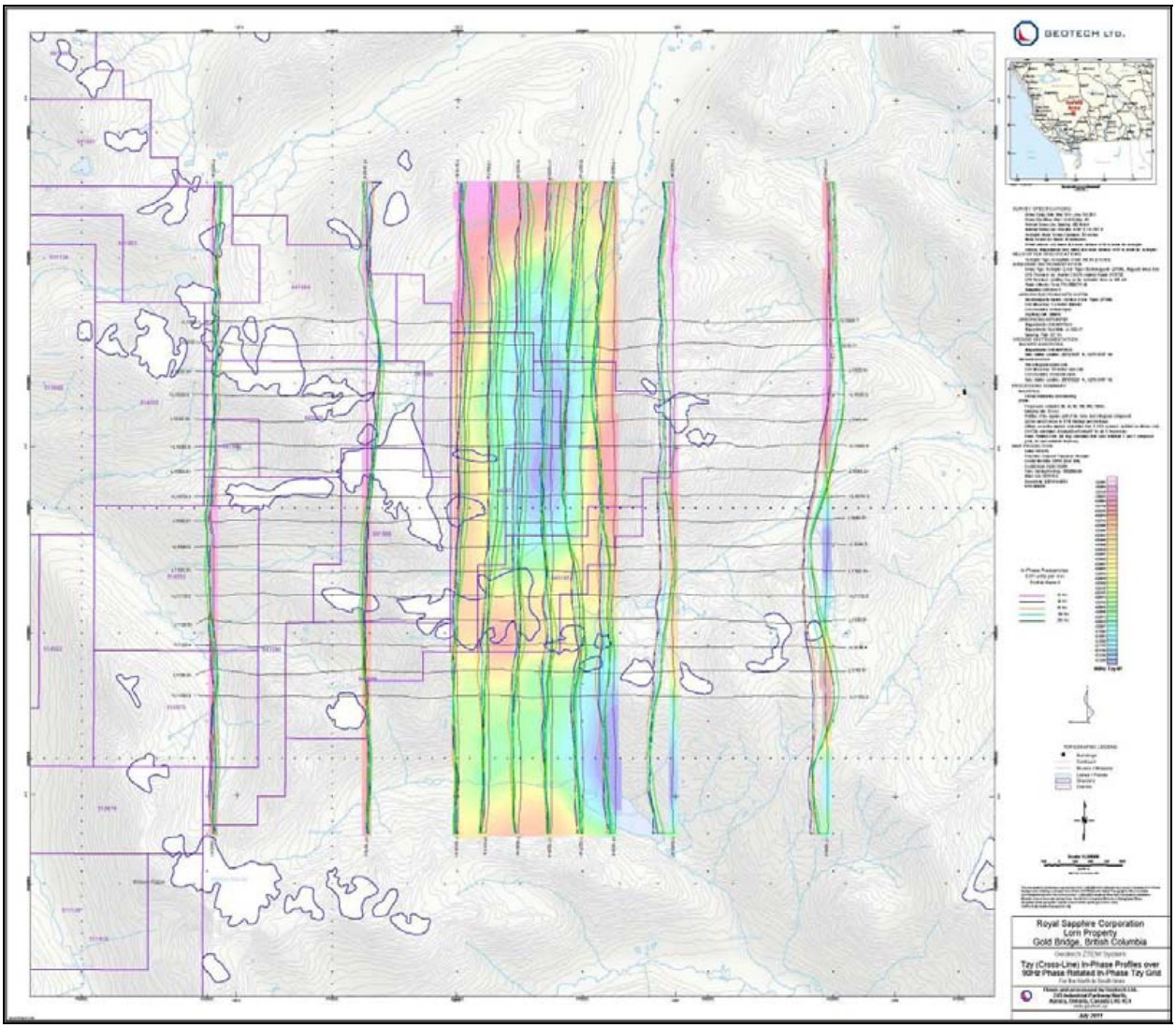
360Hz Total Divergence In-Phase (DT) Grid



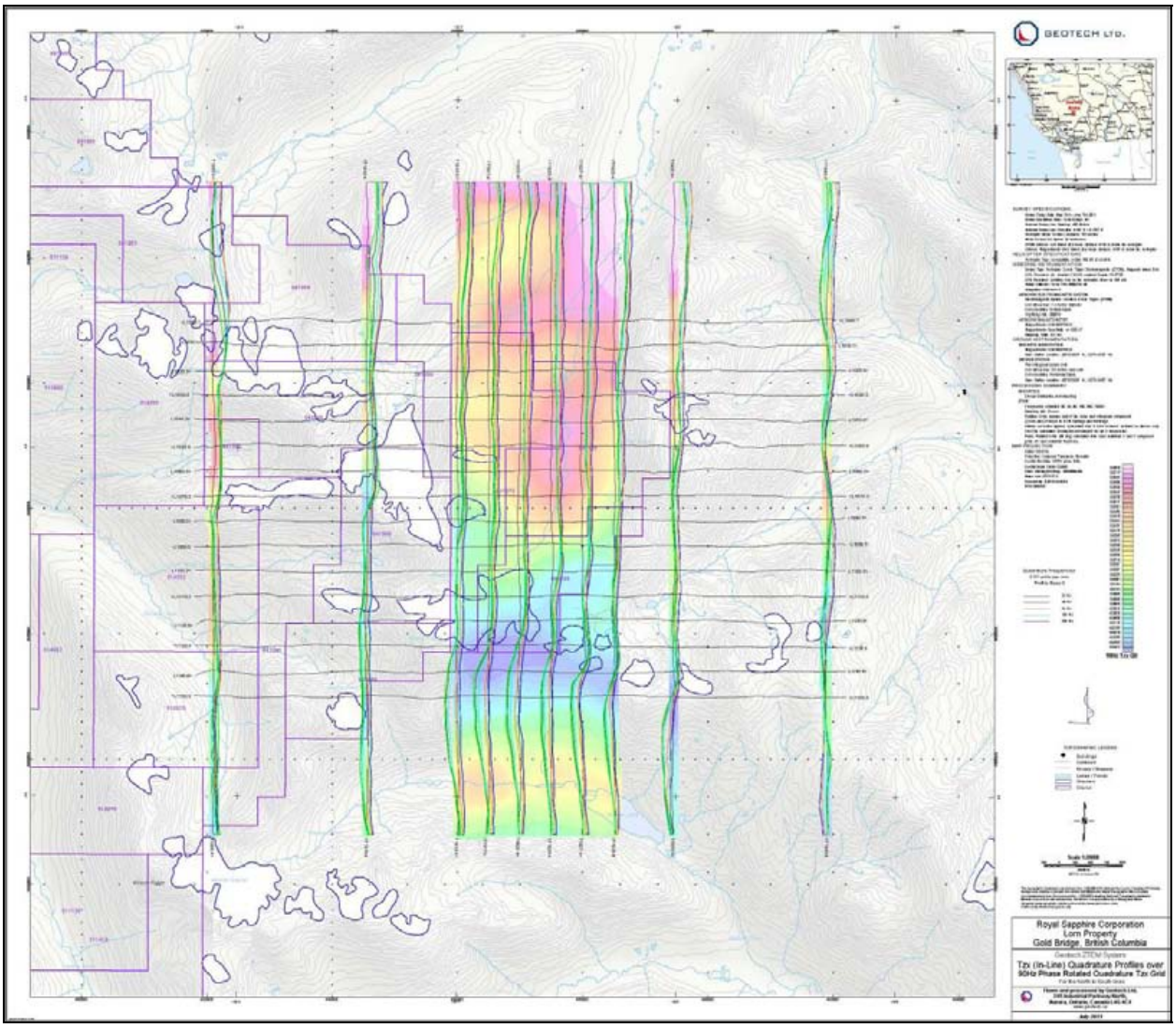
Total Magnetic Intensity (TMI)



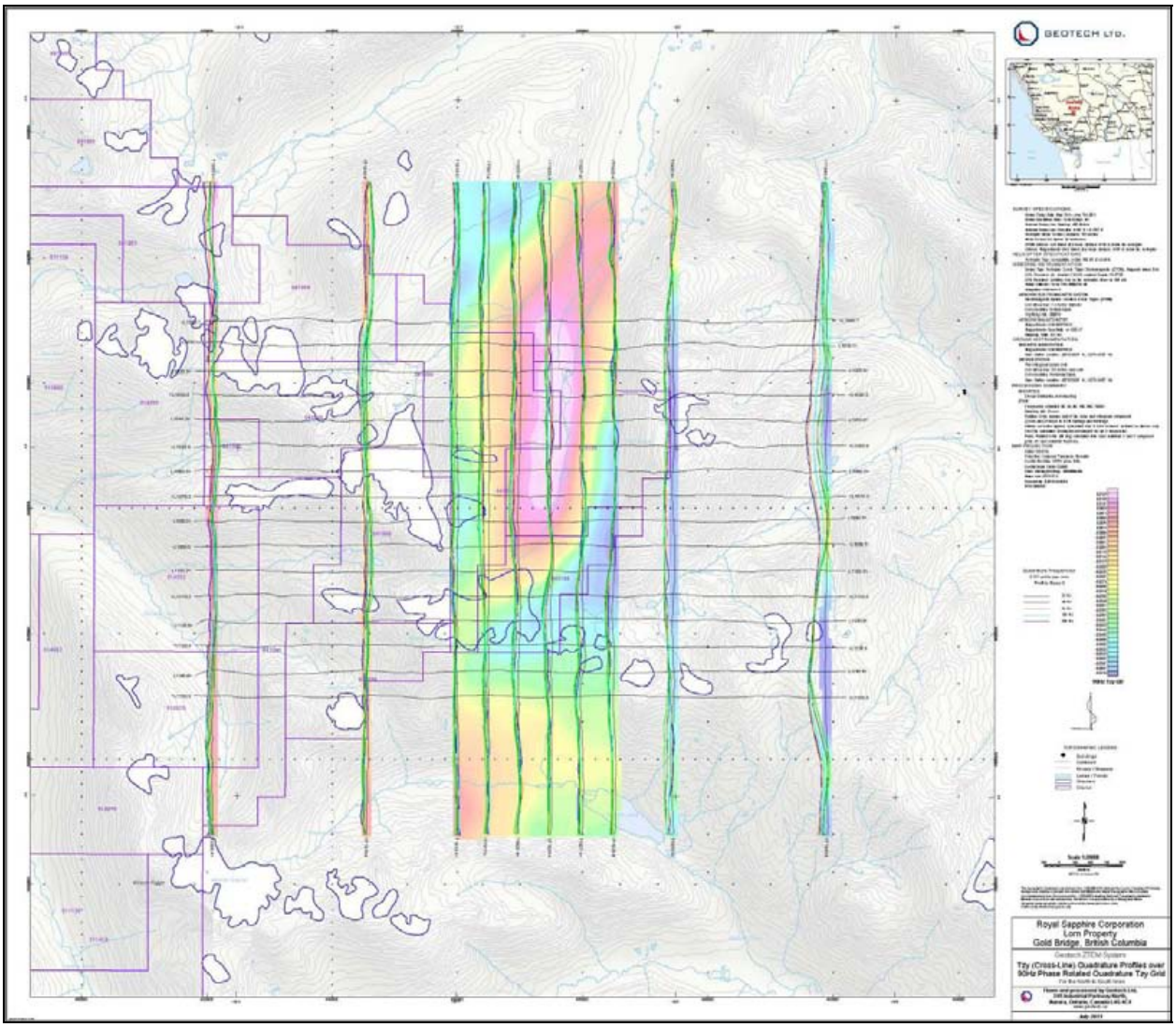
Tzx (In-line) In-Phase Profiles over 90Hz Rotated Tzx In-Phase Grid (For North-South Lines)



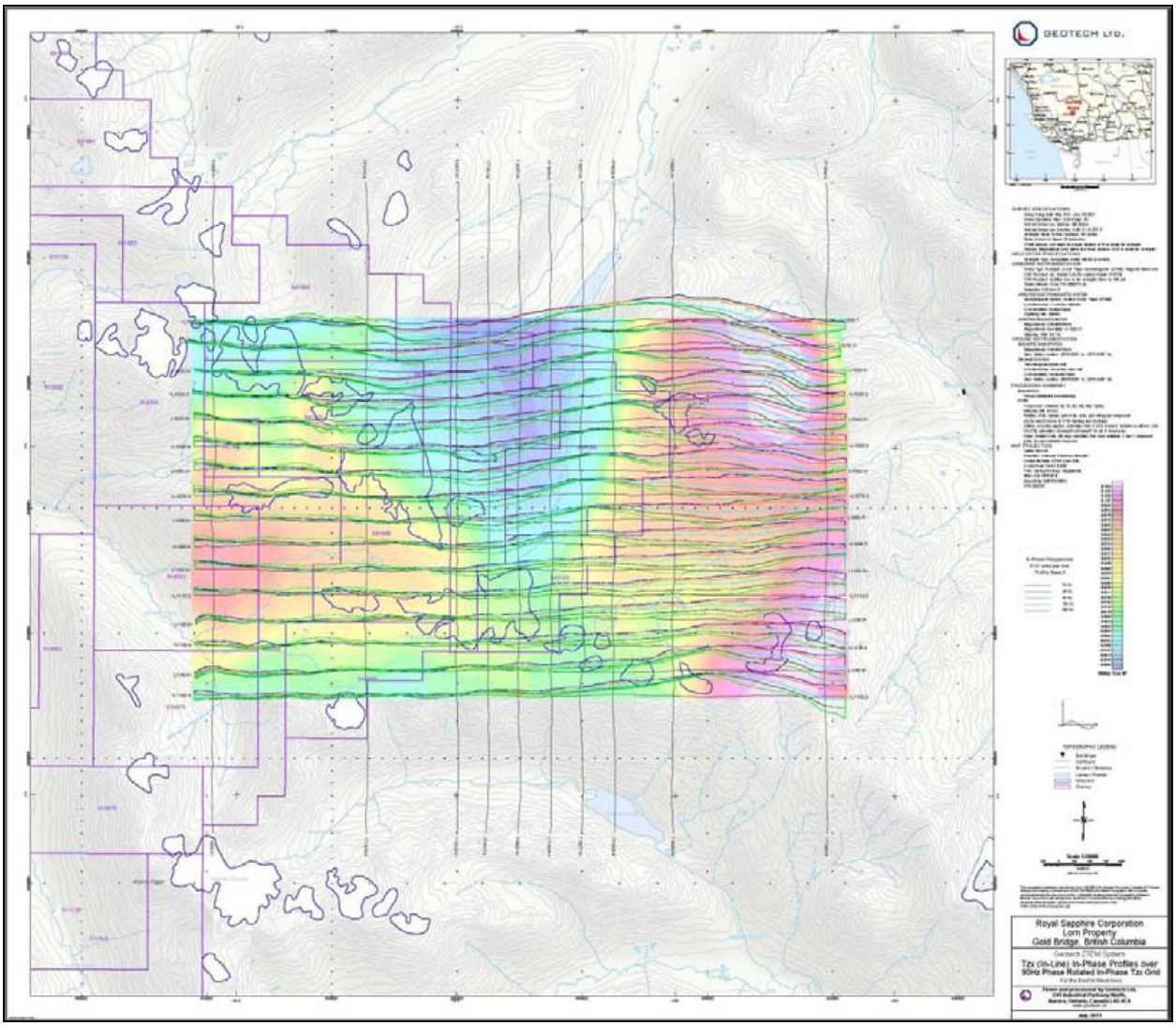
Tzy (Cross-line) In-Phase Profiles over 90Hz Rotated Tzy In-Phase Grid (For North-South Lines)



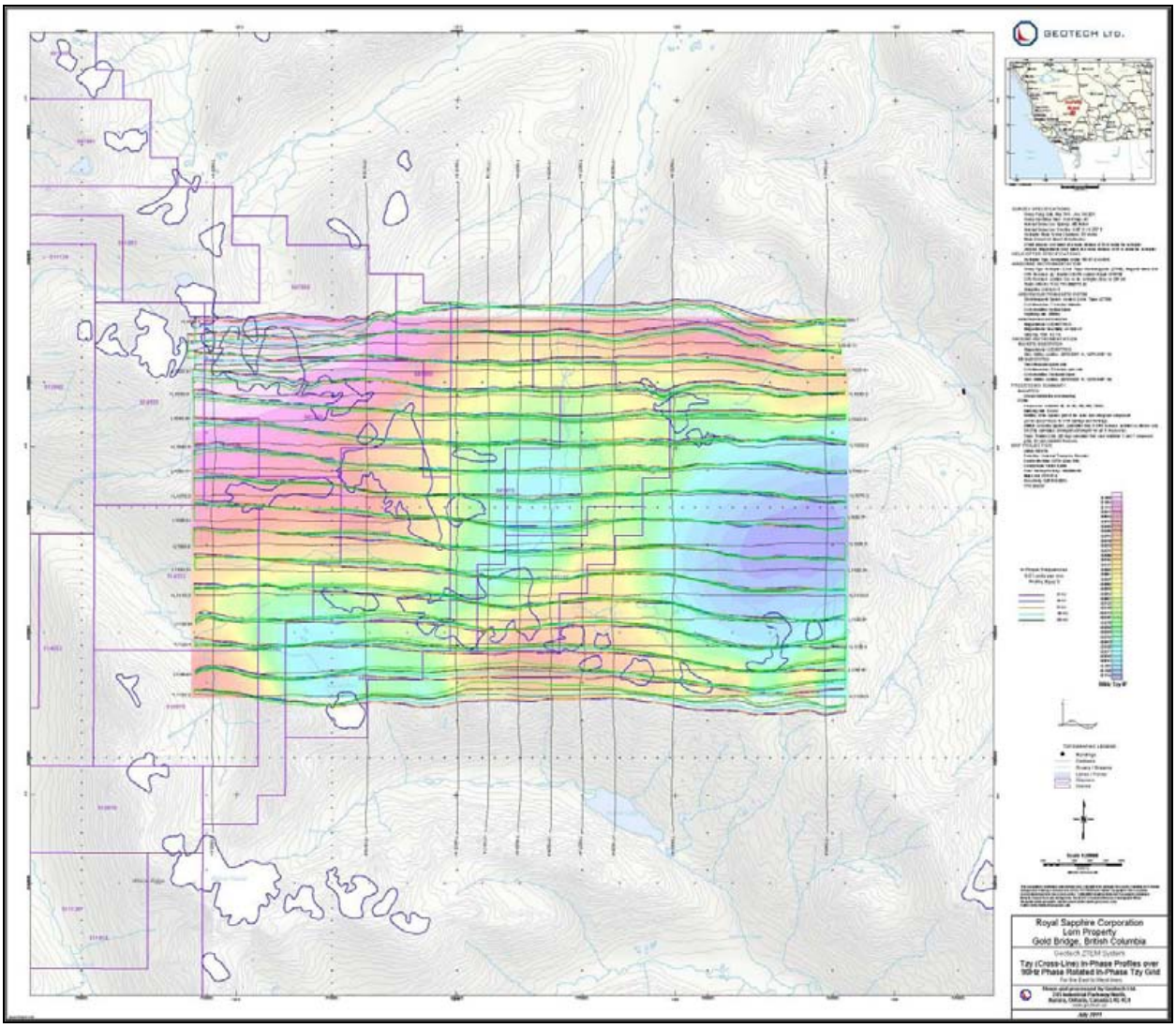
Tzx (In-line) Quadrature Profiles over 90Hz Rotated Tzx Quadrature Grid (For North-South Lines)



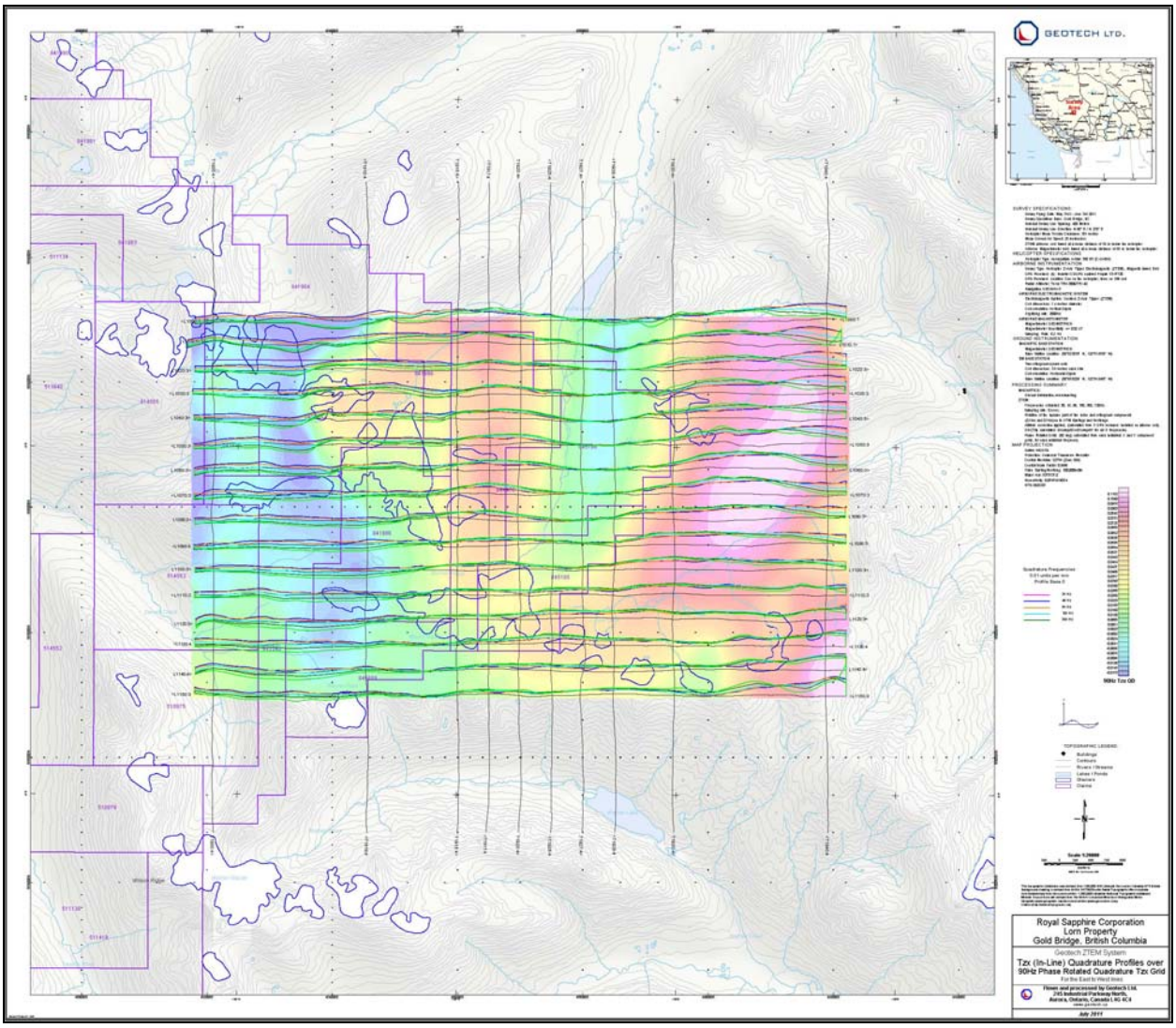
Tzy (Cross-line) Quadrature Profiles over 90Hz Rotated Tzy Quadrature Grid (For North-South Lines)



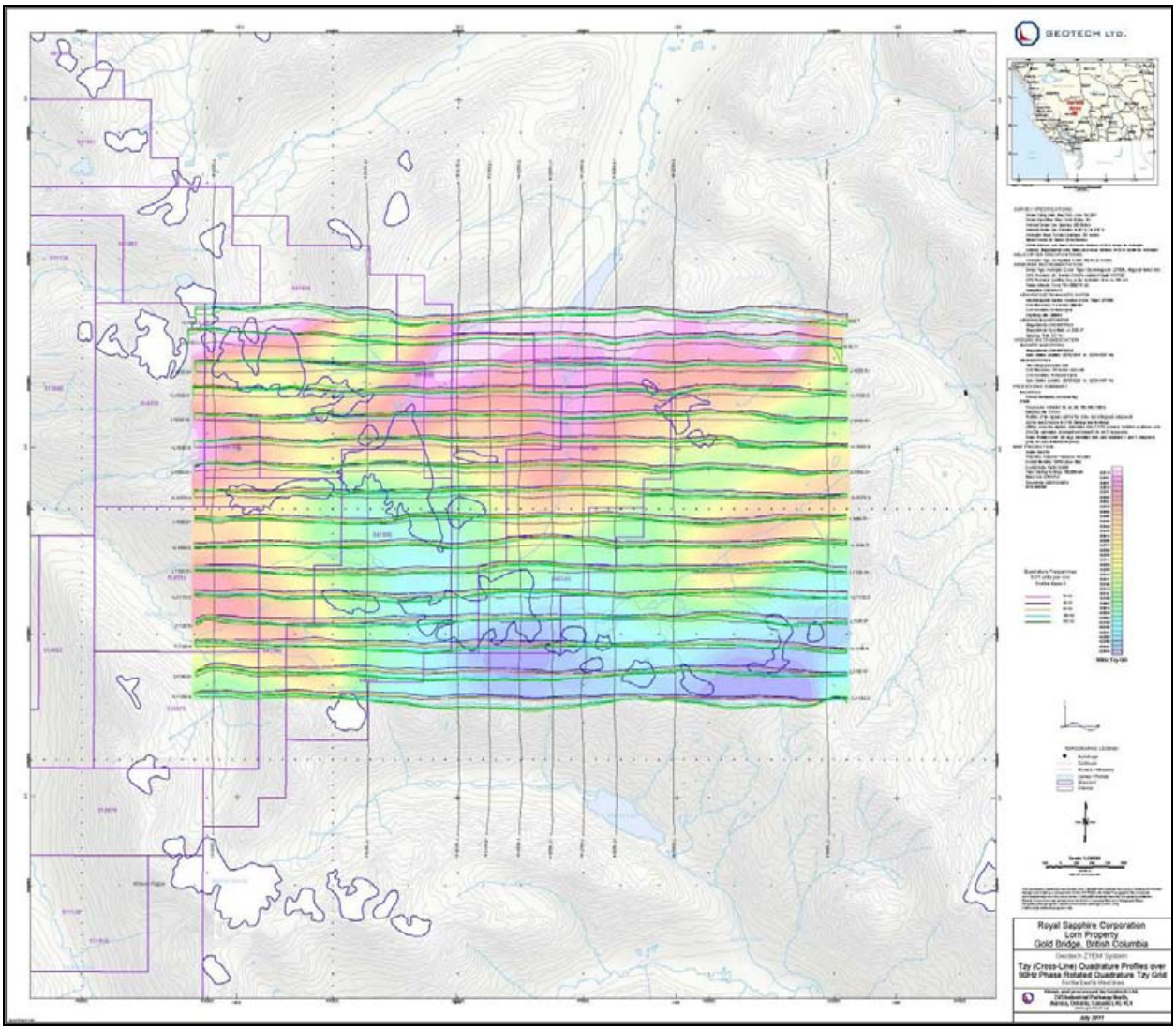
Tzx (In-line) In-Phase Profiles over 90Hz Rotated Tzx In-Phase Grid (For East-West Lines)



Tzy (Cross-line) In-Phase Profiles over 90Hz Rotated Tzy In-Phase Grid (For East-West Lines)



Tzx (In-line) Quadrature Profiles over 90Hz Rotated Tzx Quadrature Grid (For East-West Lines)



Tzy (Cross-line) Quadrature Profiles over 90Hz Rotated Tzy Quadrature Grid (For East-West Lines)

APPENDIX D

ZTEM THEORETICAL CONSIDERATIONS

A brief section on the theory behind the AFMAG technique is provided for completeness and a more comprehensive development of the theory can be found in standard texts. The natural EM field is normally horizontally polarized. Subsurface lateral variations of conductivity generate a vertical component, which is linearly related to the horizontal field. Although the fields look like random signals, they may be treated as the sum of sinusoids. At each frequency the field can be expressed as a complex number with magnitude and argument equal to the amplitude and phase of the sinusoid. The relation between the field components can then be expressed by a linear complex equation with two complex coefficients at any one frequency. These coefficients are dependent upon the subsurface and not upon the horizontal field present at any particular time and are appropriate parameters to measure (Vozoff, 1972).

$$\mathbf{Hz(f) = Tx(f)\ Hx(f) + Ty(f)\ Hy(f),} \qquad \mathbf{(1)}$$

Where

Hx(f), Hy(f) and Hz(f) are x, y and z components of the field,

Tx(f) and Ty(f) are the "tipper" coefficients.

