Airborne Geophysical Report on the ELLEN PROJECT

Ellen 1-20: YA97362-66, YB26797-99, YB27078-89
Ellen 25-37: YB27094-96, YB35480-83, YB35844-49
Ellen 182, 41-81: YE69180-200, YE69369-89
Ellen 181, 82-141, 144-170: YE69401-61, 64-90
Ellen 172-180: YE69492-500

NTS: 115 A/13
Latitude 60^{0}52'N Longitude 137^{o}58'W
Whitehorse Mining District, Yukon
Work Preformed form January 27 to February 1 , 2012
For
Broken Stone Mining
P.O. Box 31293
Whitehorse, Yukon
Y1A 5P7

January 20, 2012

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1 SUMMARY

The 3,577 hectare Ellen Project, NTS map sheet 115 A/13, is located in the Whitehorse Mining District, approximately 27 km northwest of Haines Junction, which is 159 km by road from Whitehorse, Yukon Territory at a latitude of 60°52’N and a longitude of 137°58’W. The property comprises 172 Ellen claims, owned by Mr. Bill Harris and Mr. Ron Stack of Whitehorse, Yukon Territory and optioned to Broken Stone Mining.

The Ellen Project is primarily underlain by 110º/30º to 50º south trending andesitic volcanic rocks, with minor interbedded limestone and clastic beds, mapped as the Triassic Nicolai Group of the Wrangell Terrane. Diorite, andesite and fine grained peridotite sills of the Kluane mafic-ultramafic suite have been emplaced along thrust faults at the base of the Triassic volcanic sequence. The units are unconformably overlain by Upper Jurassic to Lower Cretaceous Dezadeash Group clastic sedimentary rocks in the southern property area.

The Kluane mafic-ultramafic suite hosts a number of magmatic nickel-copper-platinum group mineral occurrences in Wrangellia from Northern British Columbia, through Yukon and into Alaska. One of these occurrences, the Wellgreen Deposit, produced almost 200,000 tonnes of Ni-Cu-PGE ore in 1972 and 1973 and hosts reserves of 49.9 million tonnes grading 0.36% Ni, 0.35% Cu, 0.51 g/t Pt and 0.34 g/t Pd. The Kluane Belt nickelcopper- PGE occurrences are particularly enriched in the rarer platinum group elements osmium, iridium, ruthenium and rhodium.

During January 27 to February 1, 2012 Brokenstone engaged the services of Geotech Ltd. To undertake versatile time domain electromagnetic (VTEM) a survey over the Ellen Property for a cost of $78,634.28

2 TERMS OF REFERENCE

This report has been written to fulfill the requirements for filing assessment work under the Yukon Mineral Tenure Act. It describes the exploration undertaken on the Ellen Box Property. This report is not compliant with National Instrument 43-101 and Form 43-101F1, and should not be used as a "Technical Report" under National Instrument 43-101.

Much of this report is taken directly from Pautler, J.M., 2011. Geological and geochemical Report on the Ellen Project, Ellen 1-20: YA97362-66, YB26797-99, YB27078-8, Ellen 25-37: YB27094-96, YB35480-83, YB35844-49, Ellen 182, 41-81: YE69180-200, YE69369-89, Ellen 181, 82-141, 144-170: YE69401-61, 64-90, Ellen 172-180: YE69492-500. Assessment report for Bill Harris.

3 ELLEN PROPERTY DESCRIPTION AND LOCATION

The Ellen Project, NTS map sheet 115 A/13 is located approximately 27 km northwest of Haines Junction, which is 159 km by road from Whitehorse, Yukon Territory *(Figure 1)*. The project area is centered at a latitude of 60° 52'N and a longitude of 137°58'W

The Ellen Project consists of 172 Ellen Quartz Claims and covers an area of approximately 3,577 hectares in the Whitehorse Mining District. The property size is approximate since claim boundaries have not been legally surveyed. The claims were staked in accordance with the Yukon Quartz Mining Act on claim sheet 115A/13, available for viewing in the Whitehorse Mining Recorder's Office.