In the case of a horizontally homogeneous environment, Tx and Ty are equal to zero because Hz =0. They show certain anomalies only by the presence of changes in subsurface conductivity in the horizontal direction. The real parts of the coefficients correspond to tangents of tilt angles measured with a controlled source. The complex tensor [Tx, Ty] known as the "tipper" defines the vertical response to horizontal fields in the x and y directions respectively.

Tx and Ty are two unknown coefficients in one equation, and we therefore must combine two or more sets of measurements to solve them. To reduce effects of noise, multiple sets of measurements can be made, and the coefficients, which minimize the squared error in predicting the measured Z from X and Y, can be found. This leads to next formulas for estimating the coefficients.

$$\mathbf{Tx = ([HzHx^*]\ [HyHy^*] - [HzHy^*]\ [HyHx^*])\ /\ ([HxHx^*]\ [HyHy^*] - [HxHy^*]\ [HyHx^*]),} \qquad \mathbf{(2)}$$

and

$$\mathbf{Ty = ([HzHy^*]\ [HxHx^*] - [HzHx^*]\ [HxHy^*])\ /\ ([HxHx^*]\ [HyHy^*] - [HxHy^*]\ [HyHx^*]\ .} \qquad \mathbf{(3)}$$

Where

[HxHy*] (For example) denotes a sum of the product of Hx with the complex conjugate of Hy.

In practical processing algorithms, all numbers Hx, Hy and Hz can be obtained by applying the same digital band-pass filters to three incoming parallel data signals. FFT algorithms are also applicable. All sums like [HxHy*] can be calculated on the basis of a discrete time interval in the range from 0.1 to 1 sec or on a sliding time base.

Using platform attitude data in the EM data processing can be done at different stages of the signal processing. The most obvious idea is to transform parallel data from local coordinates of the platform into absolute geographical coordinates before the main signal processing procedure. Unfortunately, the proper algorithms of attitude data obtained, often require some post-processing algorithms such as using post-calculated accelerations based on GPS data etc. That is why it is preferable to treat x-y-z coordinates in formulas above in the local coordinate system of the platform and to recalculate resulting local tilt angles into a geographical or global coordinate system later, during the data post processing.

In weak field conditions where the level of the signal is comparable with input noise levels in preamplifiers, the bias in the estimated values of Tx and Ty caused by noise in the horizontal signals become substantial and can not be reduced by any averaging. This bias can be removed by the use of separate reference signals containing noise uncorrelated with noise in signals Hx and Hy. (Anav et al., 1976).

$$Tx = ([HzRx^*]\,[HyRy^*] - [HzRy^*]\,[HyRx^*]) / ([HxRx^*]\,[HyRy^*] - [HxRy^*]\,[HyRx^*]), \quad (4)$$

and

$$Ty = ([HzRy^*]\,[HxRx^*] - [HzRx^*]\,[HxRy^*]) / ([HxRx^*]\,[HyRy^*] - [HxRy^*]\,[HyRx^*]). \quad (5)$$

Where:

Rx is the reference field x component,
Ry is the reference field y component.

An additional two electromagnetic sensors, providing these reference signals can be placed at some distance away from the main x, y and z sensors. Currently, though, no additional remote-reference processing are applied to ZTEM data.

Numerical Modelling

In order to understand the airborne AFMAG responses to conductors for a variety of geological environments, EMIGMA^{TM} modelling code from PetRos EiKon (Toronto, ON) was obtained to conduct the formulated model studies.

Below are some of the modelling results from their study.

Modelling assumption:

The assumptions for the modelling are that:

3 components of the magnetic field are measured and they are processed according to:

$$Hz(f) = Tx(f)\,Hx(f) + Ty(f)\,Hy(f)$$

The vector (Tx,Ty) is usually referred to as the 'tipper' vector and is determined in the frequency domain through processing. This is normally done by determining transfer functions from an extended time series.

For the modelling exercise, the 3 components of the magnetic vector (Hx,Hy,and Hz) are modelled twice for 2 orthogonal polarizations of a plane wave source field and then the tipper is calculated from a matrix calculation using the results of the 2 source polarizations' models. For the 2D forward modelling results, the tipper vectors are shown as a function of frequency

Basic Model Response

For the initial models, we assume a thin plate-like model. The model is perpendicular to the flight direction. Initially, we will assume very long strike directions. From this quasi-2D model, there are 2 basic responses. The so-called TE response and the so-called TM response.

For the initial models, we will assume the strike is in the y (North) directions and the flight is in the x (East) direction Sensor heights are 30m above ground.

TE Mode: For the TE response, the electric field excitation flows along strike (current channelling) and the horizontal H field (Hx) flows perpendicular to strike thus causing induction through Faraday's law. The Hz response is generated both from channelling and induction.

TM Mode: For this response, the electric field excitation flows perpendicular to strike generating quasi-static charges on faces and the horizontal H field (Hx) flows parallel to strike. Since, the XZ face is very small for this model, little current is induced. The charges on the faces have a small dipole moment due to the thinness of the model.

For the rest of the models unless otherwise noted, the parameters used are:

Strike Length: 1km
Depth Extent: 1km
Conductance: 100S
Depth to Top: 10m
Background: Thin-overburden (10m), Resistive Basement (1000 Ohm-m)

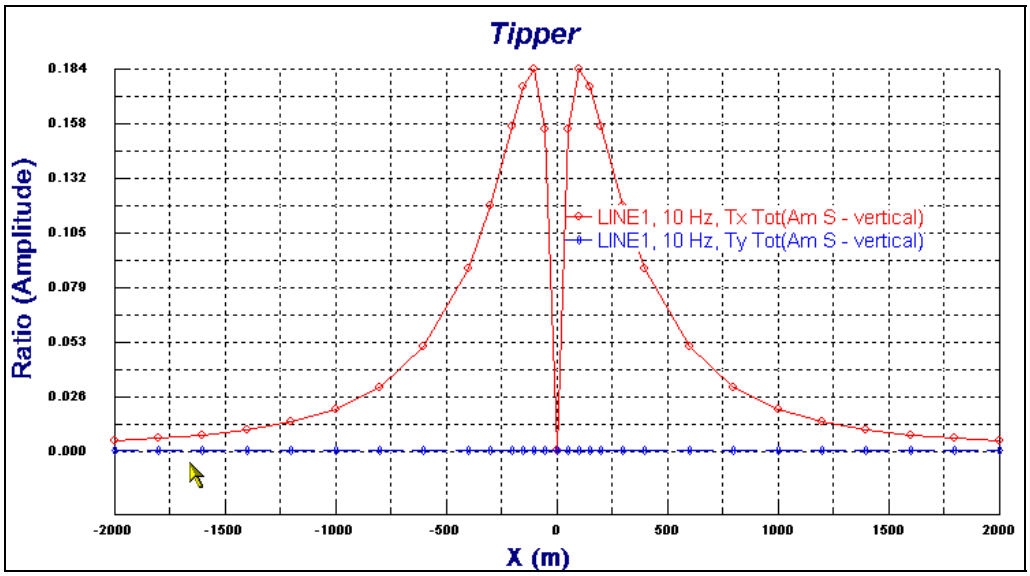


Figure D-1 – Calculated Tipper components at 10 Hz for above model parameters.

Figure D1 shows the Tipper (Tx,Ty) Amplitudes at 10Hz using a10Ωm overburden. Note small Ty (ie quasi-TM response)

Amplitude Response

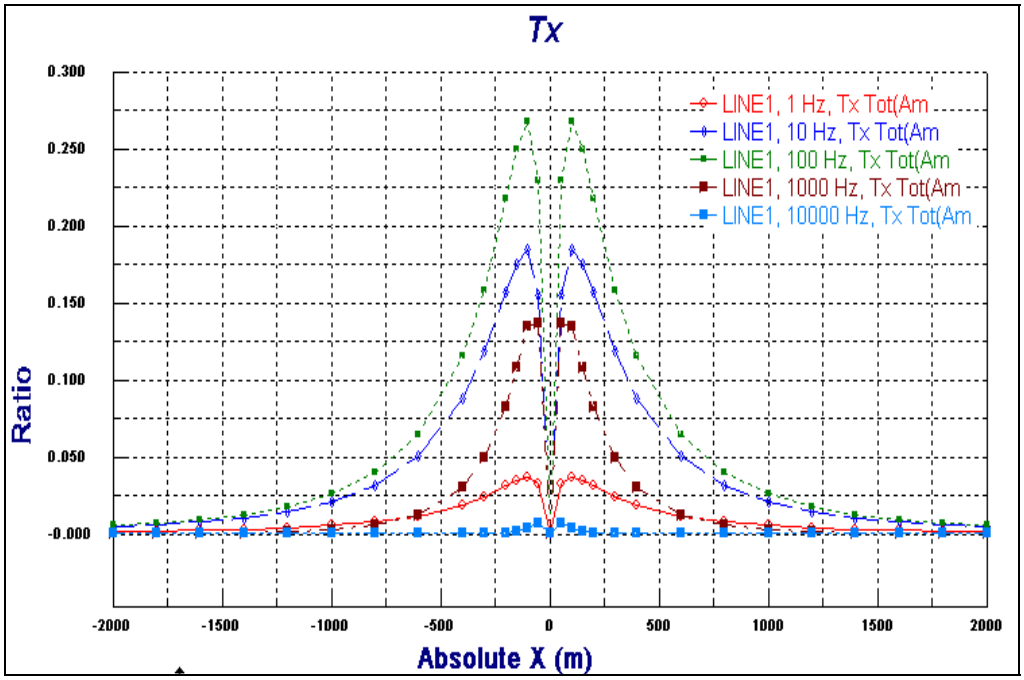


Figure D-2 – Calculated Tx component of the Tipper at various frequencies

The (Tx) response amplitude at 1,10,100,1000,10000 Hx. Peak amplitude at 100Hz

Inphase and Quadrature Response

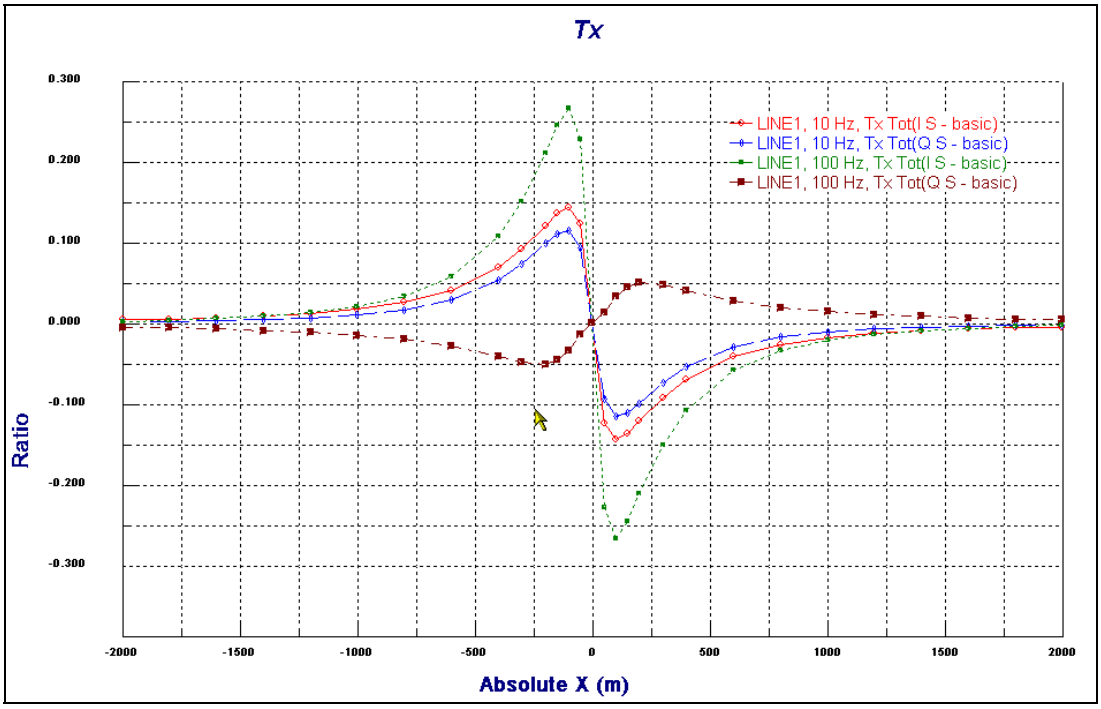


Figure D-3 – Calculated In-phase and Quadrature of the Tx component at various frequencies

Figure D-3 shows the In-phase and Quadrature response at 10 and 100Hz. Note the crossovers in the In-phase and Quadrature, and the phase reversal in the Quadrature responses from low to high frequencies.

Bo Lo, P.Eng, B.Sc. (Geophysics), Consultant
Geotech Ltd.
September, 2007

AFMAG Source Fields and ZTEM method[1]

AFMAG uses naturally occurring audio frequency magnetic fields as the source of the primary field signal, and therefore requires no transmitter (Ward, 1959). The primary fields resemble those from VLF except that they are lower frequency (tens & hundreds of Hz versus tens of kHz) and are usually not as strongly directionally polarized (Labson et al., 1985). These EM fields used in AFMAG are derived from world wide atmospheric thunderstorm activity, have the unique characteristic of being uniform, planar and horizontal, and also propagate vertically into the earth – to great depth, up to several km, as determined by the magnetotelluric (MT) skin depth (Vozoff, 1972), which is directly proportional to the ratio of the bedrock resistivity to the frequency (Figure D4).

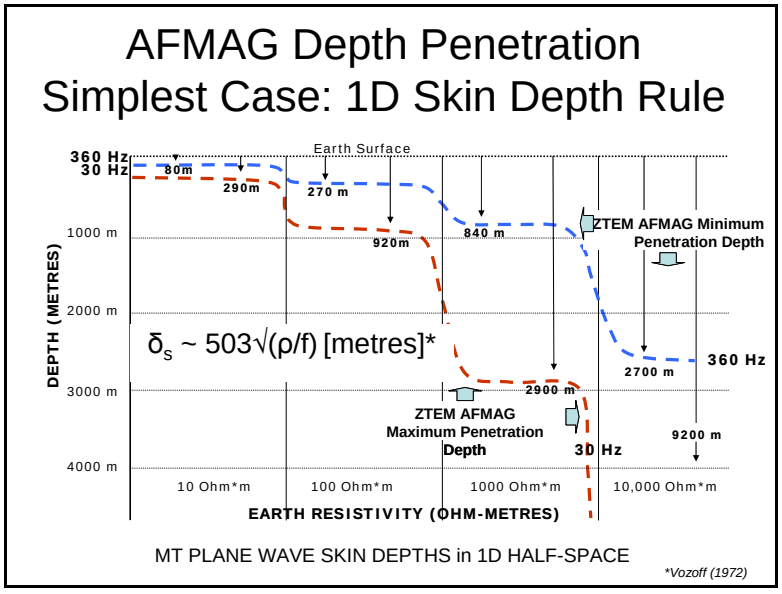


Figure D4: MT Skin Depth Penetrations for ZTEM in 30-360Hz and 10-1000 ohm resistivity

At the frequencies used for ZTEM, the penetration depths likely range between approx. 600m to 2km in this region (approx. 1k ohm-m avg. resistivity assumed), according to the following equation for the Bostick skin depth $\delta_B = 356 * \sqrt{(\rho / f)}$ metres (Bostick, 1977), which is considered appropriate as a rule of thumb equivalent depth estimate.

The other unique aspect of AFMAG fields is that they react to relative contrasts in the resistivity, and therefore do not depend on the absolute conductance, as measured using inductive EM systems, such as VTEM. Hence poorly, conductive targets, such as alteration zones and fault zones can be mapped, as well as higher conductance features, like graphitic units. Conversely, resistive targets can also be detected using AFMAG– provided they are of a sufficient size and contrast to produce a vertical field anomaly. Indeed resistors produce reversed anomalies relative to conductive features. Hence AFMAG can be effective as an

[1] From: Legault, J.M., Kumar, H., and Milicevic, B. (2009): ZTEM tipper AFMAG and 2D inversion results over an unconformity uranium target in northern Saskatchewan, Expanded Abstract submitted to Society of Exploration Geophysics SEG conference, Houston, Tx, Nov-2009, 5 pp.

all-round resistivity mapping tool, making it unique among airborne EM methods. A series of 2D synthetic models that illustrate these aspects have been created using the 2D forward MT modelling code of Wannamaker et al. (1987) and are presented in figures D5-D7.

The tipper from a single site contains information on the dimensionality of the subsurface (Pedersen, 1998), for example, in a horizontally stratified or 1D earth, $\boldsymbol{T}$=0 and as such H_Z is absent. For a 2D earth with the y-axis along strike, T_Y=0 and $H_Z = T_X * H_X$. In 3D earths, both T_X and T_Y will be non-zero. H_Z is therefore only present, as a secondary field, due to a lateral resistivity contrast, whereas the horizontal H_X and H_Y fields are a mixture of secondary and primary fields (Stodt et al., 1981). But, as an approximation, as in the telluric-magnetotelluric method (T-MT; Hermance and Thayer, 1975) used by distributed MT acquisition systems, the horizontal fields are assumed to be practically uniform, which is particularly useful for rapid reconnaissance mapping purposes. By measuring the vertical magnetic field H_X, using a mobile receiver and the orthogonal horizontal H_X and H_Y fields at a fixed base station reference site, ZTEM is a direct adaptation of this technique for airborne AFMAG surveying.

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Geotech Ltd.

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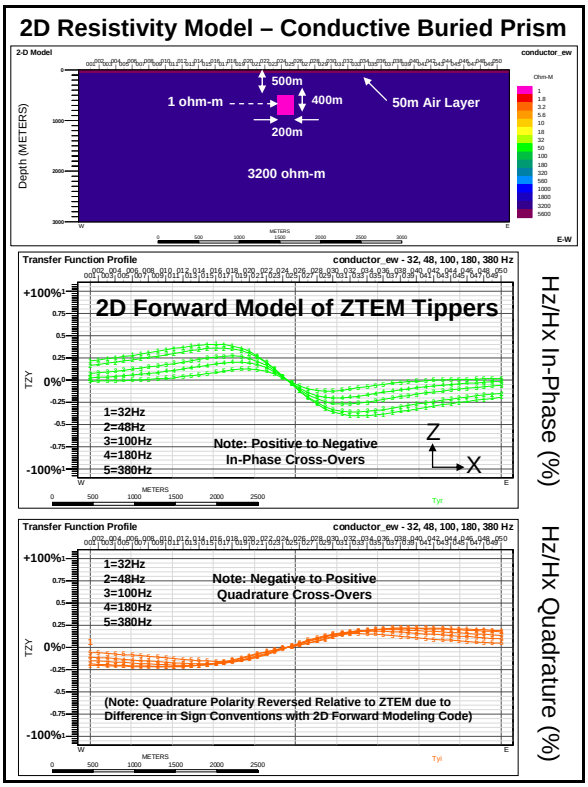

Figure D5: 2D synthetic forward model Tipper responses (Tzy) for conductive brick model.

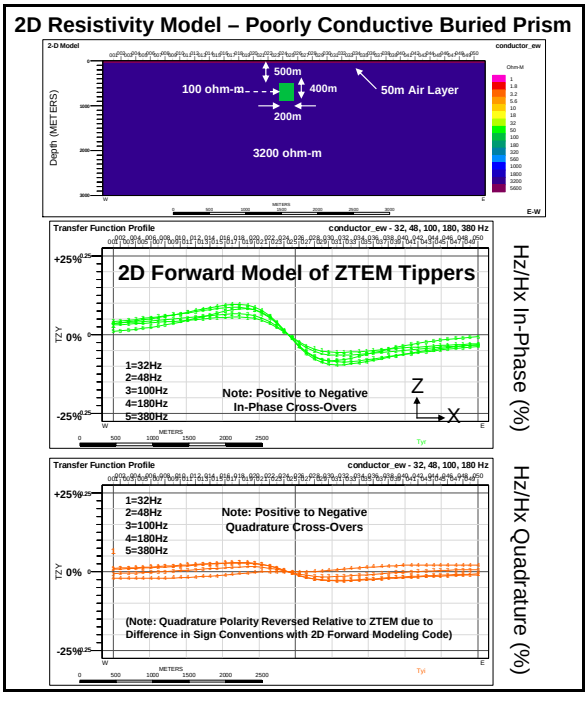

Figure D6: 2D synthetic forward model Tipper response (Tzx) for poorly conductive brick model.

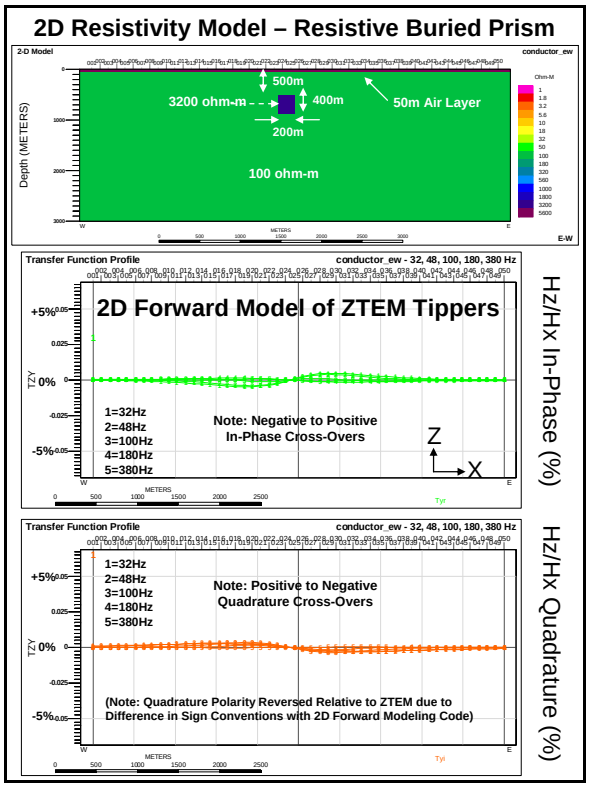

Figure D7: 2D synthetic forward model Tipper response (Tzx) for resistive brick model.

APPENDIX E

ZTEM (AIRBORNE AFMAG) TESTS OVER UNCONFORMITY URANIUM DEPOSITS[6]

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Key Words: ZTEM, AFMAG, electromagnetic, airborne, uranium, Athabasca.

INTRODUCTION

A series of demonstration tests were conducted using the ZTEM, airborne AFMAG system over deep targets in the Athabasca Basin of Saskatchewan, Canada. These tests were conducted in mid-2008 and were flown to test ZTEM's ability to detect large conductive targets at depth; deeper than conventional airborne EM methods. Data are presented over areas where the conductors are located 450-600 metres beneath the surface. As well, a case of ZTEM following the plunge of a conductor to over 800 metres depth is shown.

BACKGROUND

The ZTEM system is the latest implementation of an airborne AFMAG system first commercialized in late 2006. ZTEM uses a large, 8 metre diameter airborne air core coil, slung from a helicopter, to measure the vertical component of the AFMAG signal. Two 4 metre square coils are deployed on the ground to measure the horizontal field. The ZTEM system has flown successful demonstration surveys over porphyry copper deposits in the southwest USA (Zang et al., 2008).

ZTEM was tested in the Athabasca Basin in Canada in May of 2008 to determine its depth of investigation and to determine its suitability for mapping deep conductors in the crystalline basement. Over 30% of the world's U3O8 is mined in the Athabasca Basin from unconformity uranium deposits. Unconformity uranium deposits of the Athabasca Basin are often associated with conductors located in the crystalline basement. The search for economic uranium deposits is moving to areas of the basin which are deeper and beyond the detection limits of modern airborne instrumentation. This creates the requirement for a system which can detect conductivity past the detection limits of modern traditional EM systems. This was the motivation behind the field trials of the ZTEM system in the Athabasca Basin. Several areas where known deep conductors (450-600m+) were located were flown. Also, a test survey block in the northern part of the basin was able to trace a deep and plunging conductor to depths that no other airborne EM system has been able to achieve.