The Ellen 1-5, 9-20, 25-27 and Ellen 32-37 claims are registered in the name of Mr. Ron Stack and the remainder of the claims are registered in the name of Mr. Bill Harris, both of Whitehorse, Yukon Territory. Pertinent claim data is summarized in Table 1.

Table 1: Ellen Property Information

Claim Name	Grant No.	No.	Owner
Ellen 1-5	YA97362-66	5	Ron Stack
Ellen 6-8	YB26797-99	3	Bill Harris
Ellen 9-20	YB27078-89	12	Ron Stack
Ellen 25-27	YB27094-96	3	Ron Stack
Ellen 28-31	YB35480-83	4	Bill Harris
Ellen 32-37	YB35844-49	6	Ron Stack
Ellen 182, 41-60	YE69180-200	21	Bill Harris
Ellen 61-81	YE69369-89	21	Bill Harris
Ellen 181, 82-141	YE69401-61	61	Bill Harris
Ellen 144-170	YE69464-90	27	Bill Harris
Ellen 172-180	YE69492-500	9	Bill Harris
TOTAL		**172**	

The Ellen property is situated within the Kluane Wildlife Sanctuary within which exploration and mining is permitted (Figures 1 and 2). Kluane National Park lies approximately 6 km to the south (Figure 2). First Nations have settled their land claims in the area with the western portion of the property occurring within Champagne-Aishihik First Nations surveyed land (see Figure 2). The claims are grandfathered and do not revert to the First Nation unless claims lapse. The remaining land in which the mineral claims are situated is Crown Land. The mineral claims fall under the jurisdiction of the Yukon Government.

4 ACCESSIBILTY, CLIMATE, INFRASTRUCTURE & PHYSIOGRAPHY

The project area is accessible from Haines Junction via the Alaska Highway (Highway 1), which is followed northwest to approximately one km northwest of the Jarvis River Bridge. At this point a gravel road heads southerly following the Jarvis River to active placer mine sites on Kimberley Creek. An old tote road connects the Ellen claims to the Kimberley Creek road approximately 250m west of (prior to) the crossing of the Jarvis River. The 1990 camp, with an intact 14 by 16 foot tent frame is situated at UTM coordinates 6751729m N, 339596m E, Nad 83, Zone 8. Helicopter charter services are available from Haines Junction on a year-round basis. A large helicopter clearing is located proximal to the camp at UTM coordinates 6751594m N, 339585m E, Nad 83, Zone 8.

Haines Junction is the closest town, with a population of approximately 800. Facilities include a grocery store, health centre, ambulance service, RCMP, service stations and restaurants. The town is on the power grid with diesel backup. Complete services are available in Whitehorse. Haines Junction is the gateway to Kluane National Park and lies 255 km via Highway 3 from the seaport of Haines, Alaska.

The project lies along the west margin of the Shakwak Valley in the Kluane Ranges of the St. Elias Mountains, in southwestern Yukon *(Figure 3)*. The Shakwak Valley is a deep northwest-southeast oriented depression stretching for several hundred kilometers from northwestern British Columbia to Alaska. In the Jarvis River area the valley is 8 to 10 km wide, bounded on the west side by the rugged Kluane Ranges which rise to 2588m.

The property is located at the northern end of Mt. Decoeli *(Figure 2)* covering an alpine plateau incised by a deep creek gully (Ellen Creek, a tributary of the Jarvis River). The plateau is bounded on the east by a steep north facing slope which descends to the low lying Shakwak Valley floor. Elevations on the property range from 2675 feet along the Jarvis River in the north to 5700 feet on the north flank of Mt. Decoeli.

The copper showings are located in a rugged steep sided gully, oriented perpendicular to the Shakwak Valley. Outcrop is abundant in the gully and on steeper slopes, however the surrounding uplands are covered with glacial till. Vegetation below the alpine plateau consists of spruce and poplar forest with moderate to thick ground cover broken by tundra. Water is available from tributaries of the Jarvis River.