ATHABASCA BASIN GEOLOGY

The high-grade uranium deposits within the Athabasca Basin are associated with the unconformity between the essentially flat-lying Proterozoic Athabasca Group sandstones and the underlying Archean-Paleoproterozoic metamorphic and igneous basement rocks. The deposits occupy a range of positions from wholly basement-hosted to wholly sediment-hosted, at structurally favourable sites in the interface between the deeply weathered basement and overlying sediments of the Athabasca Basin (Ruzicka, 1997). The locations of These deposits are lithologically and structurally controlled by the sub-Athabasca unconformity and basement faults and fracture zones, which are localized in graphitic pelitic gneisses that may flank structurally competent Archean granitoid domes (Quirt, 1989).

In general, most of the known important deposits tend to occur within a few tens to a few hundred metres of the unconformity and within 500 m of the current ground surface. This may be more of a limitation of exploration techniques. There is no reason to believe that the distribution of the deposits is dependent on the modern day depth of

[6] Extended abstract submitted to 20TH ASEG International Geophysical Conference & Exhibition, Adelaide, AU, 22-26 Feb, 2009.

burial.
Empirically, the geophysical exploration for unconformity type uranium targets have been to search for large basement structures which post date the sandstone deposition of the basement (Matthews et. al, 1997). All the deposits located so far are associated with fault structures associated with a graphitic conductive basement. An alteration zone of clay silicification and enrichment around the deposits probably leads to magnetite destruction causing the magnetic low observed around the deposits. The clay alteration should give rise to a resistivity low signature about the deposits. The low conductivity of the clay alteration makes it a difficult target for airborne EM if it is buried at significant depth.

ZTEM INSTRUMENTATION AND PRESENTATION

ZTEM is an airborne AFMAG system introduced by Geotech Ltd. of Canada in early 2007 (Lo et al., 2008). In a ZTEM survey, a single vertical dipole air-core coil is flown over the survey area in a grid pattern similar to other airborne electromagnetic surveys. Two orthogonal, air-core, horizontal axis coils placed close to the survey site measures the horizontal EM fields for reference. A GPS array on the airborne coil monitors its attitude for post-flight corrections.

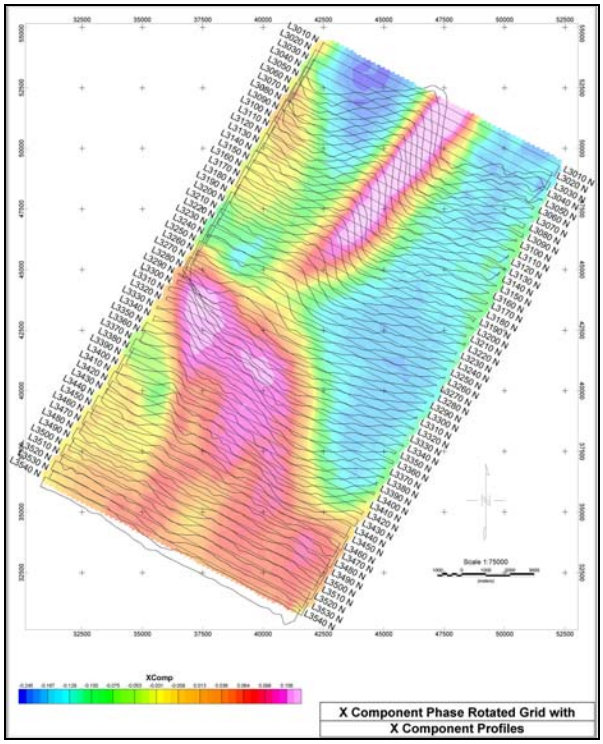

Figure 1 – Stacked profiles of the x-component Tipper over the gridded values of the phase rotated x-component data. Note that the cross-overs in the profiles are now peaks on the image.

As the source field is assumed to be far away, the excitation of the ground is more or less uniform. For large structures, the signal fall-off will be much slower than from a dipole source, such as those energized by traditional airborne systems. With the ZTEM system being less susceptible to terrain clearance, the planned ground clearance height is higher and the terrain drape is looser as compared to standard helicopter EM surveys.

The two Tippers obtained from the relationship between the vertical airborne coil and the two ground coils have a cross-over over a steeply dipping, plate-like body. The cross-overs can be made into local maxima via a 90 degree phase rotation which allows for easier interpretation of the gridded values. Figure 1 is an example of this transformation.

To present the data of both Tippers as one image, we calculate a parameter termed the DT which is the horizontal divergence of the two Tippers, much in the same manner as the "peaker" parameter in VLF (Pedersen, 1998). The DT is typically plotted with an inverted colour bar as it is negative over a steeply dipping thin body.

ZTEM RESULTS – NORTHERN ATHABASCA BASIN

Figure 2 shows gridded values from a number of ZTEM lines over an area where the sedimentary cover is approximately 450-600 metres thick. A number of traditional EM systems have also been flown over this block. While they were able to detect conductors, the resolution of the conductive features is not nearly as detailed as the information provided by ZTEM.

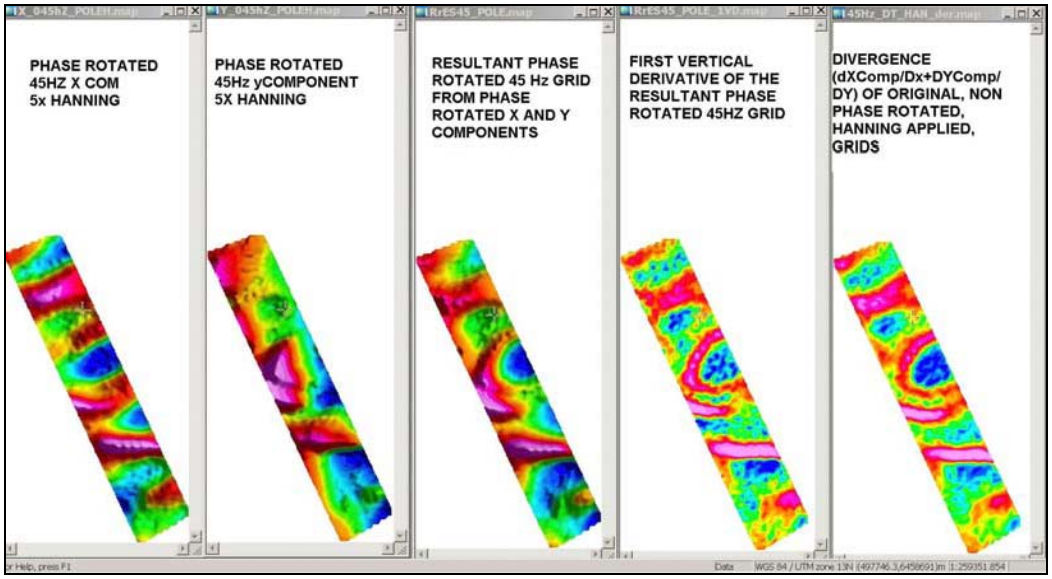

Figure 2 – ZTEM results over an area of 450-600 metre thick sedimentary cover.

Figure 3, from another area, shows the data from one of the larger blocks that was flown. It is a 3D composite image of the DT at various frequencies plotted at the equivalent skin depth assuming a 1,000 ohm-m average resistivity.

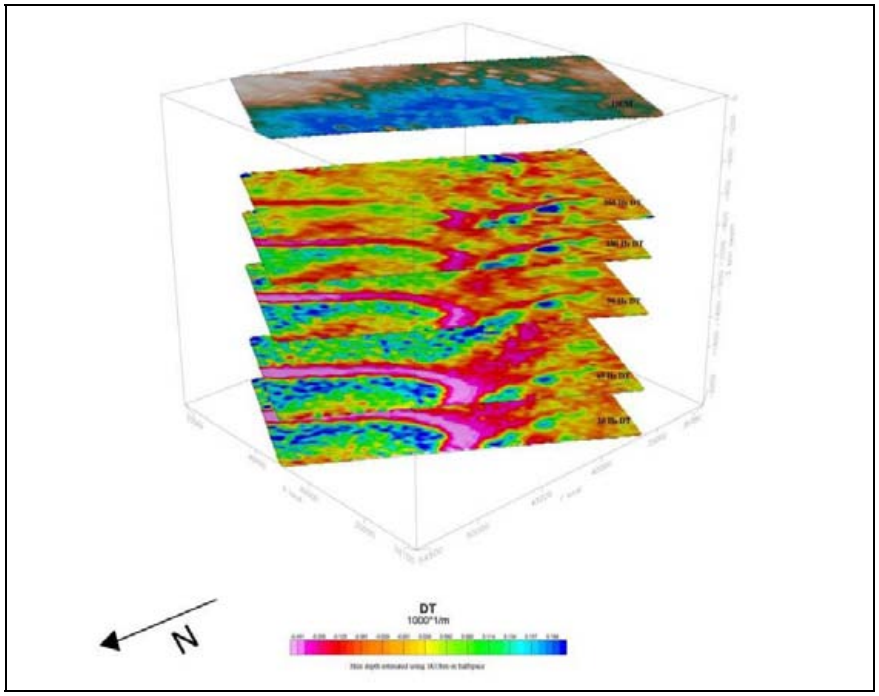

Figure 3 - Perspective view of DT's of different frequencies plotted at the skin depth (using a 1,000 ohm-m Earth.

The data in Figure 3 come from a survey over the north rim of the Athabasca Basin. The sandstone cover is about 500m on the left hand side of the image, and progressively getting deeper to the right. It is about 700m in the middle part of the image and over 800 metres thick on the right middle portion where exploration drilling is concentrated. Starting in the middle left and trending to the right of the image, there is a known graphitic shear.

In the uppermost (600m) "depth slice", Figure 3 shows a linear conductive feature that progressively weakens as one moves to the right until it is no longer seen. This is interpreted to be due to the graphitic shear conductor plunging deeper past the depth of investigation of the 360 Hz data. The lower frequencies penetrate more into the sedimentary cover that is deeper towards the right. DT's of decreasing frequency show the linear conductive feature extending more and more to the right. The feature also strengthens/sharpens into a synformal shape with lower frequencies. This fits with what the known geology of a plunging conductor at depth is doing.

At the nose of the fold, in the right third of the images, we also see another, broader anomalous zone that trends towards the back of the image. At this location, two radioactive springs are situated. These spring waters which are anomalously high in uranium and radon may reflect the upward migration of deep waters along faults, suggesting structural targets in areas where basinal waters may have tapped a radioactive source. This broad DT trend might be the plunge of the fold axis that is aligned away from the front of the image. An anomaly along this trend, at the highest frequency, that steadily grows with each decreasing frequency can be seen. This might represent an alteration zone in the sandstone that is detected at the shallowest depth. By about the 90Hz DT depth slice or so, we are possibly in the deeper basement and into a basement graphitic unit.

CONCLUSIONS

A number of successful ZTEM tests were conducted over the Athabasca Basin. The tests demonstrated that ZTEM can easily detect conductivity to 800 metres beneath relatively resistive sedimentary cover. Assuming a 1,000 ohm-metre

resistivity, the skin depth of the 30 Hz data is approximately 2,000 metres. The 30 Hz data presented have good signal to noise ratios indicating a deep depth of exploration. The observation that ZTEM may be detecting the clay alteration above the crystalline basement is a significant advantage for exploration of unconformity uranium deposits.

More demonstration surveys are planned in the Athabasca Basin later this year. And more target types for testing are also planned.

ACKNOWLEDGEMENTS

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APPENDIX F

2D ZTEM Inversion Results
for
Royal Sapphire Corp
Lorn Block
Gold Bridge, British Columbia

Job: 11031

By
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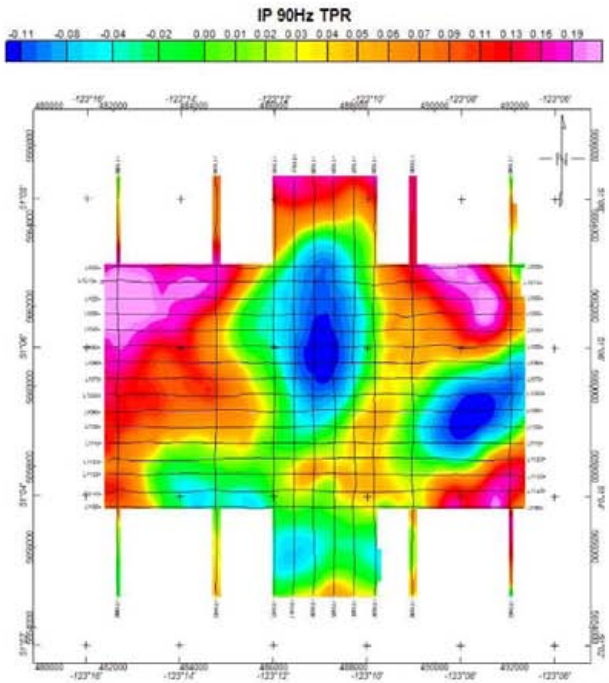
July, 2011

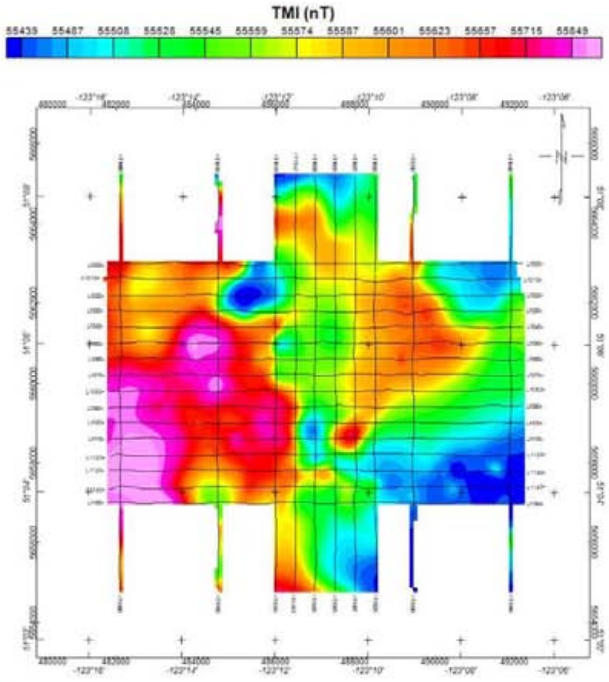
Summary

- Geotech Av2Dtopo program was used to perform the inversion of ZTEM data with topography and receiver altitude effects considered. While we collected both in-line (Tzx) and cross-line (Tzy) tippers, inversion makes use only of Tzx (In-phase and Quadrature).
- Total of 2 lines of data were inverted with starting model resistivity 1000 Ω.m
- Slide 3 show the location of the survey lines over IP 90Hz TPR (left) and TMI (right) grids.
- Following slides show the inversion results, the inversion parameters and the location of each line over IP 90Hz DT grid.

Lorn Block



Line Locations over IP 90 Hz TPR Image



Line Locations over TMI Image

Scale 1:40000

500 0 500 1000 1500 2000 2500

(meters)

WGS 84 / UTM zone 10N

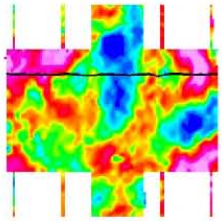
GEOTECH LTD.

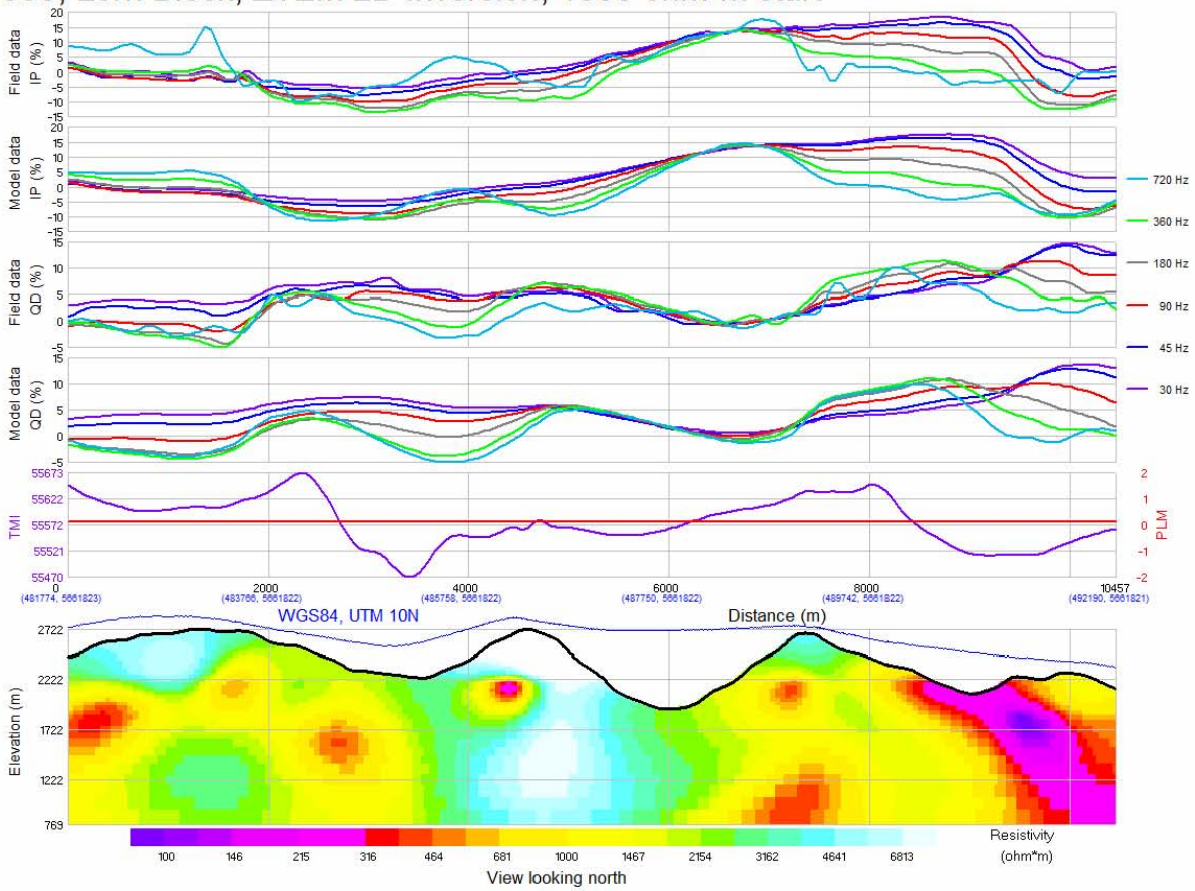
L1030, Lorn Block, ZTEM 2D Inversion, 1000 ohm-m start

2D INVERSION PARAMETERS

Inversion code: Geotech AV2DTOPO
Model Mesh: 440 wide x 112 vertical,
Average cell width: 27.37 m
2 cells between sites
Input Data: In-Phase & Quadrature,
Tzx In-line (only)
Average sampling rate: 5.690 points,
Total data points: 2304
Frequency (Hz): 30 45 90 180 360 720
Input error(%): 1.66 1.66 1.66 1.66 1.66 1.66
Half-space resistivity: 1000 ohm-m,
Output error: 0.994 RMS in 4 iterations

Flight Path of Line 1030 over IP 90Hz DT image





Royal Sapphire Corp Lorn Block Gold Bridge, British Columbia
Geotech ZTEM System Resistivity-Depth Image Project 11060, Line 1030 Flight 3, 2011/06/03
Flown and processed by Geotech Ltd. 245 Industrial Parkway North Aurora, Ontario, Canada L4G 4C4 www.geotech.ca
2011/8/2

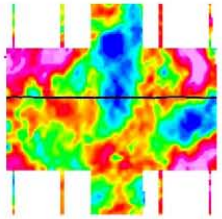
L1060, Lorn Block, ZTEM 2D Inversion, 1000 ohm-m start

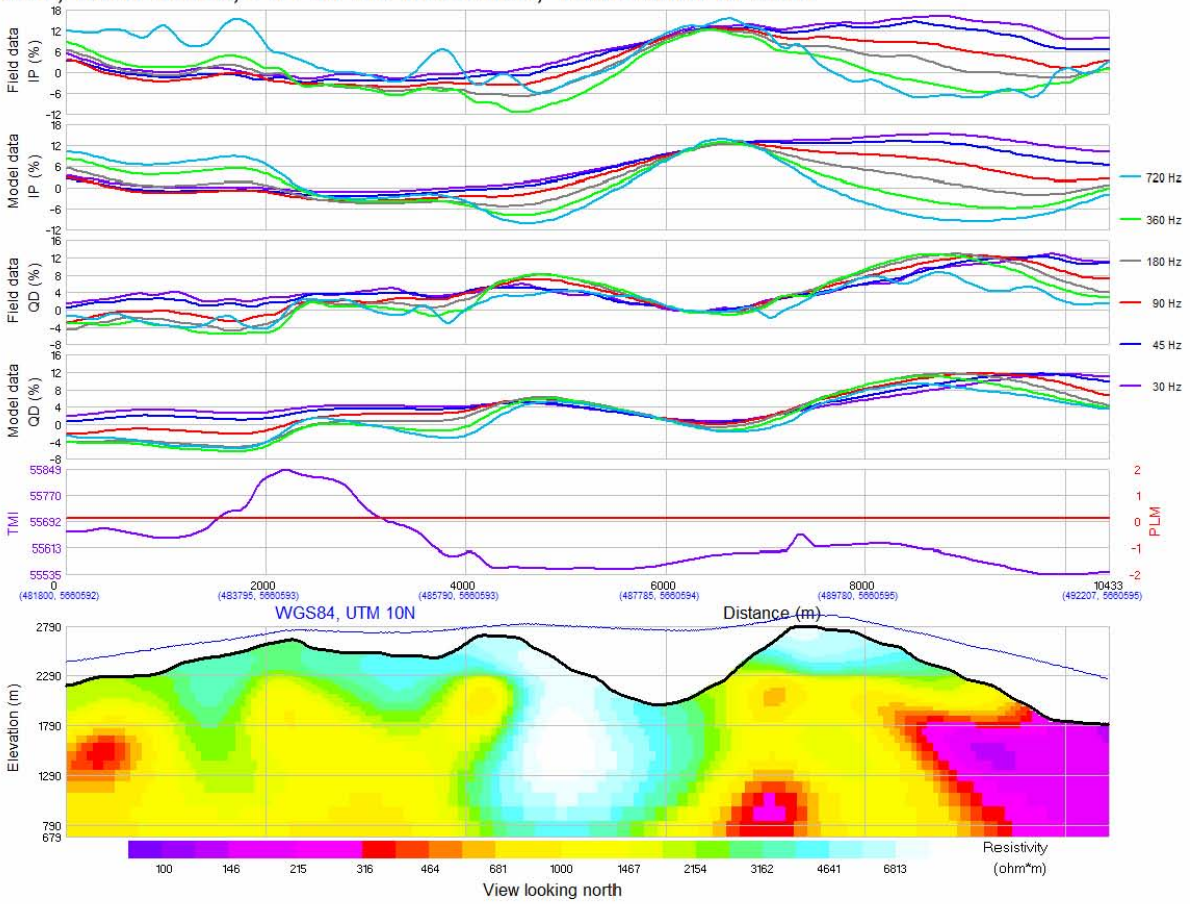
GEOTECH LTD.

2D INVERSION PARAMETERS

Inversion code: Geotech AV2DTOPO
Model Mesh: 440 wide x 112 vertical,
Average cell width: 27.30 m
2 cells between sites
Input Data: In-Phase & Quadrature,
Tzx In-line (only)
Average sampling rate: 5.380 points,
Total data points: 2304
Frequency (Hz): 30 45 90 180 360 720
Input error(%): 1.44 1.44 1.44 1.44 1.44 1.44
Half-space resistivity: 1000 ohm-m,
Output error: 0.998 RMS in 4 iterations

Flight Path of Line 1060 over IP 90Hz DT image





Royal Sapphire Corp Lorn Block Gold Bridge, British Columbia
Geotech ZTEM System Resistivity-Depth Image Project 11060, Line 1060 Flight 3, 2011/06/03
Flown and processed by Geotech Ltd. 245 Industrial Parkway North Aurora, Ontario, Canada L4G 4C4 www.geotech.ca
2011/8/2

GEOTECH LTD.

SURVEY SPECIFICATIONS:

Survey Flying Date: May 31st - June 3rd 2011
Survey Operations Base: Gold Bridge, BC
Nominal Survey Line Spacing: 400 Meters
Nominal Survey Line Direction: N 90° E / N 270° E
Helicopter Mean Terrain Clearance: 351 metres
Mean Ground Air Speed: 25 metres/sec
ZTEM airborne coil: towed at a mean distance of 70 m below the helicopter
Airborne Magnetometer bird: towed at a mean distance of 55 m below the helicopter

HELICOPTER SPECIFICATIONS

Helicopter Type: Aerospatiale A-Star 350 B3 (C-GABH)

AIRBORNE INSTRUMENTATION

Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
GPS Receivers Location: One on the helicopter, three on EM coil
Radar Altimeter: Terra TRA 3000/TRI 40
Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM
Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
Coil dimensions: 7.4 metres diameter
Coil orientation: Vertical Dipole
Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER
Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION
Magnetometer: GEOMETRICS
Base Station Location: (50°52.5018' N, 122°51.6707' W)

EM BASE STATION
Two orthogonal square coils
Coil dimensions: 3.5 metres each side
Coil orientation: Horizontal Dipole
Base Station Location: (50°93.8229' N, 122°91.6487' W)

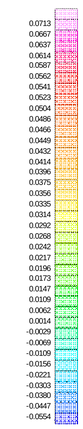
PROCESSING SUMMARY

MAGNETICS:
Diurnal Subtraction, microlevelling

ZTEM:
Frequencies extracted: 30, 45, 90, 180, 360, 720Hz.
Sampling rate: 0.4 sec.
Rotation of the Inphase part of the inline and orthogonal components (Z/Xloc and Z/Yloc)on to UTM Eastings and Northings.
Attitude correction applied, (calculated from 3 GPS recievers installed on airborne coil).
DIV(Tilt) calculated: dXcomp/dX+dYcomp/dY for all 6 frequencies.
Phase Rotated Grids (90 deg) calculated from each individual X and Y component grids, for each individual frequency.

MAP PROJECTION

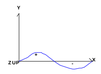
Datum: WGS 84
Projection: Universal Transverse Mercator
Central Meridian: 123°W (Zone 10N)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000mN/0m
Major Axis: 6378137.0
Eccentricity: 0.08181919084
NTS: 092O03



Quadrature Frequencies
0.01 units per mm
Profile Base 0

30 Hz
45 Hz
90 Hz
180 Hz
360 Hz

90Hz Tzy QD



TOPOGRAPHIC LEGEND:

Buildings
Contours
Rivers / Streams
Lakes / Ponds
Glaciers
Claims

Scale 1:20000

250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

The topographic data base was derived from 1:50,000 NRC (Natural Resources Canada) NTDB data
Background shading is derived from NASA SRTM(Shuttle Radar Topographic Mission)data
Inset data derived from Geocommunities 1:250,000 Canadian National Topographic database
Mineral Dispositions are derived from the British Columbia Ministyof Energyand Mines
Geogratis (www.geogratis.ca)/Geocommunities (www.geocomm.com)
Claims (http://www.empr.gov.bc.ca)

Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System

Tzy (Cross-Line) Quadrature Profiles over 90Hz Phase Rotated Quadrature Tzy Grid

For the East to West lines

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project # 11060

GEOTECH LTD.

SURVEY SPECIFICATIONS:

Survey Flying Date: May 31st - June 3rd 2011
Survey Operations Base: Gold Bridge, BC
Nominal Survey Line Spacing: 400 Meters
Nominal Survey Line Direction: N 90° E / N 270° E
Helicopter Mean Terrain Clearance: 351 metres
Mean Ground Air Speed: 25 metres/sec
ZTEM airborne coil: towed at a mean distance of 70 m below the helicopter
Airborne Magnetometer bird: towed at a mean distance of 55 m below the helicopter

HELICOPTER SPECIFICATIONS

Helicopter Type: Aerospatiale A-Star 350 B3 (C-GABH)

AIRBORNE INSTRUMENTATION

Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
GPS Receivers Location: One on the helicopter, three on EM coil
Radar Altimeter: Terra TRA 3000/TRI 40
Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM
Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
Coil dimensions: 7.4 metres diameter
Coil orientation: Vertical Dipole
Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER
Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION
Magnetometer: GEOMETRICS
Base Station Location: (50°52.5018' N, 122°51.6707' W)

EM BASE STATION
Two orthogonal square coils
Coil dimensions: 3.5 metres each side
Coil orientation: Horizontal Dipole
Base Station Location: (50°93.8229' N, 122°91.6487' W)

PROCESSING SUMMARY

MAGNETICS:
Diurnal Subtraction, microlevelling

ZTEM:
Frequencies extracted: 30, 45, 90, 180, 360, 720Hz.
Sampling rate: 0.4 sec.
Rotation of the inphase part of the inline and orthogonal components (Z/Xloc and Z/Yloc)on to UTM Eastings and Northings.
Attitude correction applied, (calculated from 3 GPS recievers installed on airborne coil).
DIV(Tilt) calculated: dXcompdX+dYcompdY for all 6 frequencies.
Phase Rotated Grids (90 deg) calculated from each individual X and Y component grids, for each individual frequency.

MAP PROJECTION

Datum: WGS 84
Projection: Universal Transverse Mercator
Central Meridian: 123°W (Zone 10N)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m
Major Axis: 6378137.0
Eccentricity: 0.08181919084
NTS: 092O03

In-Phase Frequencies
0.01 units per mm
Profile Base 0

30 Hz
45 Hz
90 Hz
180 Hz
360 Hz

0.0387
0.0254
0.0129
0.0021
-0.0064
-0.0140
-0.0215
-0.0273
-0.0319
-0.0368
-0.0406
-0.0441
-0.0469
-0.0500
-0.0529
-0.0557
-0.0582
-0.0607
-0.0631
-0.0654
-0.0678
-0.0702
-0.0725
-0.0747
-0.0771
-0.0792
-0.0812
-0.0835
-0.0872
-0.0913
-0.0957
-0.1005
-0.1051
-0.1099
-0.1145
-0.1194
-0.1249
-0.1298

90Hz Tzy IP

TOPOGRAPHIC LEGEND:

Buildings
Contours
Rivers / Streams
Lakes / Ponds
Glaciers
Claims

Scale 1:20000

250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

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Background shading is derived from NASA SRTM(Shuttle Radar Topographic Mission)data
Inset data derived from Geocommunities 1:250,000 Canadian National Topographic database
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Claims (http://www.empr.gov.bc.ca)

Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System

Tzy (Cross-Line) In-Phase Profiles over 90Hz Phase Rotated In-Phase Tzy Grid

For the North to South lines

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project # 11060

GEOTECH LTD.

SURVEY SPECIFICATIONS:

Survey Flying Date: May 31st - June 3rd 2011
Survey Operations Base: Gold Bridge, BC
Nominal Survey Line Spacing: 400 Meters
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Helicopter Mean Terrain Clearance: 351 metres
Mean Ground Air Speed: 25 metres/sec
ZTEM airborne coil: towed at a mean distance of 70 m below the helicopter
Airborne Magnetometer bird: towed at a mean distance of 55 m below the helicopter

HELICOPTER SPECIFICATIONS

Helicopter Type: Aerospatiale A-Star 350 B3 (C-GABH)

AIRBORNE INSTRUMENTATION

Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
GPS Receivers Location: One on the helicopter, three on EM coil
Radar Altimeter: Terra TRA 3000/TRI 40
Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM
Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
Coil dimensions: 7.4 metres diameter
Coil orientation: Vertical Dipole
Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER
Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION
Magnetometer: GEOMETRICS
Base Station Location: (50°52.5018' N, 122°51.6707' W)

EM BASE STATION
Two orthogonal square coils
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PROCESSING SUMMARY

MAGNETICS:
Diurnal Subtraction, microlevelling

ZTEM:
Frequencies extracted: 30, 45, 90, 180, 360, 720Hz.
Sampling rate: 0.4 sec.
Rotation of the inphase part of the inline and orthogonal components (Z/X0oc and Z/Y0oc)on to UTM Eastings and Northings.
Attitude correction applied, (calculated from 3 GPS recievers installed on airborne coil).
DIV(Tilt) calculated: dXcompdX+dYcompdY for all 6 frequencies.
Phase Rotated Grids: (90 deg) calculated from each individual X and Y component grids, for each individual frequency.

MAP PROJECTION

Datum: WGS 84
Projection: Universal Transverse Mercator
Central Meridian: 123°W (Zone 10N)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m
Major Axis: 6378137.0
Eccentricity: 0.08181919084
NTS: 092O03

In-Phase Frequencies
0.01 units per mm
Profile Base 0

30 Hz
45 Hz
90 Hz
180 Hz
360 Hz

0.1959
0.1664
0.1317
0.0911
0.0675
0.0553
0.0466
0.0406
0.0354
0.0310
0.0270
0.0234
0.0200
0.0164
0.0127
0.0095
0.0061
0.0028
-0.0005
-0.0033
-0.0062
-0.0091
-0.0122
-0.0148
-0.0172
-0.0197
-0.0230
-0.0259
-0.0293
-0.0332
-0.0373
-0.0420
-0.0471
-0.0545
-0.0761
-0.1085
-0.1426
-0.1744

90Hz Tzy IP

TOPOGRAPHIC LEGEND:

Buildings
Contours
Rivers / Streams
Lakes / Ponds
Glaciers
Claims

Scale 1:20000

250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

The topographic database was derived from 1:50,000 NRC (Natural Resources Canada) NTDB data
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Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System

Tzy (Cross-Line) In-Phase Profiles over 90Hz Phase Rotated In-Phase Tzy Grid

For the East to West lines

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www.geotech.ca

July 2011

Geotech Project # 11060

GEOTECH LTD.

SURVEY SPECIFICATIONS:

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HELICOPTER SPECIFICATIONS

Helicopter Type: Aerospatiale A-Star 350 B3 (C-GABH)

AIRBORNE INSTRUMENTATION

Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
GPS Receivers Location: One on the helicopter, three on EM coil
Radar Altimeter: Terra TRA 3000/TRI 40
Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM
Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
Coil dimensions: 7.4 metres diameter
Coil orientation: Vertical Dipole
Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER
Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION
Magnetometer: GEOMETRICS
Base Station Location: (50°52.5018' N, 122°51.6707' W)

EM BASE STATION
Two orthogonal square coils
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PROCESSING SUMMARY

MAGNETICS:
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ZTEM:
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Major Axis: 6378137.0
Eccentricity: 0.08181919084
NTS: 092O03

Quadrature Frequencies
0.01 units per mm
Profile Base 0

30 Hz
45 Hz
90 Hz
180 Hz
360 Hz

0.0870
0.0713
0.0625
0.0580
0.0560
0.0545
0.0530
0.0517
0.0501
0.0485
0.0470
0.0454
0.0437
0.0418
0.0398
0.0379
0.0360
0.0348
0.0336
0.0319
0.0297
0.0267
0.0235
0.0201
0.0164
0.0131
0.0098
0.0060
0.0025
-0.0016
-0.0050
-0.0080
-0.0118
-0.0166
-0.0219
-0.0288
-0.0383
-0.0472

90Hz Tzx QD

TOPOGRAPHIC LEGEND:

Buildings
Contours
Rivers / Streams
Lakes / Ponds
Glaciers
Claims

Scale 1:20000

250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

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Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System

Tzx (In-Line) Quadrature Profiles over 90Hz Phase Rotated Quadrature Tzx Grid

For the North to South lines

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project# 11060

GEOTECH LTD.

SURVEY SPECIFICATIONS:

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Helicopter Type: Aerospatiale A-Star 350 B3 (C-GABH)

AIRBORNE INSTRUMENTATION

Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
GPS Receivers Location: One on the helicopter, three on EM coil
Radar Altimeter: Terra TRA 3000/TRI 40
Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM
Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
Coil dimensions: 7.4 metres diameter
Coil orientation: Vertical Dipole
Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER
Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION
Magnetometer: GEOMETRICS
Base Station Location: (50°52.5018' N, 122°51.6703' W)

EM BASE STATION
Two orthogonal square coils
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PROCESSING SUMMARY

MAGNETICS:
Diurnal Subtraction, microlevelling

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MAP PROJECTION

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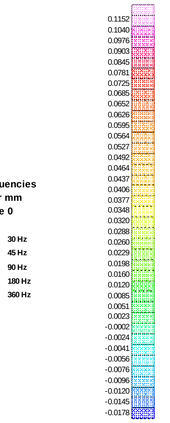
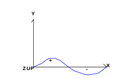
NTS: 092O03



Quadrature Frequencies
0.01 units per mm
Profile Base 0

30 Hz
45 Hz
90 Hz
180 Hz
360 Hz

90Hz Tzx QD



TOPOGRAPHIC LEGEND:

Buildings
Contours
Rivers / Streams
Lakes / Ponds
Glaciers
Claims

Scale 1:20000
250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

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Digitizing rate: 2000Hz

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Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

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MAP PROJECTION

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Major Axis: 6378137.0
Eccentricity: 0.08181919084
NTS: 092O03

In-Phase Frequencies
0.01 units per mm
Profile Base 0

30 Hz
45 Hz
90 Hz
180 Hz
360 Hz

0.1249
0.1112
0.0992
0.0882
0.0796
0.0696
0.0624
0.0568
0.0515
0.0464
0.0419
0.0377
0.0337
0.0295
0.0251
0.0210
0.0173
0.0132
0.0091
0.0051
0.0019
-0.0017
-0.0049
-0.0081
-0.0113
-0.0146
-0.0175
-0.0205
-0.0235
-0.0261
-0.0287
-0.0323
-0.0364
-0.0400
-0.0442
-0.0502
-0.0573
-0.0661

90Hz Tzx IP

TOPOGRAPHIC LEGEND:

Buildings
Contours
Rivers / Streams
Lakes / Ponds
Glaciers
Claims

Scale 1:20000

250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

The topographic data base was derived from 1:50,000 NRC (Natural Resources Canada) NTDB data
Background shading is derived from NASA SRTM(Shuttle RadarTopographic Mission)data
Inset data derived from Geocommunities 1:250,000 Canadian National Topographic database
Mineral Dispositions are derived from the British Columbia Ministryof Energyand Mines
Geogratis (www.geogratis.ca)Geocommunities (www.geocomm.com)
Claims (http://www.empr.gov.bc.ca)

Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System

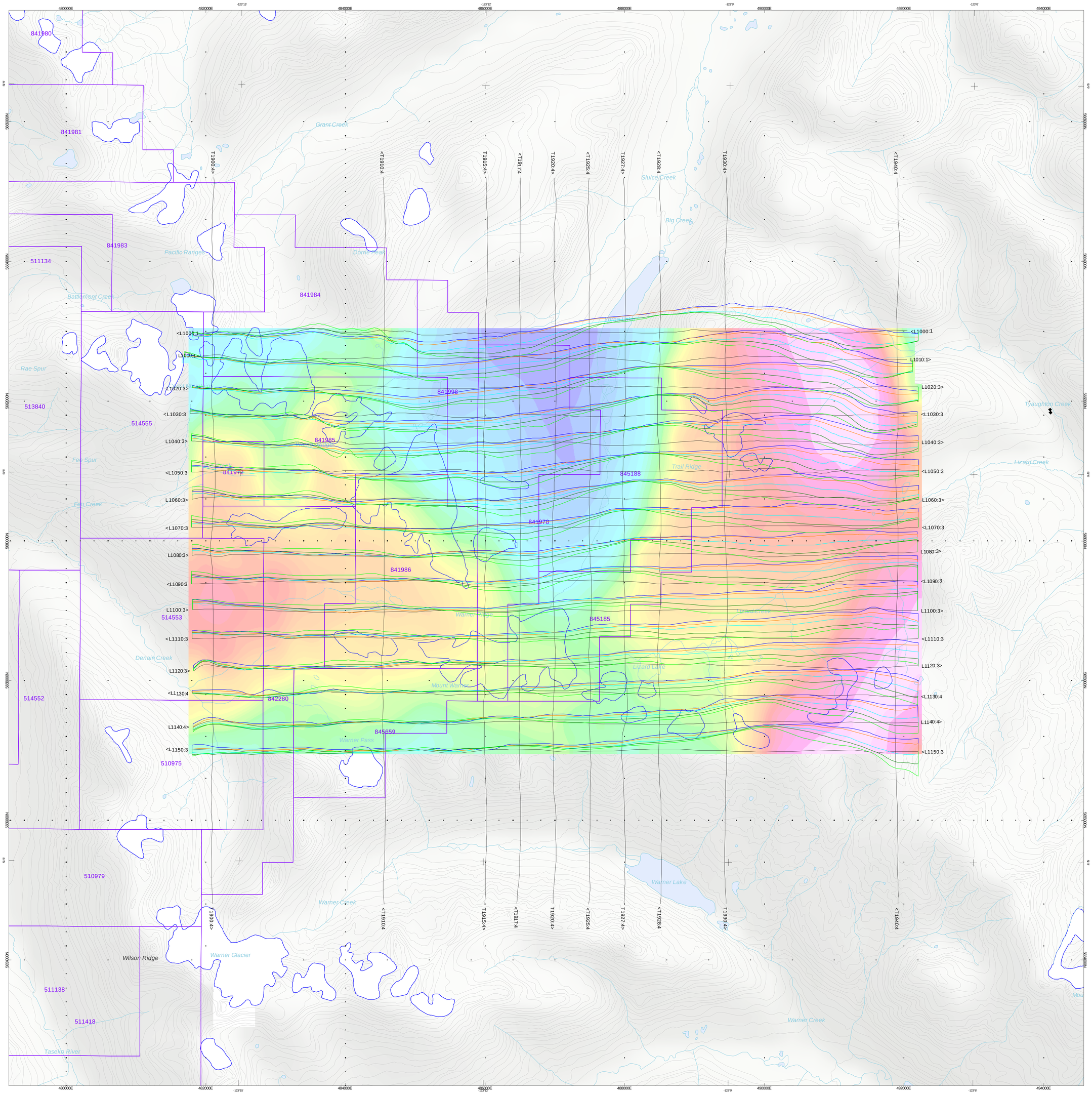
Tzx (In-Line) In-Phase Profiles over 90Hz Phase Rotated In-Phase Tzx Grid

For the North to South lines

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project # 11060



GEOTECH LTD.

SURVEY SPECIFICATIONS:

Survey Flying Date: May 31st - June 3rd 2011
Survey Operations Base: Gold Bridge, BC
Nominal Survey Line Spacing: 400 Meters
Nominal Survey Line Direction: N 90° E / N 270° E
Helicopter Mean Terrain Clearance: 351 metres
Mean Ground Air Speed: 25 metres/sec
ZTEM airborne coil: towed at a mean distance of 70 m below the helicopter
Airborne Magnetometer bird: towed at a mean distance of 55 m below the helicopter

HELICOPTER SPECIFICATIONS

Helicopter Type: Aerospatiale A-Star 350 B3 (C-GABH)

AIRBORNE INSTRUMENTATION

Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
GPS Receivers Location: One on the helicopter, three on EM coil
Radar Altimeter: Terra TRA 3000/TRI 40
Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM

Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
Coil dimensions: 7.4 metres diameter
Coil orientation: Vertical Dipole
Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER

Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION

Magnetometer: GEOMETRICS
Base Station Location: (50°52.5018' N, 122°51.6707' W)

EM BASE STATION

Two orthogonal square coils
Coil dimensions: 3.5 metres each side
Coil orientation: Horizontal Dipole
Base Station Location: (50°93.8229' N, 122°91.6487' W)

PROCESSING SUMMARY

MAGNETICS:

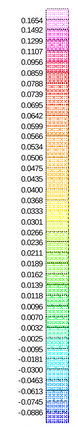
Diurnal Subtraction, microlevelling

ZTEM:

Frequencies extracted: 30, 45, 90, 180, 360, 720Hz.
Sampling rate: 0.4 sec.
Rotation of the inphase part of the inline and orthogonal components (Z/Xloc and Z/Yloc)on to UTM Eastings and Northings.
Attitude correction applied, (calculated from 3 GPS recievers installed on aiborne coil).
DIV(Tilt) calculated: dXcomp/dX+dYcomp/dY for all 6 frequencies.
Phase Rotated Grids (90 deg) calculated from each individual X and Y component grids, for each individual frequency.

MAP PROJECTION

Datum: WGS 84
Projection: Universal Transverse Mercator
Central Meridian: 123°W (Zone 10N)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m
Major Axis: 6378137.0
Eccentricity: 0.08181919084
NTS: 092O03



In-Phase Frequencies
0.01 units per mm
Profile Base 0

30 Hz
45 Hz
90 Hz
180 Hz
360 Hz

90Hz Tzx IP

TOPOGRAPHIC LEGEND:

Buildings
Contours
Rivers / Streams
Lakes / Ponds
Glaciers
Claims

Scale 1:20000

250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

The topographic database was derived from 1:50,000 NRC(Natural Resources Canada) NTDB data
Background shading is derived from NASA SRTM(Shuttle Radar Topographic Mission) data
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Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System

Tzx (In-Line) In-Phase Profiles over 90Hz Phase Rotated In-Phase Tzx Grid

For the East to West lines

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project# 11060

GEOTECH LTD.

SURVEY SPECIFICATIONS:

Survey Flying Date: May 31st - June 3rd 2011
Survey Operations Base: Gold Bridge, BC
Nominal Survey Line Spacing: 400 Meters
Nominal Survey Line Direction: N 90° E / N 270° E
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Mean Ground Air Speed: 25 metres/sec
ZTEM airborne coil: towed at a mean distance of 70 m below the helicopter
Airborne Magnetometer bird: towed at a mean distance of 55 m below the helicopter

HELICOPTER SPECIFICATIONS

Helicopter Type: Aerospatiale A-Star 350 B3 (C-GABH)

AIRBORNE INSTRUMENTATION

Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
GPS Receivers Location: One on the helicopter, three on EM coil
Radar Altimeter: Terra TRA 3000/TRI 40
Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM
Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
Coil dimensions: 7.4 metres diameter
Coil orientation: Vertical Dipole
Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER
Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION
Magnetometer: GEOMETRICS
Base Station Location: (50°52.5018' N, 122°51.6707' W)

EM BASE STATION
Two orthogonal square coils
Coil dimensions: 3.5 metres each side
Coil orientation: Horizontal Dipole
Base Station Location: (50°93.8229' N, 122°91.6487' W)

PROCESSING SUMMARY

MAGNETICS:
Diurnal Subtraction, microlevelling

ZTEM:
Frequencies extracted: 30, 45, 90, 180, 360, 720Hz.
Sampling rate: 0.4 sec.
Rotation of the inphase part of the inline and orthogonal components (Z/Xloc and Z/Yloc)on to UTM Eastings and Northings.
Attitude correction applied, (calculated from 3 GPS recievers installed on airborne coil).
DIV(Tilt) calculated: dXcompdX+dYcompdY for all 6 frequencies.
Pease Rotated Grids (90 deg) calculated from each individual X and Y component grids, for each individual frequency.

MAP PROJECTION

Datum: WGS 84
Projection: Universal Transverse Mercator
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Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m
Major Axis: 6378137.0
Eccentricity: 0.08181919084
NTS: 092O03

TMI (nT)
55896
55848
55788
55740
55716
55693
55674
55657
55642
55632
55623
55614
55607
55602
55597
55593
55588
55583
55579
55575
55570
55565
55561
55556
55552
55547
55541
55535
55530
55525
55518
55511
55505
55497
55490
55482
55468
55443

TMI Contour Intervals:
10 nT
50 nT
250 nT

TOPOGRAPHIC LEGEND:
Buildings
Contours
Rivers / Streams
Lakes / Ponds
Glaciers
Claims

Scale 1:20000
250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

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Claims (http://www.empr.gov.bc.ca)

Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System
Total Magnetic Intensity (TMI)

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project# 11060

GEOTECH LTD.

SURVEY SPECIFICATIONS:

- Survey Flying Date: May 31st - June 3rd 2011
- Survey Operations Base: Gold Bridge, BC
- Nominal Survey Line Spacing: 400 Meters
- Nominal Survey Line Direction: N 90° E / N 270° E
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- Mean Ground Air Speed: 25 metres/sec
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HELICOPTER SPECIFICATIONS

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AIRBORNE INSTRUMENTATION

- Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
- GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
- GPS Receivers Location: One on the helicopter, three on EM coil
- Radar Altimeter: Terra TRA 3000/TRI 40
- Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM

- Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
- Coil dimensions: 7.4 metres diameter
- Coil orientation: Vertical Dipole
- Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER

- Magnetometer: GEOMETRICS
- Magnetometer Sensitivity: +/- 0.02 nT
- Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION

- Magnetometer: GEOMETRICS
- Base Station Location: (50°52.5018' N, 122°51.6707' W)

EM BASE STATION

- Two orthogonal square coils
- Coil dimensions: 3.5 metres each side
- Coil orientation: Horizontal Dipole
- Base Station Location: (50°93.8229' N, 122°91.6487' W)

PROCESSING SUMMARY

MAGNETICS:

- Diurnal Subtraction, microlevelling

ZTEM:

- Frequencies extracted: 30, 45, 90, 180, 360, 720Hz.
- Sampling rate: 0.4 sec.
- Rotation of the Inphase part of the inline and orthogonal components (Z/Xloc and Z/Yloc)on to UTM Eastings and Northings.
- Attitude correction applied, (calculated from 3 GPS recievers installed on airborne coil).
- DIV(Tilt) calculated: dX/comp/dX+dY/comp/dY for all 6 frequencies.
- Phase Rotated Grids (90 deg) calculated from each individual X and Y component grids, for each individual frequency.

MAP PROJECTION

- Datum: WGS 84
- Projection: Universal Transverse Mercator
- Central Meridian: 123°W (Zone 10N)
- Central Scale Factor: 0.9996
- False Easting/Northing: 500,000mN0m
- Major Axis: 6378137.0
- Eccentricity: 0.08181919084
- NTS: 092O03

DEM (metres)
2941.7
2859.4
2777.6
2745.0
2713.1
2665.8
2634.4
2618.0
2602.1
2569.4
2537.4
2521.9
2489.4
2473.5
2441.7
2425.4
2409.4
2377.2
2361.2
2345.4
2329.4
2313.1
2297.2
2281.2
2265.3
2249.4
2233.6
2217.6
2201.8
2186.0
2170.0
2154.2
2138.4
2122.5
2106.7
2090.9
2075.0
2059.2
2043.4
2027.5
2011.8
1996.0
1980.2
1964.3
1948.4
1932.6
1916.9
1901.0
1885.2
1869.3
1853.5
1837.6
1821.8
1806.0
1790.2
1774.3
1758.5

TOPOGRAPHIC LEGEND:

- Buildings
- Contours
- Rivers / Streams
- Lakes / Ponds
- Glaciers
- Claims

Scale 1:20000
250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

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Claims (http://www.empr.gov.bc.ca)

Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System
Digital Elevation Model (DEM)

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project # 11060

GEOTECH LTD.

SURVEY SPECIFICATIONS:

Survey Flying Date: May 31st - June 3rd 2011
Survey Operations Base: Gold Bridge, BC
Nominal Survey Line Spacing: 400 Meters
Nominal Survey Line Direction: N 90° E / N 270° E
Helicopter Mean Terrain Clearance: 351 metres
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ZTEM airborne coil: towed at a mean distance of 70 m below the helicopter
Airborne Magnetometer bird: towed at a mean distance of 55 m below the helicopter

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Helicopter Type: Aerospatiale A-Star 350 B3 (C-GABH)

AIRBORNE INSTRUMENTATION

Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
GPS Receivers Location: One on the helicopter, three on EM coil
Radar Altimeter: Terra TRA 3000/TRI 40
Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM
Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
Coil dimensions: 7.4 metres diameter
Coil orientation: Vertical Dipole
Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER
Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION
Magnetometer: GEOMETRICS
Base Station Location: (50°52.5018' N, 122°51.6707' W)

EM BASE STATION
Two orthogonal square coils
Coil dimensions: 3.5 metres each side
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PROCESSING SUMMARY

MAGNETICS:
Diurnal Subtraction, microlevelling

ZTEM:
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Sampling rate: 0.4 sec.
Rotation of the inphase part of the inline and orthogonal components (Z/Xloc and Z/Yloc)on to UTM Eastings and Northings.
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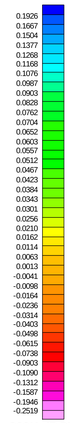
DIV(Tilt) calculated: dXcompdX+dYcompdY for all 6 frequencies.
Phase Rotated Grids (90 deg) calculated from each individual X and Y component grids, for each individual frequency.