The Haines Junction area has a northern interior climate strongly influenced by the St. Elias Mountains. The area is known for high winds which constantly blow from the mountains into the Shakwak Valley. Winter temperatures average –20º Celsius while summer temperatures average 20º Celsius but range up to 30º Celsius. The exploration season extends from mid May to October.

Figure 1: Regional Location Map of the Ellen Property

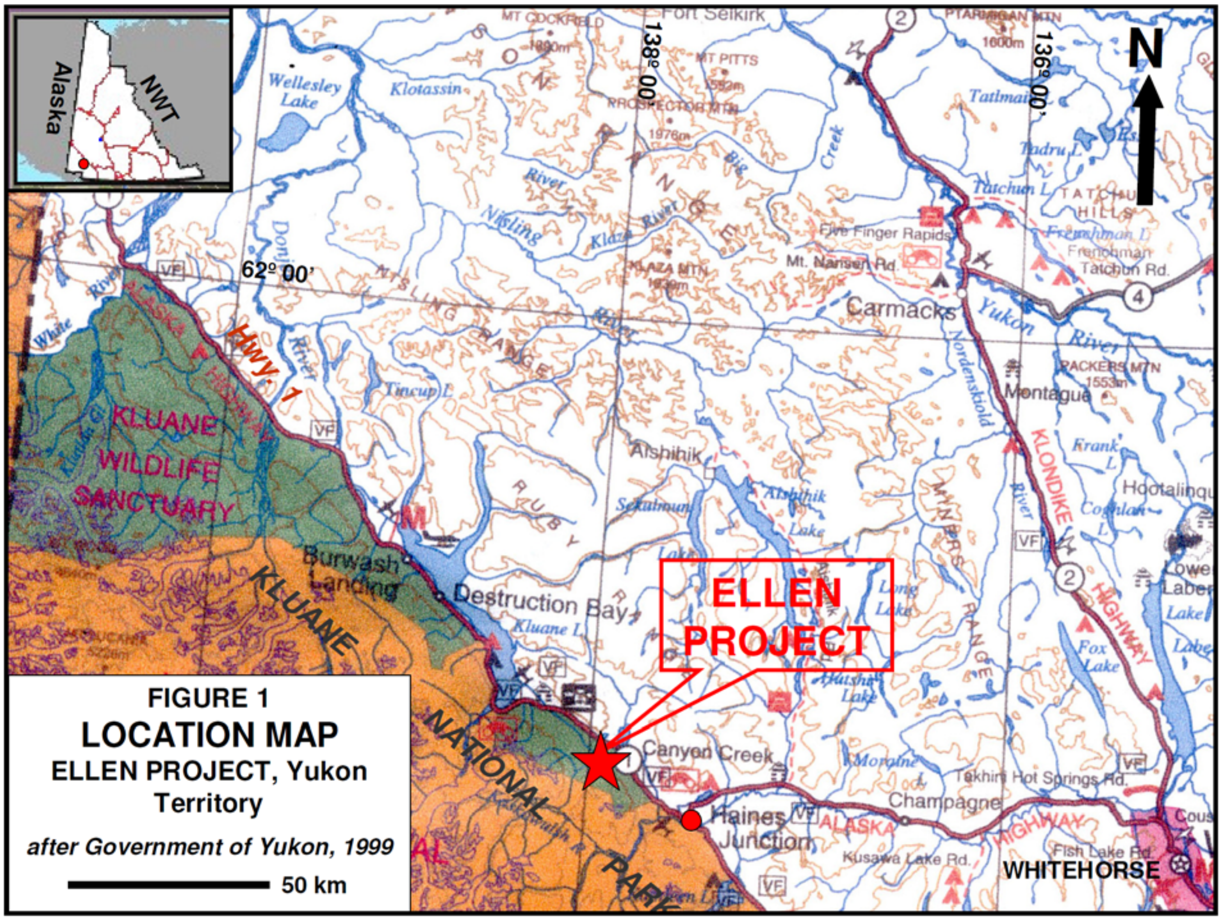