MAP PROJECTION

Datum: WGS 84
Projection: Universal Transverse Mercator
Central Meridian: 123°W (Zone 10N)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m
Major Axis: 6378137.0
Eccentricity: 0.08181919084
NTS: 092O03



360Hz IP DT
(1000*1/m)

TOPOGRAPHIC LEGEND:

- **Buildings**
- **Contours**
- **Rivers / Streams**
- **Lakes / Ponds**
- **Glaciers**
- **Claims**

Scale 1:20000
250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

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Claims (http://www.empr.gov.bc.ca)

Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System

360Hz In-Phase Total Divergence (DT) Grid

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project # 11060

GEOTECH LTD.

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AIRBORNE INSTRUMENTATION

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GPS Receivers Location: One on the helicopter, three on EM coil
Radar Altimeter: Terra TRA 3000/TRI 40
Navigation: GEONAV-3

AIRBORNE ELECTROMAGNETIC SYSTEM
Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
Coil dimensions: 7.4 metres diameter
Coil orientation: Vertical Dipole
Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER
Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION
Magnetometer: GEOMETRICS
Base Station Location: (50°52.5018' N, 122°51.6707' W)

EM BASE STATION
Two orthogonal square coils
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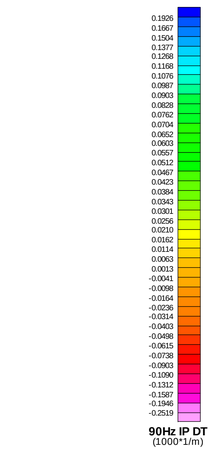

90Hz IP DT
(1000*1/m)

TOPOGRAPHIC LEGEND:

- Buildings
- Contours
- Rivers / Streams
- Lakes / Ponds
- Glaciers
- Claims

Scale 1:20000
250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

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90Hz In-Phase Total Divergence (DT) Grid

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GROUND INSTRUMENTATION

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Magnetometer: GEOMETRICS
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Major Axis: 6378137.0
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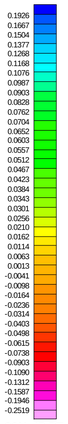

30Hz IP DT
(1000*1/m)

TOPOGRAPHIC LEGEND:

- Buildings
- Contours
- Rivers / Streams
- Lakes / Ponds
- Glaciers
- Claims

Scale 1:20000
250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

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Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

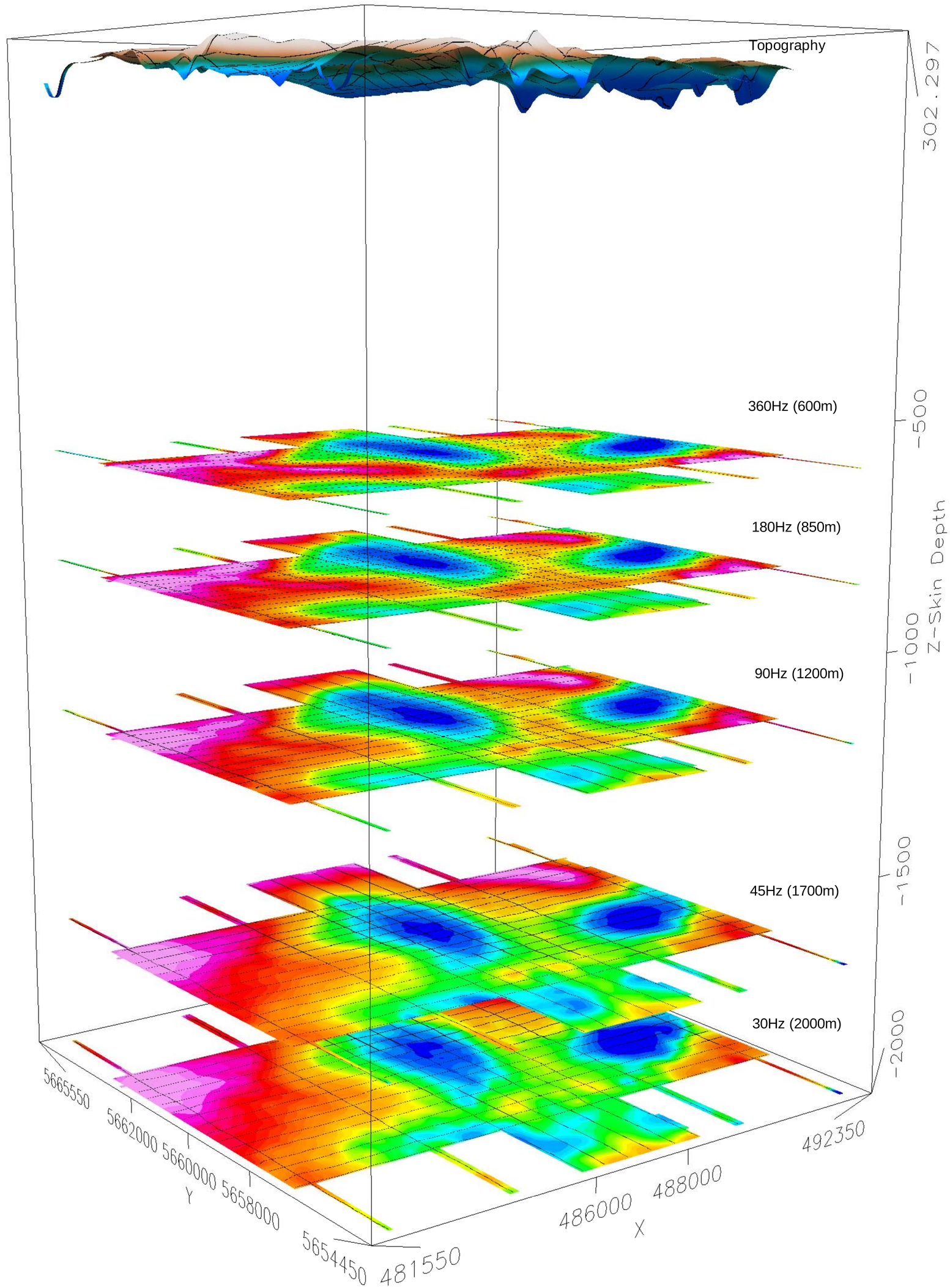
Geotech ZTEM System
30Hz In-Phase Total Divergence (DT) Grid

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project# 11060

N



Skin Depth Calculated for a 1000 ohm-m Half Space Model
Z multiplier of 8, Scale Factor 0.1, Inclination = 10.8, Declination = 36

Geotech Project # 11060

GEOTECH LTD.

SURVEY SPECIFICATIONS:

- Survey Flying Date: May 31st - June 3rd 2011
- Survey Operations Base: Gold Bridge, BC
- Nominal Survey Line Spacing: 400 Meters
- Nominal Survey Line Direction: N 90° E / N 270° E
- Helicopter Mean Terrain Clearance: 351 metres
- Mean Ground Air Speed: 25 metres/sec
- ZTEM airborne coil: towed at a mean distance of 70 m below the helicopter
- Airborne Magnetometer bird: towed at a mean distance of 55 m below the helicopter

HELICOPTER SPECIFICATIONS

- Helicopter Type: Aerospatiale A-Star 350 B3 (C-GABH)

AIRBORNE INSTRUMENTATION

- Survey Type: Helicopter Z-Axis Tipper Electromagnetic (ZTEM), Magnetic towed Bird
- GPS Receivers (4): NovAtel CDGPS enabled Propak V3-RT20
- GPS Receivers Location: One on the helicopter, three on EM coil
- Radar Altimeter: Terra TRA 3000/TRI 40
- Navigation: GEONAV-3
- AIRBORNE ELECTROMAGNETIC SYSTEM
  - Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
  - Coil dimensions: 7.4 metres diameter
  - Coil orientation: Vertical Dipole
  - Digitizing rate: 2000Hz
- AIRBORNE MAGNETOMETER
  - Magnetometer: GEOMETRICS
  - Magnetometer Sensitivity: +/- 0.02 nT
  - Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

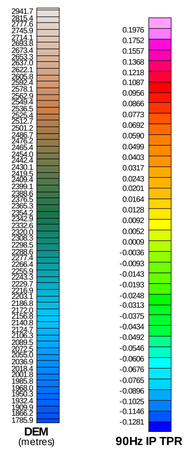
- MAGNETIC BASE STATION
  - Magnetometer: GEOMETRICS
  - Base Station Location: (50°52.5018' N, 122°51.6707' W)
- EM BASE STATION
  - Two orthogonal square coils
  - Coil dimensions: 3.5 metres each side
  - Coil orientation: Horizontal Dipole
  - Base Station Location: (50°93.8229' N, 122°91.6487' W)

PROCESSING SUMMARY

- MAGNETICS:
  - Diurnal Subtraction, microlevelling
- ZTEM:
  - Frequencies extracted: 30, 45, 90, 180, 360, 720Hz.
  - Sampling rate: 0.4 sec.
  - Rotation of the inphase part of the inline and orthogonal components (Z/Xloc and Z/Yloc)on to UTM Eastings and Northings.
  - Attitude correction applied, (calculated from 3 GPS recievers installed on airborne coil).
  - DIV(Tilt) calculated: dXcompdX+dYcompdY for all 6 frequencies.
  - Phase Rotated Grids (90 deg) calculated from each individual X and Y component grids, for each individual frequency.

MAP PROJECTION

- Datum: WGS 84
- Projection: Universal Transverse Mercator
- Central Meridian: 123°W (Zone 10N)
- Central Scale Factor: 0.9996
- False Easting/Northing: 500,000m/0m
- Major Axis: 6378137.0
- Eccentricity: 0.08181919084
- NTS: 092O03



Scale 1:20000
250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 10N

The topographic database was derived from 1:50,000 NRC (Natural Resources Canada) NTDB data
Background shading is derived from NASA SRTM (Shuttle Radar Topographic Mission) data
Inset data derived from Geocommunities 1:250,000 Canadian National Topographic database
Mineral Dispositions are derived from the British Columbia Ministry of Energy and Mines
Geogratis (www.geogratis.ca) Geocommunities (www.geocomm.com)
Claims (http://www.empr.gov.bc.ca)

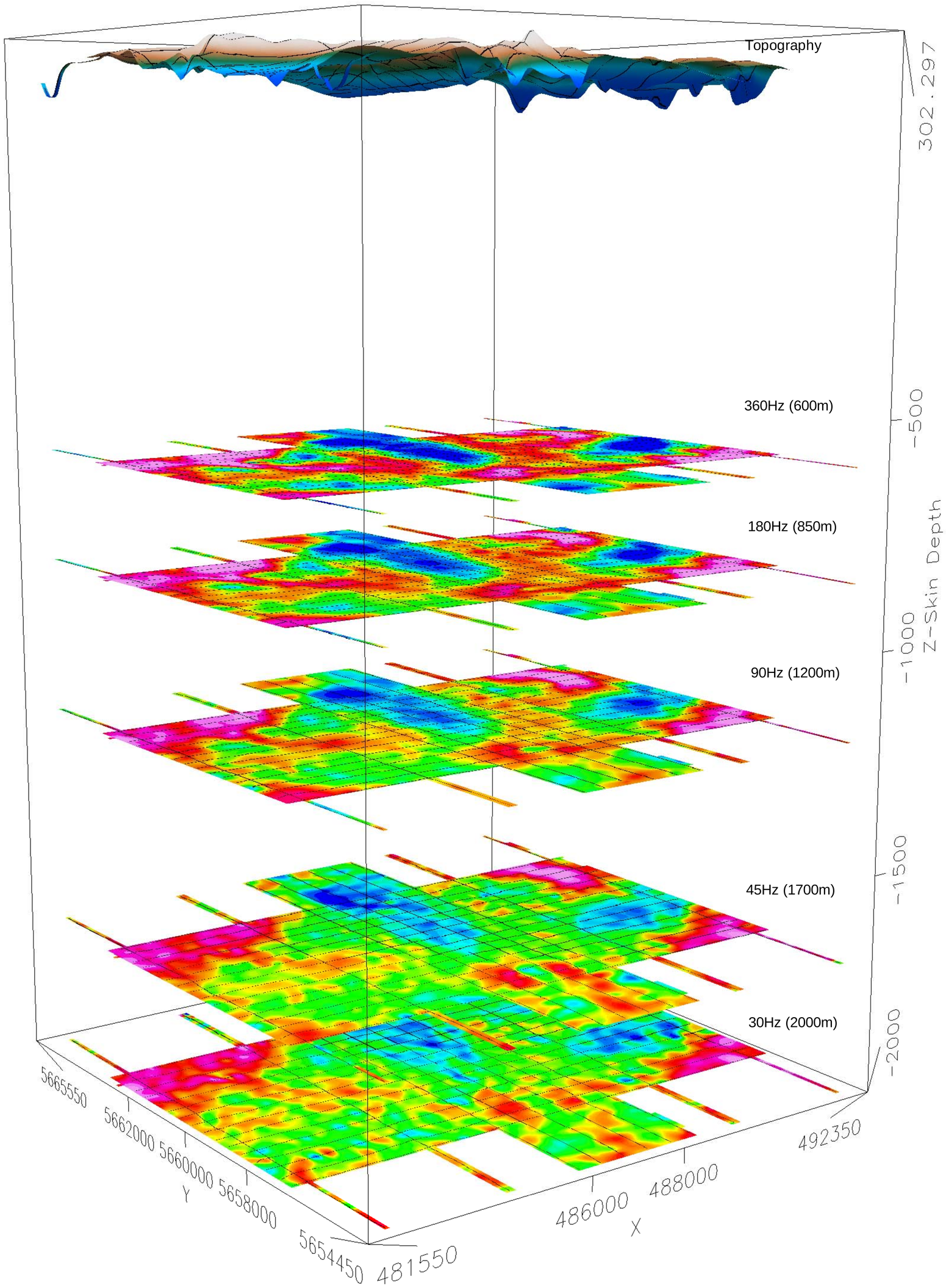
Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System
3D View of In-Phase Total Phase Rotated versus Skin Depth (30-360 Hz)

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

N



Skin Depth Calculated for a 1000 ohm-m Half Space Model
Z multiplier of 8, Scale Factor 0.1, Inclination = 10.8, Declination = 36

SURVEY SPECIFICATIONS:
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- Nominal Survey Line Direction: N 90° E / N 270° E
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AIRBORNE ELECTROMAGNETIC SYSTEM
- Electromagnetic System: Geotech Z-Axis Tipper (ZTEM)
- Coil dimensions: 7.4 metres diameter
- Coil orientation: Vertical Dipole
- Digitizing rate: 2000Hz

AIRBORNE MAGNETOMETER
- Magnetometer: GEOMETRICS
- Magnetometer Sensitivity: +/- 0.02 nT
- Sampling Rate: 0.2 Hz

GROUND INSTRUMENTATION

MAGNETIC BASE STATION
- Magnetometer: GEOMETRICS
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PROCESSING SUMMARY

MAGNETICS:
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MAP PROJECTION
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- Central Scale Factor: 0.9996
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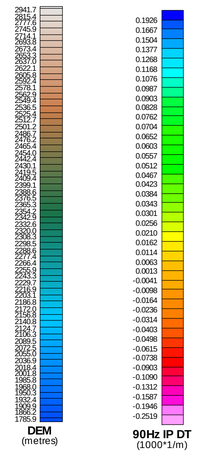
- Major Axis: 6378137.0
- Eccentricity: 0.08181919084
- NTS: 092O03



DEM (metres)

90Hz IP DT (1000*1/m)

Scale 1:20000

250 0 250 500 750 1000

(meters)

WGS 84 / UTM zone 10N

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Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System
3D View of In-Phase Total Divergence versus Skin Depth (30-360 Hz)

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project # 11060

GEOTECH LTD.

SURVEY SPECIFICATIONS:

Survey Flying Date: May 31st - June 3rd 2011
Survey Operations Base: Gold Bridge, BC
Nominal Survey Line Spacing: 400 Meters
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Magnetometer: GEOMETRICS
Magnetometer Sensitivity: +/- 0.02 nT
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GROUND INSTRUMENTATION

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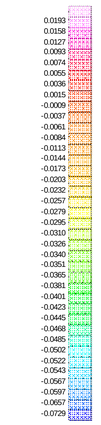


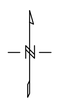
Quadrature Frequencies
0.01 units per mm
Profile Base 0

30 Hz
45 Hz
90 Hz
180 Hz
360 Hz

90Hz Tzy QD

TOPOGRAPHIC LEGEND:

- Buildings
- Contours
- Rivers / Streams
- Lakes / Ponds
- Glaciers
- Claims



Scale 1:20000

250 0 250 500 750 1000
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Royal Sapphire Corporation
Lorn Property
Gold Bridge, British Columbia

Geotech ZTEM System

Tzy (Cross-Line) Quadrature Profiles over 90Hz Phase Rotated Quadrature Tzy Grid

For the North to South lines

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca

July 2011

Geotech Project # 11060

APPENDIX II

Talus Geochemistry

Analytical Results

APPENDIX II - Talus Geochemistry

Sample ID	Lab Report #	1DX15 Au ppb 0.5	1DX15 Cu ppm 0.1	1DX15 Ag ppm 0.1	1DX15 As ppm 0.5	1DX15 Mo ppm 0.1	1DX15 Pb ppm 0.1	1DX15 Zn ppm 1	1DX15 Bi ppm 0.1	1DX15 Te ppm 0.2	1DX15 Ni ppm 0.1	1DX15 Co ppm 0.1	1DX15 Mn ppm 1	1DX15 Fe % 0.01
904S006	VAN11004979	2.9	204.2	1.7	61.1	4.7	115.7	191	1.0	1.0	29.7	24.3	736	5.21
904S007	VAN11004979	3.5	113.7	0.7	42.5	3.1	57.7	166	0.5	0.7	25.8	20.7	754	4.05
904S008	VAN11004979	<0.5	124.1	0.4	58.1	1.9	47.7	176	0.4	0.3	24.2	17.0	745	3.44
904S009	VAN11004979	<0.5	140.5	0.4	31.6	2.1	45.8	185	0.3	0.3	25.6	21.5	734	3.47
904S010	VAN11004979	1.8	136.7	0.5	18.6	1.2	47.4	156	0.6	0.4	23.7	15.9	752	3.09
904S011	VAN11004979	<0.5	155.9	0.5	46.2	2.9	49.8	168	0.5	0.5	22.6	21.1	629	3.71
904S012	VAN11004979	5.1	160.9	0.7	70.9	3.0	43.4	95	1.0	0.5	18.7	16.7	465	4.73
904S013	VAN11004979	12.4	116.8	0.5	67.2	2.5	37.7	85	1.4	0.6	16.7	13.9	403	5.80
904S014	VAN11004979	2.5	200.9	0.5	40.0	2.9	10.6	55	6.7	3.0	13.9	12.4	362	4.87
904S015	VAN11004979	22.9	1649.8	3.3	46.9	5.9	25.4	85	16.9	11.2	15.7	13.6	312	6.05
904S016	VAN11004979	17.7	1356.4	3.1	50.9	6.1	121.6	319	27.4	16.0	13.3	21.4	602	4.63
904S017	VAN11004979	210.7	3442.2	2.1	71.6	5.9	41.7	395	52.1	38.0	31.2	38.3	472	6.53
904S018	VAN11004979	10.3	526.4	1.1	68.9	2.5	47.6	131	5.5	4.2	20.2	16.7	313	4.47
904S019	VAN11004979	2.4	192.3	0.2	76.1	2.3	8.1	57	1.2	1.4	27.0	22.5	309	5.12
904S020	VAN11004979	8.3	472.6	1.0	121.0	4.2	69.4	93	3.7	3.0	22.1	18.5	347	7.13
904S021	VAN11004979	4.4	213.7	0.4	60.1	2.7	8.0	75	1.4	1.3	23.5	20.7	293	5.24
904S025	VAN11004979	<0.5	51.5	0.3	11.2	0.6	60.5	149	0.5	<0.2	27.2	14.4	708	2.88
904S026	VAN11004979	3.3	62.4	0.7	10.2	0.6	78.5	241	1.9	0.3	25.9	15.9	1288	3.21
904S027	VAN11004979	2.7	64.1	0.5	12.8	0.5	78.1	275	1.5	0.3	23.0	14.1	1276	3.04
904S028	VAN11004979	<0.5	105.2	0.6	106.7	2.6	70.1	205	0.2	0.4	27.7	22.6	819	3.98
904S029	VAN11004979	2.0	158.0	1.2	70.0	5.6	82.9	199	1.1	1.2	30.0	29.1	758	5.04
904S030	VAN11004979	0.8	132.0	0.7	57.6	4.5	56.8	163	0.6	0.8	27.5	25.3	823	5.04
904S031	VAN11004979	4.5	231.0	1.3	72.2	6.8	76.8	157	1.3	1.5	27.5	18.2	598	7.05
904S032	VAN11004979	1.3	149.9	0.7	64.4	3.6	48.1	126	0.7	1.1	24.0	17.0	565	6.15
904S033	VAN11004979	1.0	156.9	0.4	54.6	2.5	20.8	86	<0.1	0.4	28.2	25.5	416	4.92
904S034	VAN11004979	8.6	381.6	1.5	120.0	3.4	101.5	100	2.8	2.1	22.3	15.5	399	8.06
904S035	VAN11004979	1.2	184.1	0.4	49.2	4.5	29.3	62	1.0	0.9	16.3	11.5	315	6.44
904S036	VAN11004979	7.2	211.6	0.6	83.1	5.0	75.2	156	1.8	1.1	24.7	21.4	575	7.52
904S037	VAN11004979	35.1	696.4	2.2	75.9	4.6	15.5	67	8.8	4.7	15.7	11.6	320	12.18

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Th ppm 0.1	1DX15 Sr ppm 1	1DX15 Cd ppm 0.1	1DX15 Sb ppm 0.1	1DX15 V ppm 2	1DX15 Ca % 0.01	1DX15 P % 0.001	1DX15 La ppm 1	1DX15 Cr ppm 1	1DX15 Mg % 0.01	1DX15 Ba ppm 1	1DX15 Ti % 0.001	1DX15 B ppm 1	1DX15 Al % 0.01
904S006	0.9	172	1.4	1.7	95	1.27	0.084	4	31	0.85	90	0.098	5	3.60
904S007	1.0	152	1.2	1.1	86	1.28	0.079	5	29	0.84	85	0.104	4	3.28
904S008	0.9	130	1.3	1.2	63	1.10	0.076	5	24	0.87	88	0.085	4	2.99
904S009	1.1	124	1.0	0.9	62	1.02	0.076	5	22	0.83	90	0.085	8	2.94
904S010	1.3	123	1.0	0.9	71	1.18	0.083	6	29	0.91	80	0.132	4	2.62
904S011	1.1	138	1.0	1.1	63	1.07	0.072	5	19	0.78	99	0.081	4	3.14
904S012	0.7	205	0.6	0.9	119	2.00	0.094	4	27	0.98	109	0.148	3	4.58
904S013	0.6	165	0.3	0.7	132	1.63	0.105	3	34	1.01	100	0.135	2	3.98
904S014	0.7	157	0.2	0.6	153	1.84	0.100	4	43	1.10	106	0.168	2	4.08
904S015	1.3	132	0.3	2.1	151	0.84	0.111	6	25	1.16	123	0.212	2	3.79
904S016	2.5	80	0.7	1.9	107	0.61	0.101	7	15	0.87	88	0.147	2	2.84
904S017	2.0	224	1.1	1.1	195	0.77	0.122	7	22	1.83	206	0.279	<1	4.53
904S018	2.3	147	0.4	1.4	105	1.19	0.081	5	26	0.87	100	0.147	3	3.36
904S019	0.6	217	<0.1	1.3	153	1.85	0.102	3	44	1.04	103	0.147	4	4.57
904S020	1.1	190	0.1	1.2	135	1.40	0.132	4	37	0.98	123	0.150	3	4.02
904S021	0.7	252	0.3	1.3	161	2.31	0.097	3	41	1.00	127	0.158	4	4.99
904S025	1.4	77	1.1	1.9	54	0.94	0.069	7	28	1.02	77	0.139	3	2.22
904S026	1.4	76	2.0	1.4	58	1.26	0.080	8	30	1.10	109	0.141	4	2.38
904S027	1.3	84	1.9	1.3	54	1.34	0.081	8	26	1.09	124	0.145	3	2.44
904S028	1.0	172	1.9	1.0	89	1.45	0.075	4	33	0.89	97	0.103	4	3.87
904S029	1.0	149	1.3	1.4	98	1.19	0.081	5	28	0.81	93	0.103	3	3.53
904S030	0.7	186	0.7	1.0	120	1.76	0.094	4	36	0.90	90	0.134	4	4.12
904S031	1.0	176	0.6	1.6	106	1.32	0.114	5	32	0.85	102	0.110	3	3.80
904S032	1.0	169	0.3	1.1	114	1.41	0.112	5	34	0.87	107	0.125	3	3.67
904S033	0.7	255	0.2	0.8	131	1.94	0.122	4	34	1.09	121	0.142	3	4.13
904S034	0.8	184	0.4	1.2	127	1.48	0.109	3	34	1.04	108	0.137	1	4.19
904S035	1.0	148	0.1	0.9	115	1.47	0.098	4	37	0.88	92	0.151	2	3.68
904S036	0.8	162	0.4	1.2	131	1.24	0.116	4	33	1.07	102	0.142	3	4.12
904S037	0.6	111	0.1	0.6	139	1.06	0.092	3	43	1.10	107	0.181	2	3.13