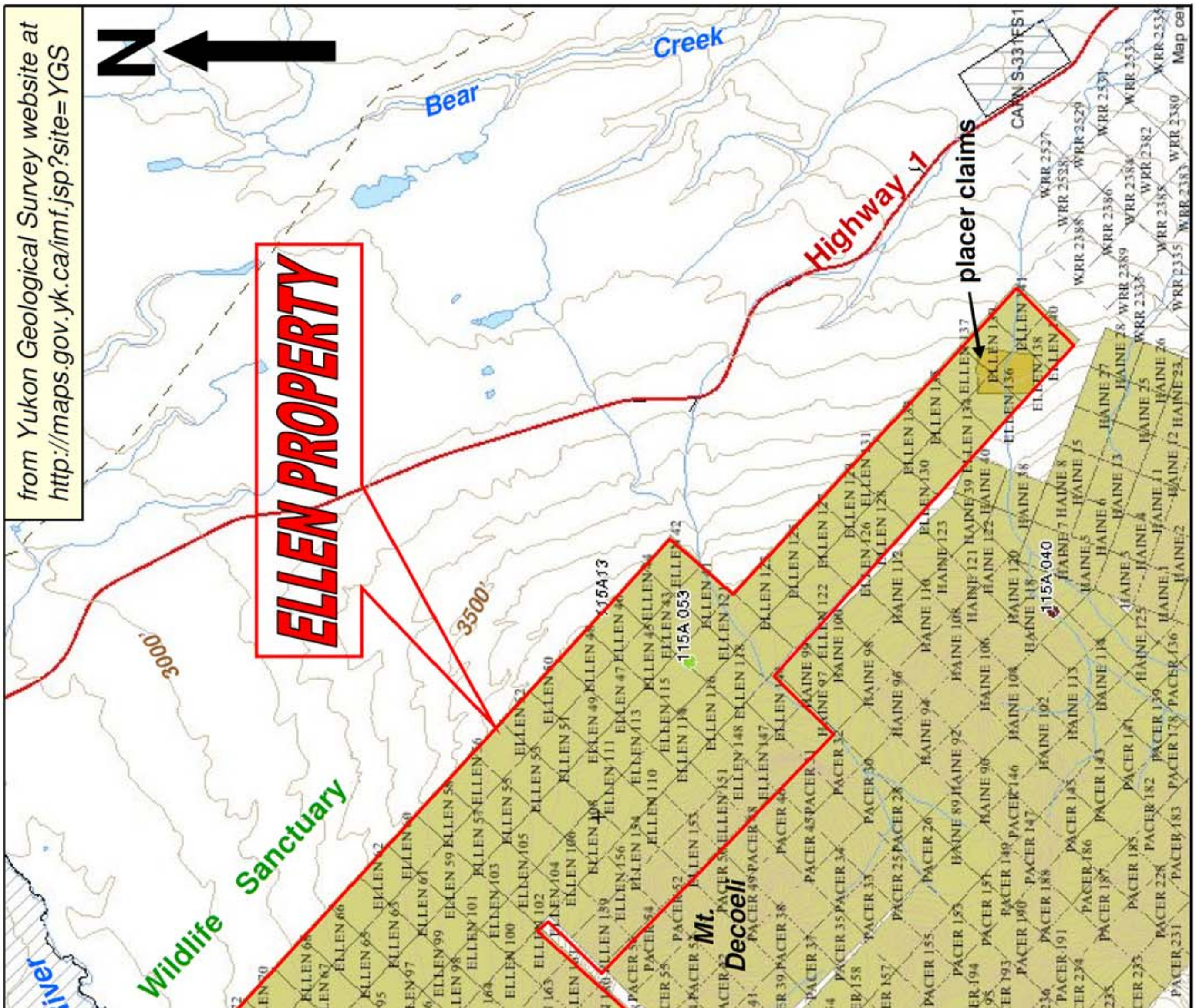


FIGURE 1
LOCATION MAP
ELLEN PROJECT, Yukon Territory
after Government of Yukon, 1999
50 km

Figure 2: Claim Map for the GD Property



5 EXPLORATION HISTORY OF THE PROPERTY AREA

Exploration on the Ellen Project, undertaken from 1954 to 2006, has involved approximately 1,214m of drilling in 17 holes, hand/blast trenching, rock and soil geochemistry, ground electromagnetic (VLF-EM, and horizontal loop) and magnetic geophysical surveys.

A summary of the work completed by various operators, as documented in Yukon Minfile *(Deklerk, 2009)*, various government publications of the Yukon Geological Survey or its

before 1950
Discovery of chalcopyrite in greenstone in tributary of Jarvis River *(Davidson, 1995)*.

1953-5
An electromagnetic survey, construction of road to within 500m of showing and diamond drilling of 323m in 5 holes in 1954, all by Hudson Bay Mining and Smelting Company under option from Mr. R. Reber *(Deklerk, 2009)*.

1965-71
Program of geochemistry, geological mapping and ground geophysics *(Baird, 1969),* completion of road to showing, 101m of diamond drilling in 4 holes in 1966 (with results of 3.15% Cu over 5.2m and 2.2% Cu over 6.4m reported) and 333m in 4 additional holes in 1969 (with results of 1.1% Cu over 0.9m from MC-5 and 0.66% Cu over 4.3m from MC-6, 61m along strike to the northwest) *(Canadian Barranca Mines Limited, 1969)*. Work was performed by Canadian Barranca Mines Limited under option from Mr. T. Worbetts.

1987-1990
Hand/blast trenching, geological mapping, prospecting, soil and rock geochemistry and a horizontal loop electromagnetic geophysical survey by Mr. Ron Stack and Mr. Harris, delineating volcanogenic massive sulphide copper±gold mineralization over a strike length of 75m *(Davidson, 1988-1990)*.

1993-1996
Geological and geochemical surveys, horizontal loop electromagnetic and VLF-EM geophysical surveys, excavator and hand trenching and diamond drilling of 457m in 5 holes by Probe Resources Limited under option.The drill program intersected 1.76% Cu, 0.3 g/t Au over 5.5m in DDH 95-1 and 1.96% Cu, 2.1 g/t Au over 2.1m in DDH 95-3. A 12 to 15m wide intersection of a serpentinite sill in DDH 95-4, -5 returned an average of 0.17% Ni. The surface program outlined strong copper geochemical anomalies coincident with geophysical conductors around the main zone, located widespread concordant chalcopyritepyrite- quartz mineralization downstream and along strike from the main showing and delineated new showings to the southeast *(Davidson, 1993* and *1995)*.

2001-2006
Prospecting, geochemical sampling and hand trenching on new showings by Mr. Bill Harris and Mr. Ron Stack and by the author in 2006 *(Craig, 2001, 2002, 2005, and Pautler, 2007).* Results from 2006 include 7.23% Cu, 1.01 g/t Au and 1.01 g/t Pd over 2.5m *(Pautler, 2007)*.

6 GEOLOGICAL SETTING

6.1 Regional Geology

The regional geology of the area has been summarized from Gordey and Makepeace (2003), Israel and van Zeyl (2005) and Israel and Cobbett (2008).

The Ellen Property is situated between the Denali Fault and the Shakwak Valley in a wedge of Triassic volcanic rocks overlain by the Dezadeash clastic succession (JKs) within the accreted Wrangell Terrane (WR), part of the Insular Super Terrane *(Figure 3)*. The Wrangell and Alexander terranes were together by the mid-Jurassic and formed the basement beneath at least part of Wrangellia by Early Pennsylvanian time *(see Israel and van Zeyl, 2005)*.

Regionally, the Wrangell Terrane consists of Devonian to Permian arc volcanic, clastic and platform carbonate rocks overlain by Triassic oceanic rift tholeiitic basalt (uTrN), and carbonate rocks and associated igneous bodies of the Kluane mafic-ultramafic complex, thought to represent feeders to the Triassic flood basalts. The Alexander terrane here is composed of lower Paleozoic volcanic and sedimentary rocks (CPS1, ODG2 and OSDB). The latter includes a large package of limestone (OSDB1).