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Na % 0.001	1DX15 K % 0.01	1DX15 W ppm 0.10	1DX15 Hg ppm 0.01	1DX15 Sc ppm 0.1	1DX15 Tl ppm 0.1	1DX15 S % 0.05	1DX15 Ga ppm 1	1DX15 Se ppm 0.5
904S006	0.234	0.16	0.20	<0.01	4.9	0.2	0.10	9	0.7
904S007	0.239	0.18	0.30	<0.01	4.6	0.1	0.08	8	<0.5
904S008	0.187	0.19	0.20	<0.01	3.8	0.1	0.06	7	<0.5
904S009	0.185	0.20	0.20	0.01	3.9	0.1	0.05	7	<0.5
904S010	0.189	0.19	0.50	<0.01	4.1	0.2	0.06	7	<0.5
904S011	0.210	0.25	0.20	0.01	3.8	0.2	0.09	8	<0.5
904S012	0.443	0.42	0.50	<0.01	5.9	0.5	0.23	12	0.6
904S013	0.369	0.35	1.50	<0.01	6.3	0.4	0.25	11	0.7
904S014	0.419	0.43	5.50	<0.01	7.2	0.5	0.34	11	1.0
904S015	0.157	0.71	5.00	<0.01	6.9	0.7	0.13	11	2.3
904S016	0.115	0.33	2.60	<0.01	5.3	0.3	0.09	9	1.5
904S017	0.130	1.44	25.00	<0.01	11.4	1.5	0.11	13	2.1
904S018	0.218	0.42	1.00	<0.01	6.0	0.3	0.35	8	1.0
904S019	0.363	0.38	0.30	<0.01	8.4	0.3	0.34	11	0.8
904S020	0.250	0.40	3.90	<0.01	6.5	0.3	0.23	11	1.5
904S021	0.435	0.48	0.70	<0.01	8.1	0.4	0.67	12	0.7
904S025	0.094	0.17	0.20	<0.01	3.8	<0.1	<0.05	6	<0.5
904S026	0.071	0.19	0.30	<0.01	4.0	0.1	<0.05	7	<0.5
904S027	0.052	0.25	0.30	0.02	4.1	0.2	<0.05	7	<0.5
904S028	0.293	0.22	0.10	<0.01	5.2	0.1	0.07	9	<0.5
904S029	0.207	0.18	0.20	0.01	5.6	0.2	0.06	9	<0.5
904S030	0.328	0.19	0.30	<0.01	6.6	0.2	0.13	11	0.6
904S031	0.226	0.22	3.70	0.02	5.5	0.2	0.15	10	1.4
904S032	0.268	0.27	0.80	0.02	5.9	0.3	0.15	10	0.6
904S033	0.331	0.36	0.40	<0.01	6.2	0.5	0.22	11	0.5
904S034	0.293	0.41	6.60	<0.01	6.8	0.5	0.27	11	1.4
904S035	0.305	0.34	0.90	<0.01	5.6	0.4	0.25	10	1.0
904S036	0.231	0.34	1.40	0.01	6.7	0.4	0.21	11	1.1
904S037	0.231	0.60	19.70	<0.01	7.0	0.7	0.83	10	2.6

APPENDIX II - Talus Geochemistry

Sample ID	Lab Report #	1DX15 Au ppb 0.5	1DX15 Cu ppm 0.1	1DX15 Ag ppm 0.1	1DX15 As ppm 0.5	1DX15 Mo ppm 0.1	1DX15 Pb ppm 0.1	1DX15 Zn ppm 1	1DX15 Bi ppm 0.1	1DX15 Te ppm 0.2	1DX15 Ni ppm 0.1	1DX15 Co ppm 0.1	1DX15 Mn ppm 1	1DX15 Fe % 0.01
904S038	VAN11004979	3.3	359.5	0.9	65.0	2.8	11.0	56	3.0	2.4	16.0	15.9	305	7.12
904S039	VAN11004979	1.7	274.1	0.6	106.5	3.2	12.8	58	2.2	1.9	20.8	21.3	296	7.17
904S040	VAN11004979	5.3	235.3	0.3	176.0	17.5	8.6	63	2.0	2.2	33.1	24.3	274	7.64
904S041	VAN11004979	6.3	214.0	0.3	241.4	6.0	7.7	65	0.8	1.2	30.2	24.3	273	7.37
904S042	VAN11004979	6.5	266.0	0.3	297.6	4.6	10.5	102	2.1	1.3	35.3	30.7	325	9.21
904S043	VAN11004979	7.2	391.2	0.7	37.4	2.6	12.8	70	2.7	1.8	24.4	18.1	448	7.24
904S044	VAN11004979	23.9	523.5	1.0	35.4	2.9	14.5	47	5.2	3.8	15.4	15.6	307	11.44
904S045	VAN11004979	35.6	1063.0	1.4	40.3	3.1	17.0	69	19.2	12.7	24.8	22.9	334	8.82
904S046	VAN11004979	53.2	1295.2	3.9	23.6	2.0	36.7	59	13.3	11.7	10.7	12.3	301	16.87
904S050	VAN11004979	1.7	105.2	0.4	16.3	2.3	36.6	143	0.9	0.3	28.1	18.8	614	3.87
904S051	VAN11004979	2.1	86.4	0.3	16.3	2.2	34.4	121	0.8	0.4	30.7	18.5	586	3.59
904S052	VAN11004979	<0.5	74.7	0.3	13.1	2.0	30.4	137	0.9	0.4	31.8	16.1	604	3.20
904S053	VAN11004979	1.1	86.4	0.3	9.8	1.6	36.1	222	0.9	0.4	34.8	21.9	1054	3.84
904S054	VAN11004979	1.2	107.4	0.4	10.8	1.9	32.0	200	1.8	0.3	32.3	23.7	1107	4.09
904S055	VAN11004979	<0.5	80.8	0.4	10.9	1.7	48.3	187	1.0	0.3	33.1	16.2	752	3.50
904S056	VAN11004979	1.1	126.8	0.6	9.6	1.6	53.4	201	0.8	0.3	35.3	15.9	711	3.57
904S057	VAN11004979	<0.5	88.2	0.3	11.4	1.7	49.4	194	0.8	0.5	33.5	15.7	720	3.65
904S058	VAN11004979	3.8	347.0	1.1	26.6	3.8	52.1	180	6.4	0.7	33.9	22.3	930	5.88
904S059	VAN11004979	11.5	322.1	1.0	27.2	3.6	48.4	162	13.0	1.0	31.5	18.8	792	6.21
904S060	VAN11004979	2.8	340.1	1.2	29.8	4.1	57.5	164	11.9	0.8	30.8	21.6	836	6.30
904S061	VAN11004979	3.2	205.0	0.7	25.6	2.7	56.8	173	3.5	0.6	33.9	19.1	806	4.49
904S062	VAN11004979	7.8	372.7	1.1	146.2	10.9	63.4	167	13.4	1.9	27.9	18.4	700	6.04
904S063	VAN11004979	1.2	121.1	0.4	16.3	2.4	43.2	171	1.9	0.4	32.2	16.2	706	3.72
904S064	VAN11004979	2.2	107.9	0.4	15.4	2.5	48.9	177	2.2	0.5	33.1	16.0	706	3.75
904S065	VAN11004979	3.0	171.0	0.7	19.5	3.8	45.6	159	2.9	0.6	32.6	17.2	693	4.32
904S066	VAN11004979	6.0	215.8	1.1	39.7	7.2	97.5	161	6.8	1.1	33.2	17.6	692	4.97
904S067	VAN11004979	1.8	159.3	0.5	16.7	3.0	41.5	142	2.4	0.3	34.2	19.3	694	4.42
904S068	VAN11004979	14.0	556.4	1.8	128.7	13.8	129.5	220	10.3	2.1	32.7	24.8	995	10.80
904S069	VAN11004979	26.0	570.7	2.0	137.5	18.3	142.3	235	12.4	2.4	31.9	25.1	980	10.63

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Th ppm 0.1	1DX15 Sr ppm 1	1DX15 Cd ppm 0.1	1DX15 Sb ppm 0.1	1DX15 V ppm 2	1DX15 Ca % 0.01	1DX15 P % 0.001	1DX15 La ppm 1	1DX15 Cr ppm 1	1DX15 Mg % 0.01	1DX15 Ba ppm 1	1DX15 Ti % 0.001	1DX15 B ppm 1	1DX15 Al % 0.01
904S038	0.7	161	<0.1	1.2	139	1.62	0.109	4	40	0.95	108	0.163	2	3.90
904S039	0.8	137	<0.1	0.7	144	1.51	0.112	4	51	0.94	113	0.168	5	3.82
904S040	0.5	258	0.2	2.9	152	1.99	0.106	3	46	1.14	123	0.161	4	4.83
904S041	0.4	242	0.2	2.2	151	2.13	0.093	3	40	1.07	99	0.147	4	4.91
904S042	0.5	289	0.4	3.1	159	2.03	0.099	3	42	1.17	98	0.146	6	5.38
904S043	0.9	143	0.3	1.2	138	1.14	0.110	4	40	1.03	92	0.142	3	3.57
904S044	0.8	187	<0.1	1.3	161	1.53	0.123	3	24	0.91	126	0.146	2	4.44
904S045	0.7	250	0.2	1.2	175	1.42	0.115	3	27	1.27	146	0.147	1	5.12
904S046	0.5	81	<0.1	0.9	114	0.74	0.090	1	17	1.53	98	0.098	2	3.11
904S050	1.1	118	0.7	1.5	88	0.88	0.071	4	32	1.02	85	0.086	3	3.26
904S051	1.3	123	0.4	1.4	77	0.80	0.063	5	31	0.95	103	0.082	3	3.28
904S052	1.2	103	0.6	1.3	67	0.76	0.061	5	35	0.95	84	0.087	3	2.78
904S053	1.1	82	1.0	1.6	76	0.74	0.069	4	38	1.37	92	0.090	3	3.20
904S054	0.9	105	1.0	1.7	101	0.89	0.070	4	38	1.34	79	0.119	2	3.23
904S055	1.4	93	1.0	1.6	62	0.68	0.066	5	35	1.15	97	0.078	2	2.82
904S056	1.3	94	0.9	1.7	63	0.70	0.075	5	38	1.18	114	0.079	2	2.86
904S057	1.4	94	0.8	1.8	63	0.68	0.069	5	36	1.17	108	0.082	2	3.02
904S058	1.4	115	0.7	2.8	125	0.66	0.093	4	76	1.40	87	0.148	3	3.40
904S059	1.1	101	0.6	2.0	134	0.62	0.098	4	72	1.36	79	0.145	2	3.28
904S060	1.3	98	0.6	2.3	129	0.65	0.103	4	72	1.31	83	0.142	1	3.29
904S061	1.4	103	0.8	2.4	90	0.70	0.081	5	49	1.22	101	0.108	2	3.21
904S062	1.7	78	0.4	3.2	130	0.54	0.085	4	48	1.20	104	0.149	1	3.27
904S063	1.3	96	0.8	1.7	66	0.67	0.069	5	37	1.12	100	0.082	3	2.92
904S064	1.4	96	0.7	2.0	65	0.69	0.071	5	37	1.14	102	0.084	3	3.05
904S065	1.4	107	0.6	1.8	82	0.70	0.083	5	44	1.12	103	0.090	3	3.15
904S066	1.4	120	0.5	2.3	93	0.67	0.102	5	46	1.21	107	0.106	2	3.38
904S067	1.3	118	0.5	1.6	88	0.80	0.084	5	45	1.21	96	0.102	3	3.32
904S068	0.9	147	0.6	6.5	163	0.74	0.104	3	76	1.43	102	0.159	1	4.47
904S069	0.9	143	0.6	7.4	162	0.72	0.101	3	73	1.39	104	0.166	<1	4.54

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Na % 0.001	1DX15 K % 0.01	1DX15 W ppm 0.10	1DX15 Hg ppm 0.01	1DX15 Sc ppm 0.1	1DX15 Tl ppm 0.1	1DX15 S % 0.05	1DX15 Ga ppm 1	1DX15 Se ppm 0.5
904S038	0.351	0.46	9.10	<0.01	6.8	0.4	0.37	10	1.2
904S039	0.315	0.50	3.90	<0.01	7.3	0.4	0.33	10	1.6
904S040	0.372	0.47	0.90	0.01	8.0	0.4	0.69	12	1.1
904S041	0.358	0.42	0.50	<0.01	8.2	0.3	0.77	12	1.3
904S042	0.322	0.38	0.60	<0.01	8.7	0.3	0.67	12	1.3
904S043	0.187	0.35	4.10	<0.01	7.4	0.3	0.22	11	0.7
904S044	0.313	0.47	17.30	0.02	6.6	0.4	0.41	12	1.7
904S045	0.244	0.55	10.00	<0.01	9.1	0.6	0.31	13	1.8
904S046	0.088	0.31	10.60	<0.01	4.3	0.3	0.29	12	4.4
904S050	0.165	0.21	0.30	<0.01	4.5	0.2	0.09	7	<0.5
904S051	0.182	0.25	0.20	<0.01	4.0	0.2	0.07	8	<0.5
904S052	0.153	0.22	0.20	<0.01	3.7	0.2	<0.05	7	<0.5
904S053	0.120	0.23	0.20	<0.01	4.4	0.2	0.06	7	<0.5
904S054	0.130	0.20	0.20	<0.01	5.3	0.1	<0.05	7	<0.5
904S055	0.130	0.23	0.20	0.01	3.4	0.2	0.06	6	0.6
904S056	0.128	0.24	0.40	<0.01	3.5	0.2	0.09	7	<0.5
904S057	0.133	0.27	0.20	<0.01	3.6	0.2	0.09	7	0.6
904S058	0.115	0.21	0.60	<0.01	5.7	0.2	0.13	9	1.1
904S059	0.115	0.21	0.80	<0.01	5.5	0.3	0.17	10	1.1
904S060	0.117	0.22	5.00	<0.01	5.6	0.3	0.14	10	1.2
904S061	0.137	0.25	0.50	0.01	4.3	0.3	0.09	8	0.9
904S062	0.118	0.36	1.30	0.01	6.3	0.4	0.14	10	0.9
904S063	0.138	0.24	0.30	0.01	3.4	0.2	0.05	7	<0.5
904S064	0.138	0.26	0.30	0.01	3.6	0.2	0.08	7	<0.5
904S065	0.147	0.23	0.50	<0.01	4.0	0.2	0.08	8	0.6
904S066	0.138	0.25	0.80	0.02	4.6	0.3	0.11	8	0.8
904S067	0.169	0.21	0.40	<0.01	4.3	0.2	0.10	8	<0.5
904S068	0.185	0.39	2.90	<0.01	8.4	0.6	0.40	13	1.7
904S069	0.162	0.38	3.10	<0.01	8.6	0.6	0.35	13	1.6

APPENDIX II - Talus Geochemistry

Sample ID	Lab Report #	1DX15 Au ppb 0.5	1DX15 Cu ppm 0.1	1DX15 Ag ppm 0.1	1DX15 As ppm 0.5	1DX15 Mo ppm 0.1	1DX15 Pb ppm 0.1	1DX15 Zn ppm 1	1DX15 Bi ppm 0.1	1DX15 Te ppm 0.2	1DX15 Ni ppm 0.1	1DX15 Co ppm 0.1	1DX15 Mn ppm 1	1DX15 Fe % 0.01
904S075	VAN11004979	112.3	135.7	0.4	17.0	3.3	53.6	190	1.4	0.5	31.1	17.0	636	3.94
904S076	VAN11004979	<0.5	69.8	0.4	8.0	1.1	36.3	183	0.4	0.3	40.8	16.0	785	3.37
904S077	VAN11004979	<0.5	76.6	0.3	12.6	1.3	50.3	211	0.6	0.4	33.6	15.5	758	3.18
904S078	VAN11004979	0.8	85.6	0.3	10.7	1.9	46.0	230	0.7	0.4	37.9	17.6	763	3.58
904S079	VAN11004979	2.2	130.6	0.5	18.0	2.6	73.8	269	1.4	0.5	46.9	35.1	943	3.94
904S080	VAN11004979	0.6	95.4	0.3	15.2	2.7	79.7	134	1.0	0.4	38.5	16.6	615	4.33
904S081	VAN11004979	2.4	98.7	0.3	18.4	2.5	48.7	147	1.3	0.4	29.0	14.5	567	4.01
904S082	VAN11004979	1.2	266.5	0.8	17.1	2.4	43.4	164	7.4	0.6	33.9	18.0	862	4.91
904S083	VAN11004979	3.1	307.7	1.1	30.0	4.3	56.3	157	51.1	1.0	28.3	19.3	757	6.69
904S084	VAN11004979	3.0	570.1	1.3	29.3	5.2	43.2	136	11.2	0.9	36.4	21.4	716	6.46
904S085	VAN11004979	10.8	497.1	1.5	48.9	6.5	52.6	150	11.9	1.6	37.9	22.4	724	6.88
904S086	VAN11004979	5.2	386.0	1.1	69.3	6.2	49.0	161	8.6	1.4	34.2	20.2	758	6.19
904S087	VAN11004979	20.5	398.4	1.4	164.7	10.3	106.4	230	11.3	2.6	30.6	19.7	689	6.27
904SR088	VAN11004978	0.8	216.1	6.5	0.2	0.9	8.8	52	0.5	1.9	0.6	18.0	12.2	311
904S089	VAN11004979	6.2	520.1	1.0	61.8	5.3	65.1	147	12.9	2.0	20.9	15.9	568	9.35
904S090	VAN11004979	35.0	494.1	1.2	82.2	18.9	79.5	223	13.0	2.4	27.3	19.0	664	8.49
904S091	VAN11004979	9.1	430.0	0.9	48.4	10.6	38.6	130	8.3	1.7	20.3	13.6	592	7.33
904S092	VAN11004979	10.6	586.3	1.4	117.7	25.4	99.4	187	9.4	2.7	27.5	23.4	875	9.24
904S093	VAN11004979	36.2	538.2	2.0	206.5	42.5	154.7	219	8.8	3.2	21.1	18.5	892	11.17
904S094	VAN11004979	11.3	330.0	0.7	49.1	19.3	33.4	111	4.6	1.7	22.3	17.5	703	5.00
904S095	VAN11004979	25.0	557.4	1.3	153.2	54.7	120.3	244	8.4	2.8	33.8	35.2	1149	7.61
904S100	VAN11004979	5.1	195.4	0.7	9.3	3.4	26.6	101	1.6	0.6	20.8	18.7	676	3.58
904S101	VAN11004979	5.7	87.2	0.3	9.1	3.6	38.0	114	0.9	0.5	22.9	15.0	584	3.71
904S102	VAN11004979	4.0	66.7	0.3	15.0	2.3	15.2	80	0.7	0.3	18.9	14.4	527	3.23
904S103	VAN11004979	5.5	116.1	0.4	11.1	3.9	29.6	106	1.1	0.3	21.2	17.1	618	3.55
904S104	VAN11004979	4.8	154.5	0.6	13.4	6.2	48.9	97	1.8	0.5	25.5	15.1	556	4.04
904S105	VAN11004979	7.3	459.0	2.1	107.4	22.0	61.6	170	3.2	0.4	25.4	19.9	761	4.76
904S106	VAN11004979	168.9	849.3	6.6	746.2	46.6	258.0	267	20.7	1.1	22.8	28.7	804	4.32
904S107	VAN11004979	17.1	675.0	3.4	139.4	62.4	135.4	179	3.9	0.8	24.2	20.5	754	4.47

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Th ppm 0.1	1DX15 Sr ppm 1	1DX15 Cd ppm 0.1	1DX15 Sb ppm 0.1	1DX15 V ppm 2	1DX15 Ca % 0.01	1DX15 P % 0.001	1DX15 La ppm 1	1DX15 Cr ppm 1	1DX15 Mg % 0.01	1DX15 Ba ppm 1	1DX15 Ti % 0.001	1DX15 B ppm 1	1DX15 Al % 0.01
904S075	1.2	77	0.4	2.0	84	0.47	0.078	5	39	1.06	118	0.078	2	3.19
904S076	1.3	80	0.7	1.4	53	0.62	0.055	6	34	1.19	149	0.069	5	3.10
904S077	1.3	77	0.9	1.6	46	0.49	0.062	6	29	1.06	119	0.053	3	2.67
904S078	1.7	73	1.0	1.7	55	0.58	0.068	6	33	1.14	114	0.067	3	2.94
904S079	1.6	120	2.6	2.1	72	0.73	0.077	8	35	1.16	140	0.073	3	3.42
904S080	1.5	118	0.5	2.2	89	0.67	0.071	4	62	1.23	121	0.109	3	3.49
904S081	1.9	104	0.6	3.3	67	0.68	0.061	6	31	1.02	148	0.082	5	3.45
904S082	1.4	96	0.5	2.2	120	0.77	0.085	4	79	1.34	77	0.154	3	3.38
904S083	1.2	96	0.5	2.2	129	0.54	0.097	4	67	1.22	88	0.137	2	3.17
904S084	0.9	96	0.4	2.2	136	0.54	0.106	4	89	1.17	101	0.169	2	3.25
904S085	1.2	109	0.4	2.8	125	0.57	0.102	4	82	1.16	102	0.149	1	3.37
904S086	1.5	100	0.3	3.2	124	0.61	0.096	5	64	1.24	103	0.141	2	3.52
904S087	1.8	110	0.5	3.0	102	0.27	0.088	7	46	1.07	166	0.134	5	4.01
904SR088	2.87	0.6	123	0.2	179	1.44	0.101	3	45	1.11	165	0.160	<1	3.33
904S089	0.5	109	0.3	2.3	145	0.66	0.095	2	50	1.15	74	0.163	2	4.23
904S090	0.8	116	0.5	2.7	132	0.57	0.115	3	53	1.06	93	0.147	3	3.65
904S091	0.6	122	0.3	2.3	154	1.00	0.086	2	51	1.33	84	0.182	3	4.36
904S092	0.9	131	0.5	5.2	146	0.84	0.092	2	56	1.41	94	0.149	3	4.55
904S093	0.5	111	0.8	7.8	138	0.80	0.088	2	36	1.68	73	0.135	2	3.87
904S094	1.9	127	0.3	2.2	110	1.26	0.091	5	31	1.20	106	0.151	2	3.81
904S095	1.3	100	0.6	3.6	136	0.75	0.108	5	33	1.33	133	0.184	3	3.99
904S100	2.3	118	0.5	2.3	54	0.46	0.068	7	18	0.98	117	0.058	4	2.24
904S101	1.9	120	0.3	1.7	60	0.46	0.065	5	20	1.01	103	0.085	4	2.36
904S102	2.0	100	0.3	1.4	60	0.49	0.058	5	21	0.93	102	0.083	3	1.94
904S103	2.5	131	0.4	2.0	56	0.43	0.067	6	21	0.97	198	0.065	3	2.20
904S104	1.6	217	0.3	2.1	56	0.57	0.080	6	21	1.00	135	0.096	4	2.72
904S105	3.6	55	0.7	4.3	82	0.56	0.076	8	29	0.91	98	0.127	3	2.80
904S106	2.8	100	2.3	17.3	64	0.31	0.079	10	25	0.64	125	0.088	4	2.32
904S107	2.3	88	0.8	5.5	76	0.41	0.097	6	27	0.76	104	0.116	3	2.65

APPENDIX II - Talus Geochemistry

	1DX15	1DX15	1DX15	1DX15	1DX15	1DX15	1DX15	1DX15	1DX15
	Na	**K**	**W**	**Hg**	**Sc**	**Tl**	**S**	**Ga**	**Se**
Sample ID	%	%	ppm	ppm	ppm	ppm	%	ppm	ppm
	0.001	0.01	0.10	0.01	0.1	0.1	0.05	1	0.5
904S075	0.087	0.21	0.40	0.02	4.0	0.2	0.06	7	0.6
904S076	0.130	0.40	0.20	<0.01	3.4	0.2	0.05	7	<0.5
904S077	0.086	0.27	0.20	0.01	2.9	0.2	0.05	6	<0.5
904S078	0.108	0.29	0.20	0.02	3.3	0.2	0.07	7	<0.5
904S079	0.140	0.31	0.30	0.02	3.7	0.3	0.10	8	0.9
904S080	0.144	0.34	0.20	<0.01	4.3	0.2	0.24	8	0.7
904S081	0.154	0.43	0.20	0.02	3.7	0.3	0.17	8	1.0
904S082	0.133	0.24	0.40	<0.01	5.8	0.2	0.15	9	0.7
904S083	0.102	0.22	0.80	<0.01	5.5	0.3	0.17	10	1.5
904S084	0.105	0.23	0.80	<0.01	5.3	0.3	0.14	9	1.3
904S085	0.106	0.28	1.00	0.02	4.9	0.3	0.21	9	0.9
904S086	0.118	0.32	0.80	0.02	5.6	0.4	0.14	10	0.8
904S087	0.060	0.35	2.10	0.02	5.8	0.4	0.11	10	0.9
904SR088	0.304	0.52	0.5	<0.01	11.9	0.6	0.25	10	<0.5
904S089	0.154	0.29	3.30	<0.01	7.5	0.4	0.35	11	1.3
904S090	0.130	0.27	3.10	0.03	6.4	0.4	0.32	11	2.1
904S091	0.243	0.40	2.60	<0.01	8.2	0.6	0.32	11	1.0
904S092	0.201	0.42	3.20	<0.01	8.7	0.5	0.27	12	1.7
904S093	0.171	0.41	6.30	<0.01	6.8	0.5	0.33	11	1.5
904S094	0.255	0.44	2.00	<0.01	6.6	0.4	0.16	10	0.6
904S095	0.158	0.65	2.30	0.01	7.2	0.6	0.14	11	0.7
904S100	0.073	0.23	0.20	0.01	3.4	0.2	0.36	6	0.5
904S101	0.105	0.22	0.20	0.02	3.5	0.2	0.39	6	0.7
904S102	0.100	0.18	0.20	<0.01	3.6	0.1	0.42	5	0.8
904S103	0.073	0.22	0.20	<0.01	3.6	0.2	0.21	6	0.7
904S104	0.094	0.22	0.40	0.03	3.4	0.2	0.12	6	0.8
904S105	0.096	0.36	7.30	<0.01	5.9	0.3	<0.05	8	<0.5
904S106	0.053	0.36	74.10	0.08	4.2	0.4	0.11	6	0.9
904S107	0.083	0.30	25.60	0.04	4.8	0.3	0.08	7	1.0