Post accretionary units include Jura-Cretaceous sedimentary rocks (JKs - Dezadeash Group), overlapping Wrangellia and Alexander Terranes, and Tertiary felsic to mafic volcanic rocks with interbedded terrestrial sedimentary rocks (Tvs). Post accretionary intrusions in the region include Jura-Cretaceous (JKp), Cretaceous (Kp) and Neogene plutons (Np).

The major structural feature of the area is the Denali Fault, a large fault zone that lies southwest of the property. It is a northwest trending strike-slip fault with a dextral sense of motion with an offset in the order of 350 km. The northwest trending Duke River Fault separates Wrangellia from the Alexander Terrane. The area mapped as Upper Triassic Nicolai Group (uTrN) and Dezadeash Group (JKs), northeast of the Denali Fault (including on the Ellen, Pacer and Haine properties), appear to be distinct units that are derived from Alaska

7 Property Geology

The entire Ellen property has not been mapped in detail, but regionally it is shown to be underlain by a thick sequence of layered mafic volcanic rocks consisting of andesite flows, andesitic and mafic tuffs, and thin layers of tuffaceous argillite that are mapped as the Upper Triassic Nicolai Group. Approximately 30% of the property, surrounding the Kloo showing area, has been mapped and is summarized below, primarily from Davidson (1995). The remainder of the property is primarily underlain by extensive areas of Quaternary unconsolidated sediments.

The property is primarily underlain by a thick sequence of layered mafic volcanic rocks consisting of andesite flows, andesitic and mafic tuffs, and thin layers of tuffaceous argillite that are mapped as the Upper Triassic Nicolai Group. A limestone interbed was previously noted within the volcanic succession in the southern property area. Diorite, andesite and fine grained peridotite sills occur within the volcanic rocks and have been emplaced along thrust faults at the base of the Triassic volcanic sequence. *(From Davidson, 1995)*. The units strike 110º/30º to 50º south.

The volcanic rocks have been variably foliated and altered forming quartz sericite schist and narrow bands of black chlorite schist. Epidote and quartz banding is common. Serpentinization is common towards the base of the volcanic section *(Davidson, 1995)*. The volcanic rocks are unconformably overlain by deformed clastic sedimentary rocks (phyllite), containing sections of green tuffaceous volcanic rocks, and shale at the south end of the claim block that belong to the Upper Jurassic to Lower Cretaceous Dezadeash Group. Narrow quartz carbonate veins cut the sedimentary rocks *(Davidson, 1995)*. The deformation may be related to a fault contact between the Nicolai and Dezadeash Groups.

Ultramafic sills were intersected in the 1969 and 1995 drill programs approximately 200m northeast and down section of the Kloo volcanogenic massive sulphide prospect. A sill is also postulated in the southwestern property area based on a strong magnetic anomaly *(Figure 4)*.

Fault zones with mylonite, talc and graphitic gouge were reportedly intersected in the 1995 drill program in the main showing area. Cyprus type volcanogenic massive sulphide mineralization is typically controlled and aligned near steep normal faults

The Ellen property covers the Kloo volcanogenic massive sulphide drilled prospect as documented by the Yukon Geology Program as Minfile Number 115A 041 *(Deklerk, 2009)*. The BH Minfile occurrence Minfile Number 115A 053 occurs in the central property area, but no information is available *(Deklerk, 2009)*. It may have been staked to cover an occurrence of malachite.

Mineralization at the main showing is exposed as intense malachite and azurite stained outcrops along the canyon of Ellen Creek, with several zones up to 10m wide consisting of high grade copper±gold bearing semi-massive pyrite and chalcopyrite layers (parallel to bedding and shear planes trending 110-125º/20-50ºS) crosscutting chalcopyritepyrrhotite stringers and breccia zones with sulphide cement, hosted in a series of thick andesite flows and tuffs of Triassic age. There are two horizons of chalcopyrite rich mineralization that cross the creek, an upper or main horizon and a lower horizon, 10- 15m below the main horizon.

The east side of the Main horizon consists of three distinct layers of stringer mineralization. The lowest one is about three meters thick while the upper two are approximately one meter thick. The west side of the Main horizon consists of a single 10m thick zone of chalcopyrite stringer mineralization. The Lower horizon is not well exposed and difficult to access due to the cliff type exposure, but appears to consist of 1-2 bands of 1m wide chalcopyrite rich horizons.

The zones have an associated hydrothermal alteration assemblage that commonly consists of massive dark green to black chlorite proximal to intense areas of stringer mineralization that are up to 30 centimeters thick. Pervasive weak chlorite and sericite alteration occurs up to 10 meters around the stringer zones while patches of pervasive epidote alteration with associated quartz-carbonate-epidote veinlets occur over the extent of the 75m long Kloo prospect. Minor chalcopyrite veins and stringers continue along the walls of the Ellen Creek gully for 150m downstream of the main zone.

A weakly mineralized horizon 0.5 to 3.0m wide outcrops on both sides of the creek approximately 75m north of the main zone. The mineralization consists of argillaceous tuff and greenstone containing blebs and veins of chalcopyrite in a quartz stringer zone and can be traced for 100m along strike. The sulphide mineral content of this zone ranges from 1 to 2%. Several 10-30 cm wide well mineralized quartz veins occupy fractures concordant with bedding.

The 1995 drilling indicated a cross-cutting relationship of the stringer zones to the host stratigraphy. This relationship, the high grade copper±gold values and the intense black chlorite alteration suggest that the mineralization may represent part of a feeder system with a source area down dip to the south. Potential exists for massive lenses along strike from the main Kloo prospect.

Additional chalcopyrite stringer mineralization and associated quartz-chalcopyrite veins, generally less than one meter thick and less intensely mineralized than the main showing, have been traced up to 500m to the northwest and 800m to the southeast along the same stratigraphic horizon along strike and up dip of the Kloo prospect. This demonstrates continuity to the mineralization. The quartz-chalcopyrite veins are typical within the underlying stringer zones in Cyprus type volcanogenic massive sulphide deposits.

The Ellen property also has potential for copper-nickel-PGE±gold mineralization. Previous drilling on the property (DDH 95-4 and 95-5), which targeted a strong HLEM anomaly down section of the main showing, intersected graphitic siltstone and schist hosting a \erpentinite sill carrying low grade nickel values. This sequence marks a thrust fault underlying the mafic volcanic rocks. Thrust faults found throughout the Kluane

Ultramafic Belt are good targets for both high and low grade copper-nickel-PGE±gold mineralization. The presence of low grade nickel mineralization in the previous drill holes, which averaged 0.17% Ni over 12-15m, is significant in that PGE mineralization is commonly associated with low grade nickel and higher grade copper throughout the Kluane Ultramafic Belt *(Craig, 2002)*.

8 2012 EXPLORATION PROGRAMS

During January 27th to February 1st, 2012 Brokenstone engaged the services of Geotech Ltd. To undertake versatile time domain electromagnetic (VTEM) a survey over the Ellen Property . Ancillary equipment included a GPS navigation system and a radar altimeter.

The geophysical surveys consisted of helicopter borne EM using the versatile time-domain electromagnetic (VTEM) system with Z component measurements and aeromagnetics using a cesium magnetometer. A total of 304 line-km of geophysical data were acquired during the survey (see Figure 5 for survey and Appendix 2 for Geotech report)

The crew was based out of Haines Junction, Yukon Territory for the acquisition phase of the survey. Survey flying started on January 27th, 2012 and was completed on February 1st, 2012. 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 data processing followed immediately after the end of the survey. Final reporting, data presentation and archiving were completed from the Aurora office of Geotech Ltd. in February, 2012.