APPENDIX II - Talus Geochemistry

Sample ID	Lab Report #	1DX15 Au ppb 0.5	1DX15 Cu ppm 0.1	1DX15 Ag ppm 0.1	1DX15 As ppm 0.5	1DX15 Mo ppm 0.1	1DX15 Pb ppm 0.1	1DX15 Zn ppm 1	1DX15 Bi ppm 0.1	1DX15 Te ppm 0.2	1DX15 Ni ppm 0.1	1DX15 Co ppm 0.1	1DX15 Mn ppm 1	1DX15 Fe % 0.01
904S108	VAN11004979	3.9	329.5	1.4	55.5	23.3	86.7	163	2.2	0.4	22.1	15.7	899	5.12
904S109	VAN11004979	1.8	340.0	0.9	44.7	26.8	56.0	141	0.8	0.3	27.1	18.7	650	3.93
904S110	VAN11004979	67.6	718.9	2.1	359.5	35.9	163.7	336	2.4	0.5	31.7	27.5	904	5.17
904S111	VAN11004979	47.9	482.8	3.3	637.1	37.3	190.6	248	3.3	0.5	24.7	17.2	776	4.90
904S112	VAN11004979	33.9	370.6	2.1	561.4	21.5	271.7	220	1.9	0.3	20.3	13.3	702	4.23
904S113	VAN11004979	8.1	314.0	2.5	190.5	21.3	94.9	191	7.8	0.4	4.6	9.0	882	2.35
904S114	VAN11004979	8.5	242.6	2.3	179.2	15.5	116.1	207	11.6	0.9	2.5	5.6	698	2.49
904S115	VAN11004979	38.1	119.3	2.3	419.5	9.7	220.1	200	4.5	0.4	1.6	3.8	603	1.91
904S130	VAN11004979	7.7	501.8	1.1	159.6	3.3	14.9	86	5.7	2.4	13.1	10.4	1039	3.09
904S131	VAN11004979	17.9	802.1	0.8	125.5	9.4	30.5	82	3.0	1.1	35.7	34.6	1020	4.74
904S132	VAN11004979	3.0	125.6	0.3	8.7	2.4	7.0	71	0.8	0.3	34.2	21.8	590	3.73
904S133	VAN11004979	3.9	191.9	0.4	27.2	2.9	30.6	107	1.3	0.5	28.4	17.9	786	4.06
904S134	VAN11004979	2.2	124.9	0.2	11.6	2.5	15.0	89	0.9	0.3	32.3	18.6	637	4.01
904S135	VAN11004979	10.0	1120.3	1.2	190.2	66.5	63.0	308	5.0	1.5	34.7	79.2	1572	7.81
904S136	VAN11004979	70.3	618.6	2.1	908.4	29.3	226.1	316	2.1	0.6	22.6	31.0	1472	5.07
904S137	VAN11004979	10.5	725.2	1.6	214.1	56.7	62.8	631	15.9	3.8	22.2	21.5	914	8.98
904S138	VAN11004979	5.6	457.5	1.0	117.4	32.5	41.9	124	4.8	2.5	24.2	20.6	722	4.95
904S139	VAN11004979	8.4	868.0	7.4	204.6	90.2	406.4	411	11.8	1.8	26.2	21.9	1695	6.55
904S140	VAN11004979	5.8	702.4	2.4	85.1	49.8	157.3	290	4.5	0.9	27.7	29.0	1229	6.61
904S141	VAN11004979	12.1	940.5	5.3	174.9	58.9	225.1	363	5.8	0.9	24.9	30.4	1383	4.81
904S142	VAN11004979	5.0	486.0	1.5	80.5	29.6	123.6	256	2.5	0.5	26.6	23.2	957	5.02
904S143	VAN11004979	4.6	455.3	4.6	22.5	82.8	676.0	252	6.0	0.5	12.6	12.6	838	9.47
904S144	VAN11004979	11.7	738.5	2.4	134.2	71.8	158.1	317	3.9	0.4	27.7	29.7	1115	6.12
904S145	VAN11004979	9.2	1174.5	2.0	198.3	65.4	113.6	187	4.0	0.9	21.9	18.6	1459	4.88
904S146	VAN11004979	19.4	429.4	3.3	643.4	55.1	130.3	191	4.1	0.4	7.6	11.8	647	3.21
904S147	VAN11004979	71.6	559.4	3.8	1014.8	30.8	206.2	288	3.9	0.3	4.8	9.1	1235	2.30
904S148	VAN11004979	16.6	446.2	2.1	291.8	24.9	130.2	301	5.5	0.4	10.6	14.5	1411	3.36
904S149	VAN11004979	8.9	343.9	2.8	223.1	21.8	80.1	211	8.6	0.4	3.6	8.4	1130	2.33
904S150	VAN11004979	8.5	255.9	1.6	82.2	11.8	59.8	236	6.1	0.3	1.2	5.5	1079	2.23

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Th ppm 0.1	1DX15 Sr ppm 1	1DX15 Cd ppm 0.1	1DX15 Sb ppm 0.1	1DX15 V ppm 2	1DX15 Ca % 0.01	1DX15 P % 0.001	1DX15 La ppm 1	1DX15 Cr ppm 1	1DX15 Mg % 0.01	1DX15 Ba ppm 1	1DX15 Ti % 0.001	1DX15 B ppm 1	1DX15 Al % 0.01
904S108	2.2	89	0.4	1.7	151	0.72	0.092	5	37	1.14	186	0.230	4	3.00
904S109	1.8	105	0.6	1.2	126	1.21	0.096	6	41	0.96	185	0.231	3	3.09
904S110	2.2	140	2.0	10.7	140	0.90	0.103	7	48	1.07	153	0.172	2	3.63
904S111	3.0	78	2.1	38.3	129	0.69	0.099	8	49	0.86	152	0.158	3	2.67
904S112	2.4	85	1.9	13.0	140	0.79	0.094	7	39	0.86	133	0.157	2	2.70
904S113	7.0	16	1.8	6.7	22	0.12	0.029	16	5	0.21	65	0.040	2	0.82
904S114	7.8	11	1.2	6.3	12	0.05	0.028	17	4	0.12	55	0.019	3	0.70
904S115	7.1	12	2.9	19.6	9	0.07	0.020	16	3	0.10	59	0.015	2	0.55
904S130	3.4	22	0.5	27.3	34	0.31	0.054	12	11	0.66	83	0.014	4	1.57
904S131	3.2	191	0.3	7.8	82	0.63	0.077	10	31	1.25	116	0.078	7	3.22
904S132	1.0	176	0.1	1.2	49	0.55	0.060	4	26	1.07	74	0.084	2	2.75
904S133	1.4	143	0.4	2.7	62	0.59	0.078	7	21	1.22	147	0.104	2	2.91
904S134	1.0	118	0.3	1.3	54	0.50	0.070	4	24	1.16	88	0.099	3	2.73
904S135	0.4	753	2.3	4.5	175	1.11	0.073	3	33	1.64	151	0.169	3	4.80
904S136	3.1	71	3.6	50.1	93	0.53	0.079	7	24	1.01	81	0.102	3	2.81
904S137	0.5	152	1.8	4.7	97	0.97	0.115	3	41	1.08	85	0.156	1	3.28
904S138	1.6	91	0.5	2.5	109	1.08	0.097	5	48	1.11	101	0.212	2	3.22
904S139	1.5	86	0.8	5.3	114	0.80	0.090	5	61	1.14	90	0.177	3	3.19
904S140	0.8	128	0.9	2.5	132	0.76	0.107	3	40	1.10	106	0.190	2	2.98
904S141	2.7	98	1.8	5.2	96	0.63	0.073	7	34	0.98	110	0.138	2	2.86
904S142	2.4	107	0.7	2.4	114	0.80	0.085	6	33	1.16	131	0.177	3	3.37
904S143	1.0	82	0.9	1.0	191	0.84	0.119	4	34	1.16	243	0.275	2	2.90
904S144	1.9	91	1.5	2.8	132	0.81	0.107	6	37	0.96	156	0.195	2	3.18
904S145	5.8	34	1.0	3.0	71	0.24	0.087	23	54	0.46	100	0.122	<1	1.67
904S146	6.9	24	2.0	17.1	29	0.13	0.046	18	11	0.22	59	0.040	5	1.12
904S147	8.2	16	5.1	42.9	12	0.11	0.023	24	8	0.09	46	0.011	2	0.64
904S148	6.1	32	2.9	7.7	67	0.32	0.048	17	18	0.43	81	0.083	1	1.67
904S149	7.7	14	2.3	6.1	16	0.11	0.026	20	4	0.17	56	0.024	3	0.90
904S150	6.8	8	2.5	4.1	8	0.09	0.018	17	2	0.10	48	0.008	2	0.77

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Na % 0.001	1DX15 K % 0.01	1DX15 W ppm 0.10	1DX15 Hg ppm 0.01	1DX15 Sc ppm 0.1	1DX15 Tl ppm 0.1	1DX15 S % 0.05	1DX15 Ga ppm 1	1DX15 Se ppm 0.5
904S108	0.170	0.85	3.20	0.01	9.7	0.6	0.11	9	<0.5
904S109	0.279	0.69	16.50	<0.01	8.3	0.5	0.09	8	0.6
904S110	0.190	0.74	12.10	<0.01	9.3	0.8	0.09	10	<0.5
904S111	0.133	0.61	5.80	0.01	7.6	0.6	0.13	8	<0.5
904S112	0.175	0.57	3.60	0.02	7.3	0.5	0.13	9	<0.5
904S113	0.036	0.17	2.90	0.01	2.0	0.2	<0.05	3	0.7
904S114	0.033	0.13	2.30	0.01	1.9	0.1	0.07	3	0.8
904S115	0.037	0.13	0.80	0.02	1.5	0.1	0.06	3	0.6
904S130	0.018	0.22	2.60	0.15	2.3	0.3	<0.05	6	<0.5
904S131	0.073	0.42	2.40	0.02	5.8	0.6	<0.05	9	<0.5
904S132	0.059	0.20	0.20	<0.01	3.2	0.1	<0.05	6	<0.5
904S133	0.089	0.19	0.40	0.02	3.7	0.1	0.07	7	<0.5
904S134	0.082	0.19	0.30	<0.01	3.4	0.1	0.05	7	<0.5
904S135	0.180	0.63	56.10	<0.01	10.2	0.9	0.10	11	1.8
904S136	0.092	0.40	16.10	0.03	6.2	0.5	0.06	9	<0.5
904S137	0.168	0.28	66.40	0.01	4.1	0.5	0.33	11	2.0
904S138	0.254	0.54	42.10	<0.01	7.2	0.6	0.25	9	0.7
904S139	0.152	0.44	32.10	0.02	6.6	0.4	0.11	10	1.7
904S140	0.138	0.53	>100.0	<0.01	6.3	0.5	0.16	9	1.2
904S141	0.124	0.50	23.50	0.01	6.2	0.5	0.05	8	<0.5
904S142	0.161	0.60	8.30	0.02	7.3	0.6	<0.05	9	<0.5
904S143	0.204	0.94	10.20	0.02	9.4	0.6	0.39	9	2.9
904S144	0.166	0.61	18.50	0.01	7.5	0.5	0.09	9	<0.5
904S145	0.054	0.27	20.10	<0.01	5.0	0.3	0.08	6	0.7
904S146	0.046	0.16	7.40	0.03	2.7	0.2	0.06	4	0.7
904S147	0.029	0.12	3.70	0.05	1.8	0.2	<0.05	2	0.7
904S148	0.080	0.31	2.50	0.03	4.4	0.3	0.06	5	<0.5
904S149	0.038	0.16	1.90	0.02	2.1	0.2	<0.05	3	0.6
904S150	0.037	0.14	0.60	0.02	1.6	0.1	<0.05	3	0.5

APPENDIX II - Talus Geochemistry

Sample ID	Lab Report #	1DX15 Au ppb 0.5	1DX15 Cu ppm 0.1	1DX15 Ag ppm 0.1	1DX15 As ppm 0.5	1DX15 Mo ppm 0.1	1DX15 Pb ppm 0.1	1DX15 Zn ppm 1	1DX15 Bi ppm 0.1	1DX15 Te ppm 0.2	1DX15 Ni ppm 0.1	1DX15 Co ppm 0.1	1DX15 Mn ppm 1	1DX15 Fe % 0.01
904S151	VAN11004979	0.9	69.8	0.2	41.5	1.3	18.3	89	2.7	<0.2	24.8	10.9	501	3.27
904S152	VAN11004979	6.9	83.0	0.4	88.8	1.9	32.5	106	4.9	0.4	26.5	15.6	618	3.61
904S153	VAN11004979	2.9	49.3	<0.1	11.8	1.0	13.9	76	0.5	<0.2	24.6	12.7	558	3.78
904S154	VAN11004979	3.2	48.1	0.1	20.2	0.7	17.0	109	0.8	<0.2	18.7	10.0	605	2.54
904S155	VAN11004979	3.6	216.3	0.8	169.0	1.7	47.8	221	15.5	0.2	23.2	13.6	804	4.83
904S156	VAN11004979	2.7	271.0	1.8	305.7	2.5	122.8	355	36.7	0.6	26.2	16.8	914	5.10
904S157	VAN11004979	6.9	202.0	1.0	271.8	3.9	107.4	261	7.5	0.4	21.3	16.8	753	4.07
904S158	VAN11004979	3.0	183.0	0.6	142.6	1.7	60.1	191	5.0	0.3	23.6	15.0	690	4.02
904S159	VAN11004979	59.5	6640.3	6.3	265.6	6.2	467.6	4941	10.5	0.8	63.7	17.2	788	4.20
904S160	VAN11004979	16.1	2477.0	4.1	277.9	12.8	216.2	1894	22.4	0.7	23.6	7.3	523	2.72
904S161	VAN11004979	11.3	212.6	1.8	362.7	9.3	44.3	187	3.0	<0.2	5.3	7.9	1318	1.80
904S162	VAN11004979	15.6	138.6	0.9	679.4	8.0	47.6	157	2.4	<0.2	6.3	5.4	382	2.55
904S163	VAN11004979	10.2	96.5	0.8	256.7	6.4	64.5	147	2.1	<0.2	10.8	8.4	538	2.16
904S164	VAN11004979	22.8	149.0	1.2	477.7	8.3	84.5	209	2.6	0.3	7.1	8.6	703	2.90
904S165	VAN11004979	1.9	64.0	0.3	101.0	1.8	10.6	66	0.4	<0.2	0.8	3.5	560	1.12
904S167	VAN11004979	5.8	99.5	0.7	280.1	12.3	52.7	99	4.2	0.5	3.2	4.6	629	2.15
904S168	VAN11004979	81.6	182.5	8.1	2299.2	12.7	169.4	166	19.0	0.6	5.8	6.9	469	4.93
904S169	VAN11004979	25.4	176.9	2.3	1094.0	7.4	160.2	206	4.1	0.7	14.1	13.6	727	5.14
904S170	VAN11004979	24.4	140.8	2.5	968.8	14.0	115.6	106	6.5	0.2	2.5	3.9	348	2.50
904S175	VAN11004979	3.2	135.0	0.7	74.8	1.7	60.2	174	3.6	0.6	29.2	20.2	886	3.93
904S176	VAN11004979	4.9	143.6	0.7	101.5	2.2	57.7	182	5.4	0.5	30.1	19.1	767	4.55
904S177	VAN11004979	2.4	135.6	0.5	144.4	2.3	40.1	139	6.8	0.4	25.9	16.3	628	4.14
904S178	VAN11004979	2.3	71.5	0.2	50.7	1.6	23.3	108	2.3	0.2	26.8	14.5	566	3.56
904S179	VAN11004979	0.9	58.7	0.2	27.2	1.0	14.7	102	1.2	0.2	31.0	14.0	628	3.52
904S180	VAN11004979	5.3	108.6	0.5	57.3	1.3	35.0	221	3.4	0.4	29.4	16.3	986	4.20
904S181	VAN11004979	3.4	158.3	0.7	84.7	1.8	38.9	262	4.4	0.2	23.0	15.9	949	4.09
904S182	VAN11004979	2.9	205.4	0.8	223.4	1.9	40.3	216	24.7	0.3	23.2	14.0	688	4.78
904S183	VAN11004979	2.6	303.8	2.2	394.4	3.5	126.4	349	36.6	0.6	27.8	21.1	918	5.27
904S184	VAN11004979	3.2	288.2	1.1	233.2	3.7	98.4	271	5.0	0.3	30.8	22.6	670	6.14

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Th ppm 0.1	1DX15 Sr ppm 1	1DX15 Cd ppm 0.1	1DX15 Sb ppm 0.1	1DX15 V ppm 2	1DX15 Ca % 0.01	1DX15 P % 0.001	1DX15 La ppm 1	1DX15 Cr ppm 1	1DX15 Mg % 0.01	1DX15 Ba ppm 1	1DX15 Ti % 0.001	1DX15 B ppm 1	1DX15 Al % 0.01
904S151	2.9	33	0.3	1.3	68	0.44	0.061	7	34	0.78	54	0.120	2	2.35
904S152	2.9	65	0.7	4.5	71	0.47	0.074	10	31	0.72	92	0.123	4	2.46
904S153	2.2	54	0.5	1.3	81	0.79	0.090	6	34	0.86	72	0.150	3	2.62
904S154	1.9	43	0.2	1.0	62	0.47	0.072	6	24	0.57	51	0.142	2	1.80
904S155	1.9	72	1.0	2.1	120	0.86	0.080	7	35	1.02	82	0.149	1	3.52
904S156	2.4	59	1.7	6.1	107	0.61	0.085	9	38	0.83	83	0.119	3	3.15
904S157	3.5	60	1.9	8.8	85	0.53	0.068	11	26	0.65	93	0.112	2	2.65
904S158	3.0	69	1.0	5.2	92	0.78	0.071	8	32	0.78	83	0.108	1	3.00
904S159	4.9	57	3.1	12.1	76	0.39	0.058	14	25	0.53	95	0.111	2	2.23
904S160	6.3	25	2.0	9.7	29	0.23	0.031	16	10	0.22	69	0.043	2	1.08
904S161	6.3	15	1.7	24.9	16	0.09	0.018	24	5	0.12	150	0.026	3	0.76
904S162	8.8	24	0.9	30.5	19	0.12	0.026	28	6	0.15	121	0.029	3	0.92
904S163	5.6	36	1.2	16.0	31	0.30	0.025	20	10	0.22	86	0.046	2	1.26
904S164	6.8	18	1.8	22.7	37	0.13	0.039	15	7	0.28	52	0.043	2	1.16
904S165	8.9	8	0.7	5.5	4	0.08	0.013	51	2	0.10	99	0.017	<1	0.78
904S167	7.8	9	0.7	14.5	13	0.03	0.022	16	4	0.08	55	0.019	1	0.57
904S168	11.6	28	1.3	71.4	42	0.08	0.051	25	6	0.20	119	0.032	3	1.16
904S169	5.8	51	1.5	49.2	86	0.34	0.074	12	17	0.59	148	0.084	2	2.09
904S170	8.7	15	1.3	26.2	12	0.05	0.025	28	3	0.10	91	0.019	2	0.63
904S175	2.7	34	0.9	2.2	81	0.38	0.057	7	30	0.80	49	0.109	1	2.31
904S176	2.4	45	1.0	3.3	91	0.43	0.067	8	36	0.84	73	0.139	2	2.69
904S177	2.9	42	0.8	3.3	72	0.38	0.073	9	29	0.78	57	0.109	1	2.37
904S178	2.7	41	0.4	2.4	73	0.44	0.071	8	31	0.77	60	0.130	1	2.39
904S179	2.4	43	0.2	1.8	74	0.56	0.085	7	37	0.90	70	0.153	2	2.58
904S180	2.5	58	1.4	2.8	88	0.68	0.079	8	37	0.99	75	0.165	2	2.77
904S181	2.7	49	1.7	2.9	85	0.59	0.072	8	26	0.94	69	0.131	2	2.77
904S182	2.3	61	1.0	2.3	108	0.66	0.081	7	33	0.99	81	0.157	2	3.31
904S183	2.2	69	2.3	5.4	116	0.61	0.081	8	35	0.85	87	0.120	2	3.17
904S184	2.0	77	2.0	4.9	118	0.61	0.095	6	34	0.84	121	0.098	2	3.36

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Na % 0.001	1DX15 K % 0.01	1DX15 W ppm 0.10	1DX15 Hg ppm 0.01	1DX15 Sc ppm 0.1	1DX15 Tl ppm 0.1	1DX15 S % 0.05	1DX15 Ga ppm 1	1DX15 Se ppm 0.5
904S151	0.124	0.26	0.70	<0.01	4.8	0.3	<0.05	8	<0.5
904S152	0.100	0.25	0.70	0.03	4.8	0.3	<0.05	8	0.6
904S153	0.210	0.34	0.40	0.01	5.5	0.3	<0.05	8	<0.5
904S154	0.139	0.20	0.50	0.02	3.6	0.2	<0.05	6	<0.5
904S155	0.204	0.34	3.60	<0.01	7.2	0.3	<0.05	11	<0.5
904S156	0.136	0.32	1.50	<0.01	6.4	0.3	<0.05	9	<0.5
904S157	0.110	0.23	2.50	0.03	5.5	0.3	<0.05	7	0.7
904S158	0.180	0.30	1.50	0.01	5.9	0.2	<0.05	8	<0.5
904S159	0.073	0.23	2.20	0.02	5.1	0.2	<0.05	7	<0.5
904S160	0.058	0.15	1.70	0.02	2.7	0.2	<0.05	4	0.6
904S161	0.033	0.12	1.70	0.04	1.9	0.3	<0.05	2	<0.5
904S162	0.026	0.16	0.70	0.05	2.9	0.2	0.09	3	<0.5
904S163	0.087	0.14	0.70	0.03	2.6	0.2	0.08	4	<0.5
904S164	0.041	0.14	2.30	0.05	3.0	0.1	<0.05	4	<0.5
904S165	0.035	0.15	1.30	0.01	2.4	0.2	<0.05	3	<0.5
904S167	0.038	0.11	0.60	0.03	1.7	0.1	<0.05	2	0.6
904S168	0.051	0.29	0.80	0.09	3.6	0.4	0.28	4	0.6
904S169	0.087	0.27	0.90	0.28	5.2	0.4	0.16	6	<0.5
904S170	0.040	0.18	0.50	0.03	2.4	0.2	0.08	2	<0.5
904S175	0.081	0.25	0.70	0.01	4.3	0.3	<0.05	7	0.6
904S176	0.120	0.30	1.00	<0.01	5.6	0.3	<0.05	8	<0.5
904S177	0.082	0.24	1.20	<0.01	4.7	0.2	<0.05	8	<0.5
904S178	0.120	0.30	0.60	0.02	5.1	0.3	<0.05	8	<0.5
904S179	0.141	0.31	0.50	0.02	5.2	0.3	<0.05	9	<0.5
904S180	0.153	0.34	1.20	0.01	6.2	0.3	<0.05	9	0.5
904S181	0.128	0.29	0.90	0.01	5.6	0.4	<0.05	8	<0.5
904S182	0.158	0.32	3.20	0.01	6.8	0.3	<0.05	10	<0.5
904S183	0.141	0.28	1.40	0.01	6.2	0.3	<0.05	9	0.6
904S184	0.166	0.34	1.60	<0.01	6.3	0.3	0.13	9	0.6

APPENDIX II - Talus Geochemistry

Sample ID	Lab Report #	1DX15 Au ppb 0.5	1DX15 Cu ppm 0.1	1DX15 Ag ppm 0.1	1DX15 As ppm 0.5	1DX15 Mo ppm 0.1	1DX15 Pb ppm 0.1	1DX15 Zn ppm 1	1DX15 Bi ppm 0.1	1DX15 Te ppm 0.2	1DX15 Ni ppm 0.1	1DX15 Co ppm 0.1	1DX15 Mn ppm 1	1DX15 Fe % 0.01
904S185	VAN11004979	9.8	294.4	0.9	436.6	4.7	110.4	275	9.9	0.5	29.0	21.2	755	4.81
904S186	VAN11004979	9.3	314.7	1.4	380.3	6.0	122.5	249	8.6	0.7	30.4	26.2	807	4.75
904S187	VAN11004979	6.5	247.4	1.9	256.8	6.2	175.0	282	5.2	0.4	27.1	19.9	975	4.30
904S188	VAN11004979	41.7	209.6	4.9	743.7	4.9	160.2	311	12.1	0.5	20.4	15.6	684	4.76
904S189	VAN11004979	66.7	136.3	3.5	1989.7	4.0	140.2	192	4.6	0.3	25.3	19.3	782	4.36
904S190	VAN11004979	59.0	307.5	7.9	1682.6	11.7	182.2	302	11.3	0.7	20.5	20.5	904	5.01
904S191	VAN11004979	8.9	180.2	1.2	268.0	10.5	89.8	239	2.3	0.3	8.8	12.4	901	4.30
904S192	VAN11004979	10.9	162.0	1.3	853.7	14.3	109.5	178	4.4	0.4	3.5	3.0	193	3.80
904S193	VAN11004979	36.3	119.4	4.7	1078.5	8.3	126.5	156	9.6	0.5	4.7	4.4	318	4.67
904S194	VAN11004979	22.2	222.7	2.5	968.7	7.5	124.3	192	8.5	0.5	9.4	10.2	515	4.95
904S195	VAN11004979	64.2	161.9	2.7	2436.8	7.2	191.0	174	5.1	0.7	4.2	5.2	410	4.69
Pulp Duplicates:														
904S089	VAN11004979	6.2	520.1	1.0	61.8	5.3	65.1	147	12.9	2.0	20.9	15.9	568	9.35
904S089	VAN11004979	5.7	531.2	1.0	62.5	5.5	66.8	150	13.2	2.1	21.0	16.3	578	9.60
904S110	VAN11004979	67.6	718.9	2.1	359.5	35.9	163.7	336	2.4	0.5	31.7	27.5	904	5.17
904S110	VAN11004979	20.9	691.8	2.0	346.5	33.9	162.6	327	2.4	0.5	30.2	26.7	871	5.01
904S061	VAN11004979	3.2	205.0	0.7	25.6	2.7	56.8	173	3.5	0.6	33.9	19.1	806	4.49
904S061	VAN11004979	2.7	207.5	0.7	25.6	2.9	55.5	176	3.5	0.7	34.7	19.0	797	4.50
904S081	VAN11004979	2.4	98.7	0.3	18.4	2.5	48.7	147	1.3	0.4	29.0	14.5	567	4.01
904S081	VAN11004979	1.4	96.4	0.3	17.8	2.3	44.2	144	1.2	0.5	28.4	14.2	556	3.93
904S143	VAN11004979	4.6	455.3	4.6	22.5	82.8	676.0	252	6.0	0.5	12.6	12.6	838	9.47
904S143	VAN11004979	5.0	462.5	4.9	22.1	84.4	680.5	255	6.1	0.5	12.1	13.0	842	9.56
904S170	VAN11004979	24.4	140.8	2.5	968.8	14.0	115.6	106	6.5	0.2	2.5	3.9	348	2.50
904S170	VAN11004979	28.7	142.6	2.6	1001.0	14.7	116.7	106	6.9	0.5	2.7	3.8	362	2.55
904S019	VAN11004979	2.4	192.3	0.2	76.1	2.3	8.1	57	1.2	1.4	27.0	22.5	309	5.12

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Th ppm 0.1	1DX15 Sr ppm 1	1DX15 Cd ppm 0.1	1DX15 Sb ppm 0.1	1DX15 V ppm 2	1DX15 Ca % 0.01	1DX15 P % 0.001	1DX15 La ppm 1	1DX15 Cr ppm 1	1DX15 Mg % 0.01	1DX15 Ba ppm 1	1DX15 Ti % 0.001	1DX15 B ppm 1	1DX15 Al % 0.01
904S185	3.3	52	2.0	8.8	94	0.45	0.067	10	33	0.75	94	0.111	2	2.55
904S186	3.9	59	2.0	10.4	90	0.45	0.073	12	30	0.62	91	0.105	2	2.55
904S187	4.4	55	2.2	6.1	89	0.62	0.072	10	31	0.74	91	0.103	2	2.53
904S188	5.5	46	2.4	13.8	64	0.42	0.067	10	23	0.49	181	0.061	5	1.73
904S189	3.9	57	1.7	59.6	80	0.57	0.071	11	26	0.67	122	0.078	4	2.22
904S190	6.8	35	2.7	58.4	76	0.20	0.070	17	17	0.49	111	0.077	2	1.77
904S191	6.4	21	0.9	6.2	64	0.12	0.065	8	8	0.44	71	0.061	4	1.59
904S192	13.5	15	1.1	23.9	17	0.05	0.033	20	4	0.09	48	0.015	4	0.67
904S193	10.5	32	0.5	16.4	38	0.14	0.057	17	6	0.18	101	0.031	4	1.00
904S194	11.9	60	1.4	28.0	48	0.40	0.065	27	10	0.25	109	0.051	4	1.51
904S195	8.1	34	2.3	97.9	62	0.14	0.062	17	8	0.33	247	0.042	5	1.27
Pulp Duplicate														
904S089	0.5	109	0.3	2.3	145	0.66	0.095	2	50	1.15	74	0.163	2	4.23
904S089	0.6	109	0.3	2.1	147	0.65	0.100	2	50	1.19	76	0.150	3	4.30
904S110	2.2	140	2.0	10.7	140	0.90	0.103	7	48	1.07	153	0.172	2	3.63
904S110	2.1	135	2.1	10.6	135	0.88	0.097	6	46	1.03	145	0.162	3	3.49
904S061	1.4	103	0.8	2.4	90	0.70	0.081	5	49	1.22	101	0.108	2	3.21
904S061	1.4	104	0.7	2.4	91	0.71	0.081	5	50	1.21	101	0.109	3	3.18
904S081	1.9	104	0.6	3.3	67	0.68	0.061	6	31	1.02	148	0.082	5	3.45
904S081	1.7	97	0.4	3.1	65	0.66	0.061	5	31	1.01	141	0.080	4	3.36
904S143	1.0	82	0.9	1.0	191	0.84	0.119	4	34	1.16	243	0.275	2	2.90
904S143	1.0	80	0.9	0.9	192	0.84	0.121	4	34	1.18	229	0.274	2	2.92
904S170	8.7	15	1.3	26.2	12	0.05	0.025	28	3	0.10	91	0.019	2	0.63
904S170	8.8	15	1.5	27.5	13	0.05	0.025	29	4	0.10	97	0.019	<1	0.63
904S019	0.6	217	<0.1	1.3	153	1.85	0.102	3	44	1.04	103	0.147	4	4.57

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Na % 0.001	1DX15 K % 0.01	1DX15 W ppm 0.10	1DX15 Hg ppm 0.01	1DX15 Sc ppm 0.1	1DX15 Tl ppm 0.1	1DX15 S % 0.05	1DX15 Ga ppm 1	1DX15 Se ppm 0.5
904S185	0.095	0.29	3.90	0.01	5.5	0.3	0.05	7	<0.5
904S186	0.101	0.23	3.10	0.02	5.1	0.2	0.05	7	0.6
904S187	0.131	0.26	1.00	0.01	5.4	0.2	0.05	7	<0.5
904S188	0.088	0.44	0.80	0.04	4.1	0.3	0.43	5	<0.5
904S189	0.110	0.35	0.70	0.22	5.0	0.3	0.17	6	<0.5
904S190	0.050	0.26	1.20	0.10	4.7	0.3	0.21	6	<0.5
904S191	0.042	0.16	0.60	0.02	4.5	0.1	0.07	5	0.6
904S192	0.028	0.12	3.80	0.03	2.3	0.1	0.06	3	1.1
904S193	0.060	0.35	0.60	0.04	3.0	0.4	0.37	4	0.9
904S194	0.132	0.20	1.50	0.07	3.7	0.2	0.27	5	<0.5
904S195	0.046	0.25	0.70	0.75	4.8	0.7	0.23	4	0.9
Pulp Duplicate									
904S089	0.154	0.29	3.30	<0.01	7.5	0.4	0.35	11	1.3
904S089	0.154	0.30	3.00	<0.01	7.3	0.4	0.36	11	1.5
904S110	0.190	0.74	12.10	<0.01	9.3	0.8	0.09	10	<0.5
904S110	0.185	0.71	12.00	<0.01	9.3	0.7	0.08	10	<0.5
904S061	0.137	0.25	0.50	0.01	4.3	0.3	0.09	8	0.9
904S061	0.138	0.25	0.50	0.01	4.4	0.3	0.09	8	<0.5
904S081	0.154	0.43	0.20	0.02	3.7	0.3	0.17	8	1.0
904S081	0.150	0.42	0.20	0.02	3.8	0.3	0.16	8	1.0
904S143	0.204	0.94	10.20	0.02	9.4	0.6	0.39	9	2.9
904S143	0.203	0.95	10.00	0.03	9.6	0.6	0.40	9	1.5
904S170	0.040	0.18	0.50	0.03	2.4	0.2	0.08	2	<0.5
904S170	0.042	0.18	0.60	0.04	2.3	0.2	0.08	2	<0.5
904S019	0.363	0.38	0.30	<0.01	8.4	0.3	0.34	11	0.8

APPENDIX II - Talus Geochemistry

Sample ID	Lab Report #	1DX15 Au ppb 0.5	1DX15 Cu ppm 0.1	1DX15 Ag ppm 0.1	1DX15 As ppm 0.5	1DX15 Mo ppm 0.1	1DX15 Pb ppm 0.1	1DX15 Zn ppm 1	1DX15 Bi ppm 0.1	1DX15 Te ppm 0.2	1DX15 Ni ppm 0.1	1DX15 Co ppm 0.1	1DX15 Mn ppm 1	1DX15 Fe % 0.01
904S019	VAN11004979	2.2	209.1	0.3	83.8	2.9	8.7	67	1.3	1.4	30.1	24.3	343	5.69
904S038	VAN11004979	3.3	359.5	0.9	65.0	2.8	11.0	56	3.0	2.4	16.0	15.9	305	7.12
904S038	VAN11004979	4.3	370.5	1.0	65.7	3.1	11.5	58	3.2	2.5	16.4	16.7	322	7.39
Lab Standards:														
STD DS8	VAN11004979	91.9	109.6	1.6	22.8	12.8	109.8	282	5.8	4.0	38.0	7.7	566	2.34
STD DS8	VAN11004979	101.7	103.6	1.6	28.0	12.9	115.7	286	6.0	4.4	36.3	7.4	582	2.35
STD DS8	VAN11004979	113.2	116.5	1.9	26.3	13.9	125.4	325	6.8	5.9	40.7	8.1	653	2.66
STD DS8	VAN11004979	102.0	111.2	1.7	24.6	13.5	123.0	297	6.9	5.0	38.0	7.3	602	2.52
STD DS8	VAN11004979	128.9	107.6	1.8	25.4	12.9	120.6	298	6.6	4.7	36.1	7.5	605	2.49
STD DS8	VAN11004979	104.7	104.0	1.6	24.0	12.8	113.1	283	5.5	4.3	35.0	7.1	575	2.40
Lab Prep Blanks:														
G1	VAN11004979	2.4	2.0	<0.1	0.6	<0.1	5.0	45	<0.1	<0.2	2.5	4.0	558	2.00
G1	VAN11004979	1.2	1.9	<0.1	<0.5	<0.1	4.1	43	<0.1	<0.2	2.2	3.7	534	1.86
Lab Analytical Blanks:														
BLK	VAN11004979	<0.5	<0.1	<0.1	<0.5	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<1	<0.01
BLK	VAN11004979	<0.5	<0.1	<0.1	<0.5	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<1	<0.01
BLK	VAN11004979	<0.5	<0.1	<0.1	<0.5	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<1	<0.01
BLK	VAN11004979	<0.5	<0.1	<0.1	<0.5	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<1	<0.01
BLK	VAN11004979	<0.5	1.0	<0.1	<0.5	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<1	0.03
BLK	VAN11004979	<0.5	3.0	<0.1	<0.5	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<1	0.02

Discovery Consultants
January 31, 2011
W.R. Gilmour, PGeo

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Th ppm 0.1	1DX15 Sr ppm 1	1DX15 Cd ppm 0.1	1DX15 Sb ppm 0.1	1DX15 V ppm 2	1DX15 Ca % 0.01	1DX15 P % 0.001	1DX15 La ppm 1	1DX15 Cr ppm 1	1DX15 Mg % 0.01	1DX15 Ba ppm 1	1DX15 Ti % 0.001	1DX15 B ppm 1	1DX15 Al % 0.01
904S019	0.6	235	0.2	1.5	169	2.02	0.116	4	48	1.15	115	0.167	4	4.93
904S038	0.7	161	<0.1	1.2	139	1.62	0.109	4	40	0.95	108	0.163	2	3.90
904S038	0.7	168	0.1	1.6	147	1.59	0.111	4	42	0.98	114	0.168	3	3.95
Lab Standards														
STD DS8	6.3	58	2.3	4.7	40	0.67	0.070	14	115	0.57	249	0.114	2	0.86
STD DS8	6.6	64	2.3	5.1	40	0.71	0.073	16	113	0.58	259	0.122	2	0.90
STD DS8	6.8	70	2.4	6.2	45	0.76	0.084	16	121	0.67	281	0.124	3	0.98
STD DS8	6.8	66	2.0	5.9	45	0.73	0.076	15	113	0.62	281	0.120	2	0.93
STD DS8	7.3	71	2.4	5.3	41	0.74	0.076	17	112	0.61	282	0.128	1	0.96
STD DS8	6.6	61	1.9	5.2	41	0.72	0.073	15	110	0.60	254	0.116	2	0.93
Lab Prep Blank														
G1	6.3	65	0.3	0.2	38	0.55	0.074	14	7	0.53	174	0.134	2	1.02
G1	5.7	60	<0.1	<0.1	35	0.50	0.070	13	6	0.48	161	0.125	3	0.94
Lab Analytical														
BLK	<0.1	<1	<0.1	<0.1	<2	<0.01	<0.001	<1	<1	<0.01	<1	<0.001	<1	<0.01
BLK	<0.1	<1	<0.1	<0.1	<2	<0.01	<0.001	<1	<1	<0.01	<1	<0.001	<1	<0.01
BLK	<0.1	<1	<0.1	<0.1	<2	<0.01	<0.001	<1	<1	<0.01	<1	<0.001	<1	<0.01
BLK	<0.1	<1	<0.1	<0.1	<2	<0.01	<0.001	<1	<1	<0.01	<1	<0.001	<1	<0.01
BLK	<0.1	<1	<0.1	<0.1	<2	<0.01	<0.001	<1	<1	<0.01	<1	<0.001	<1	<0.01
BLK	<0.1	<1	<0.1	<0.1	<2	<0.01	<0.001	<1	<1	<0.01	<1	<0.001	<1	<0.01

APPENDIX II - Talus Geochemistry

Sample ID	1DX15 Na % 0.001	1DX15 K % 0.01	1DX15 W ppm 0.10	1DX15 Hg ppm 0.01	1DX15 Sc ppm 0.1	1DX15 Tl ppm 0.1	1DX15 S % 0.05	1DX15 Ga ppm 1	1DX15 Se ppm 0.5
904S019	0.405	0.43	0.40	<0.01	9.4	0.3	0.38	13	<0.5
904S038	0.351	0.46	9.10	<0.01	6.8	0.4	0.37	10	1.2
904S038	0.355	0.48	9.60	<0.01	6.8	0.4	0.39	11	1.7
Lab Standards									
STD DS8	0.082	0.40	2.60	0.17	2.0	4.8	0.16	4	4.4
STD DS8	0.085	0.39	2.70	0.17	2.1	5.0	0.15	4	5.0
STD DS8	0.090	0.44	3.20	0.22	2.3	5.4	0.18	5	5.2
STD DS8	0.082	0.40	3.00	0.20	2.1	5.3	0.18	5	4.6
STD DS8	0.096	0.42	2.80	0.18	2.4	5.2	0.15	5	4.3
STD DS8	0.086	0.41	2.60	0.17	2.1	4.9	0.16	4	5.2
Lab Prep Blank									
G1	0.104	0.51	<0.1	<0.01	2.0	0.3	<0.05	5	<0.5
G1	0.093	0.46	<0.1	<0.01	1.8	0.3	<0.05	5	<0.5
Lab Analytical									
BLK	<0.001	<0.01	<0.1	<0.01	<0.1	<0.1	<0.05	<1	<0.5
BLK	<0.001	<0.01	<0.1	<0.01	<0.1	<0.1	<0.05	<1	<0.5
BLK	<0.001	<0.01	<0.1	<0.01	<0.1	<0.1	<0.05	<1	<0.5
BLK	<0.001	<0.01	<0.1	<0.01	<0.1	<0.1	<0.05	<1	<0.5
BLK	<0.001	<0.01	<0.1	<0.01	<0.1	<0.1	<0.05	<1	<0.5
BLK	<0.001	<0.01	<0.1	<0.01	<0.1	<0.1	<0.05	<1	<0.5

APPENDIX III

Rock Geochemistry

Analytical Results

APPENDIX III - Rock Geochemistry

Sample ID	Lab Report #	WGHT Wgt kg 0.01	1DX15 Au ppb 0.5	7AR Cu % 0.001	1DX15 Cu ppm 0.1	1DX15 As ppm 0.5	1DX15 Sb ppm 0.1	1DX15 Mo ppm 0.1	1DX15 Pb ppm 0.1	1DX15 Zn ppm 1	1DX15 Ag ppm 0.1	1DX15 Bi ppm 0.1	1DX15 Te ppm 0.2	1DX15 Ni ppm 0.1
904R001	VAN11004978	1.21	5.5		266.7	16.9	0.6	1.2	5.4	34	0.4	1.8	1.1	14.9
904R002	VAN11004978	0.85	53.2		493.0	4.1	0.1	3.0	9.7	71	0.7	32.6	23.8	24.5
904R003	VAN11004978	1.15	6.1		479.7	13.4	0.6	1.3	123.9	143	2.0	3.9	1.7	10.1
904R004	VAN11004978	0.73	10.3		2288.8	3.6	0.2	0.3	24.3	584	1.0	4.3	1.3	22.1
904R005	VAN11004978	1.17	2.8		226.0	45.3	0.5	2.3	239.9	779	3.1	4.6	1.0	10.0
904R006	VAN11004978	0.59	1.7		517.0	18.5	1.5	52.4	221.0	97	4.7	2.1	0.2	10.9
904R007	VAN11004978	0.93	26.1		481.8	223.2	10.4	49.6	148.7	113	5.1	37.4	15.6	9.6
904R010	VAN11004978	1.47	1.6		168.6	40.8	1.8	9.9	10.2	33	0.3	0.6	0.3	44.7
904R011	VAN11004978	0.73	2.2		47.2	15.4	0.7	2.2	7.4	21	0.2	1.8	0.6	44.8
904R012	VAN11004978	1.27	2.9		28.6	10.7	1.3	2.7	2.9	26	0.1	1.9	0.4	55.8
904R013	VAN11004978	0.81	5.6	1.266	>10000.0	12.9	2.5	0.8	64.8	269	18.8	3.7	<0.2	72.7
904R014	VAN11004978	0.93	1.4		616.0	1.4	0.7	1.1	8.9	18	0.7	5.0	1.1	44.2
904R015	VAN11004978	0.33	5.0		710.7	8.6	1.1	1.6	19.5	126	1.5	4.7	1.1	10.7
904R016	VAN11004978	0.46	58.4		625.0	19.6	0.3	0.3	7.3	56	0.5	2.1	1.3	45.3
Pulp Duplicates:														
904R016	VAN11004978	0.46	58.4		625.0	19.6	0.3	0.3	7.3	56	0.5	2.1	1.3	45.3
904R016	VAN11004978		64.1		667.0	20.8	0.4	0.4	8.0	61	0.5	2.3	1.2	48.9
Preparation Duplicates:														
904R005	VAN11004978	1.17	2.8		226.0	45.3	0.5	2.3	239.9	779	3.1	4.6	1.0	10.0
904R005	VAN11004978		1.7		209.4	40.8	0.5	1.9	212.8	697	2.9	4.1	0.8	9.3
Lab Standards:														
STD DS8	VAN11004978		112.7		109.3	25.4	5.3	12.8	119.6	302	1.8	6.1	4.8	37.8

APPENDIX III - Rock Geochemistry

Sample ID	1DX15 Co ppm 0.1	1DX15 Mn ppm 1	1DX15 Fe % 0.01	1DX15 Th ppm 0.1	1DX15 Sr ppm 1	1DX15 Cd ppm 0.1	1DX15 V ppm 2	1DX15 Ca % 0.01	1DX15 P % 0.001	1DX15 La ppm 1	1DX15 Cr ppm 1	1DX15 Mg % 0.01	1DX15 Ba ppm 1	1DX15 Ti % 0.001
904R001	19.8	197	3.21	1.4	127	0.2	113	1.77	0.113	6	23	0.77	126	0.183
904R002	19.4	153	1.68	1.2	67	0.4	146	1.09	0.191	4	19	0.95	85	0.194
904R003	18.0	324	4.12	2.0	94	0.6	119	0.74	0.103	4	19	0.92	117	0.197
904R004	14.6	393	2.10	3.7	32	2.7	61	0.43	0.059	7	25	0.82	106	0.114
904R005	29.7	1494	4.86	<0.1	95	3.9	73	1.26	0.070	2	7	1.10	24	0.086
904R006	10.8	432	3.31	1.5	22	0.2	132	0.38	0.100	4	20	0.74	129	0.171
904R007	12.0	283	2.48	2.6	66	2.0	77	0.90	0.091	6	10	0.32	58	0.083
904R010	37.1	210	5.15	0.2	243	0.2	55	3.35	0.080	2	33	0.35	32	0.121
904R011	48.8	126	6.45	0.3	118	0.1	62	1.39	0.073	2	21	0.23	12	0.136
904R012	24.5	273	3.55	0.1	299	0.4	39	2.68	0.119	1	113	0.45	43	0.136
904R013	14.7	2441	6.22	0.2	103	4.3	109	2.45	0.090	1	140	1.45	4	0.138
904R014	58.2	126	11.39	<0.1	10	0.1	9	0.49	0.006	<1	1	0.15	1	0.011
904R015	25.9	893	5.20	1.2	47	0.3	45	0.87	0.043	3	7	1.34	45	0.071
904R016	27.6	272	5.51	0.5	144	0.2	149	1.91	0.113	3	95	1.30	89	0.127
Pulp Duplicat														
904R016	27.6	272	5.51	0.5	144	0.2	149	1.91	0.113	3	95	1.30	89	0.127
904R016	29.9	296	5.92	0.6	155	0.2	158	2.05	0.120	3	101	1.38	95	0.141
Preparation I														
904R005	29.7	1494	4.86	<0.1	95	3.9	73	1.26	0.070	2	7	1.10	24	0.086
904R005	26.5	1360	4.43	<0.1	85	3.3	68	1.17	0.067	2	7	1.01	23	0.081
Lab Standard														
STD DS8	7.6	600	2.43	5.8	57	2.3	40	0.66	0.081	13	116	0.61	256	0.099

APPENDIX III - Rock Geochemistry

Sample ID	1DX15 B ppm 1	1DX15 Al % 0.01	1DX15 Na % 0.001	1DX15 K % 0.01	1DX15 W ppm 0.1	1DX15 Hg ppm 0.01	1DX15 Sc ppm 0.1	1DX15 Tl ppm 0.1	1DX15 S % 0.05	1DX15 Ga ppm 1	1DX15 Se ppm 0.5
904R001	<1	3.28	0.300	0.58	0.3	<0.01	5.7	0.4	0.98	8	1.0
904R002	2	2.11	0.191	0.77	1.6	<0.01	4.7	0.6	<0.05	8	<0.5
904R003	<1	2.10	0.190	0.76	0.6	<0.01	5.5	0.6	0.70	8	1.2
904R004	<1	1.50	0.064	0.44	0.2	<0.01	3.5	0.3	<0.05	5	<0.5
904R005	3	3.16	0.235	0.17	0.2	0.02	2.5	0.1	<0.05	8	0.9
904R006	<1	1.38	0.094	0.80	4.8	<0.01	5.4	0.7	0.08	5	<0.5
904R007	<1	1.73	0.191	0.26	1.6	0.01	2.9	0.2	0.25	5	0.9
904R010	5	5.27	0.717	0.03	<0.1	<0.01	2.9	<0.1	2.85	9	1.4
904R011	3	2.03	0.307	0.04	0.2	<0.01	2.9	<0.1	5.49	5	3.6
904R012	2	3.55	0.463	0.04	0.2	<0.01	3.1	<0.1	2.56	7	0.8
904R013	2	2.04	0.004	<0.01	0.2	<0.01	7.8	<0.1	0.17	7	2.7
904R014	<1	0.30	0.023	<0.01	31.4	<0.01	0.7	<0.1	6.73	2	2.1
904R015	2	2.09	0.017	0.20	0.1	0.01	2.2	0.1	2.14	8	1.1
904R016	2	4.79	0.294	0.68	3.0	<0.01	10.1	1.4	1.40	17	1.4
Pulp Duplicat											
904R016	2	4.79	0.294	0.68	3.0	<0.01	10.1	1.4	1.40	17	1.4
904R016	2	5.14	0.318	0.73	3.1	<0.01	10.8	1.6	1.51	18	1.5
Preparation I											
904R005	3	3.16	0.235	0.17	0.2	0.02	2.5	0.1	<0.05	8	0.9
904R005	2	2.91	0.219	0.16	0.2	0.01	2.5	0.1	<0.05	7	1.3
Lab Standard											
STD DS8	2	0.87	0.083	0.40	2.8	0.18	1.9	5.3	0.16	4	5.9

APPENDIX III - Rock Geochemistry

Sample ID	Lab Report #	WGHT Wgt kg 0.01	1DX15 Au ppb 0.5	7AR Cu % 0.001	1DX15 Cu ppm 0.1	1DX15 As ppm 0.5	1DX15 Sb ppm 0.1	1DX15 Mo ppm 0.1	1DX15 Pb ppm 0.1	1DX15 Zn ppm 1	1DX15 Ag ppm 0.1	1DX15 Bi ppm 0.1	1DX15 Te ppm 0.2	1DX15 Ni ppm 0.1
STD DS8	VAN11004978		105.9		108.8	23.2	5.5	12.2	120.1	285	1.6	6.6	4.9	37.1
STD GC-7	VAN11004978			0.558										
STD GC-7	VAN11004978			0.573										
Lab Prep Blanks:														
G1	VAN11004978	<0.01	<0.5		2.4	0.5	<0.1	<0.1	3.0	47	<0.1	<0.1	<0.2	2.7
G1	VAN11004978	<0.01	<0.5		2.2	<0.5	<0.1	<0.1	2.9	46	<0.1	<0.1	<0.2	2.7
Lab Analytical Blanks:														
BLK	VAN11004978		<0.5		<0.1	<0.5	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.2	<0.1
BLK	VAN11004978		<0.5		<0.1	<0.5	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.2	<0.1
BLK	VAN11004978			<0.001										

Discovery Consultants

January 31, 2011

W.R. Gilmour, PGeo

APPENDIX III - Rock Geochemistry

Sample ID	1DX15 Co ppm 0.1	1DX15 Mn ppm 1	1DX15 Fe % 0.01	1DX15 Th ppm 0.1	1DX15 Sr ppm 1	1DX15 Cd ppm 0.1	1DX15 V ppm 2	1DX15 Ca % 0.01	1DX15 P % 0.001	1DX15 La ppm 1	1DX15 Cr ppm 1	1DX15 Mg % 0.01	1DX15 Ba ppm 1	1DX15 Ti % 0.001
STD DS8	7.7	575	2.34	6.6	62	2.2	39	0.67	0.072	14	114	0.59	260	0.117
STD GC-7														
STD GC-7														
Lab Prep Blar														
G1	4.1	574	1.96	6.0	60	<0.1	37	0.47	0.075	14	4	0.51	162	0.105
G1	4.1	563	1.87	5.2	53	<0.1	35	0.43	0.076	12	4	0.50	154	0.101
Lab Analytica														
BLK	<0.1	<1	<0.01	<0.1	<1	<0.1	<2	<0.01	<0.001	<1	<1	<0.01	<1	<0.001
BLK	<0.1	<1	<0.01	<0.1	<1	<0.1	<2	<0.01	<0.001	<1	<1	<0.01	<1	<0.001
BLK														

APPENDIX III - Rock Geochemistry

Sample ID	1DX15 B ppm 1	1DX15 Al % 0.01	1DX15 Na % 0.001	1DX15 K % 0.01	1DX15 W ppm 0.1	1DX15 Hg ppm 0.01	1DX15 Sc ppm 0.1	1DX15 Tl ppm 0.1	1DX15 S % 0.05	1DX15 Ga ppm 1	1DX15 Se ppm 0.5
STD DS8	2	0.89	0.080	0.40	2.7	0.17	2.0	5.2	0.16	4	4.7
STD GC-7											
STD GC-7											
Lab Prep Blar											
G1	<1	0.86	0.085	0.44	<0.1	<0.01	1.8	0.4	<0.05	5	<0.5
G1	<1	0.82	0.073	0.42	<0.1	<0.01	1.7	0.3	<0.05	4	<0.5
Lab Analytica											
BLK	<1	<0.01	<0.001	<0.01	<0.1	<0.01	<0.1	<0.1	<0.05	<1	<0.5
BLK	<1	<0.01	<0.001	<0.01	<0.1	<0.01	<0.1	<0.1	<0.05	<1	<0.5
BLK											