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 processed survey results are presented as the following maps:

Total Magnetic Intensity Appendix 2
B-Field Z Component Channel grid Appendix 2
Calculated Time Constant (TAU) Appendix 2
Electromagnetic stacked profiles of the B-field Z component Appendix 2
Electromagnetic stacked profiles of the dB/dt Z component Appendix 2

Figure 3: Regional Geology of the GD Property Area

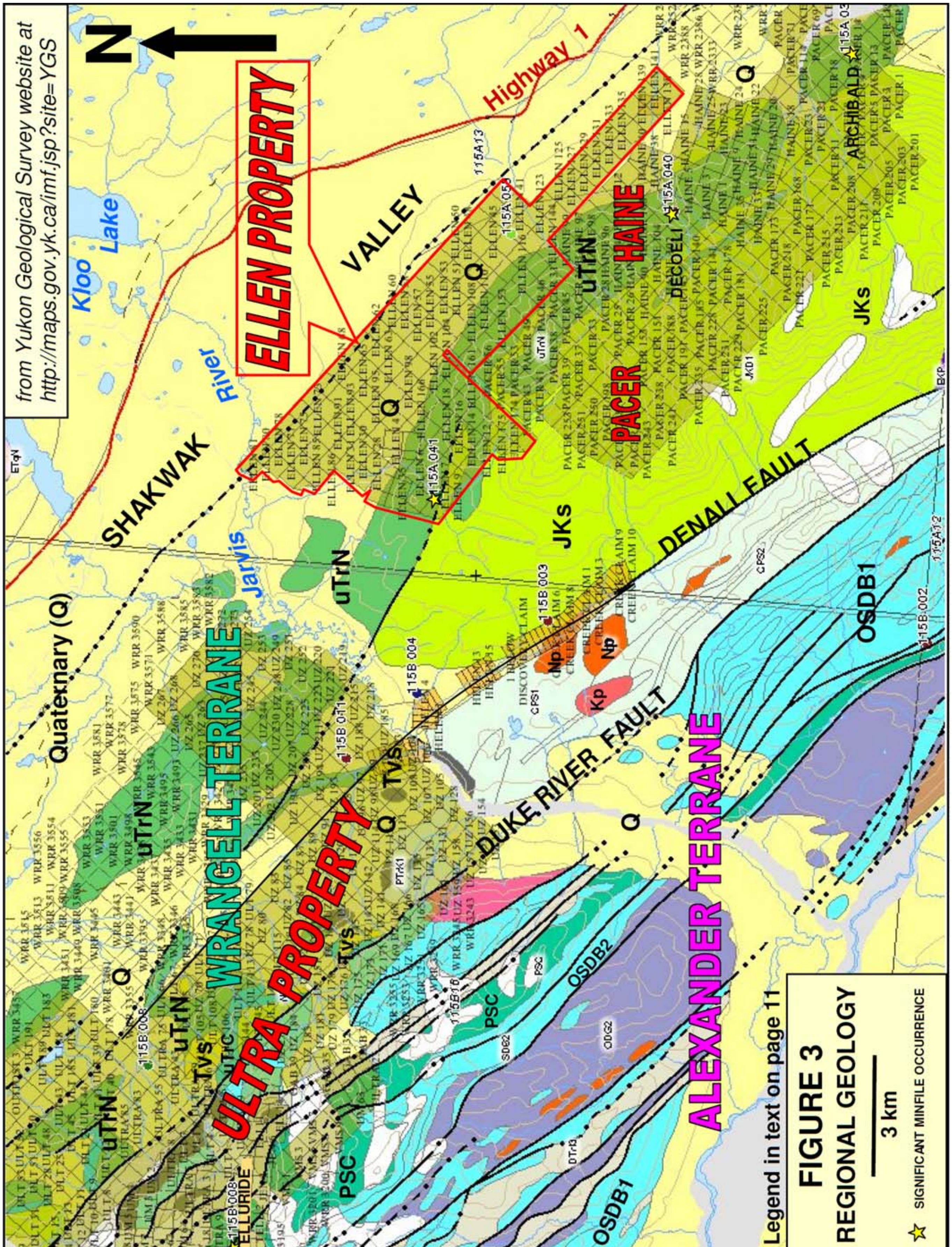


Figure 4: Property Geology

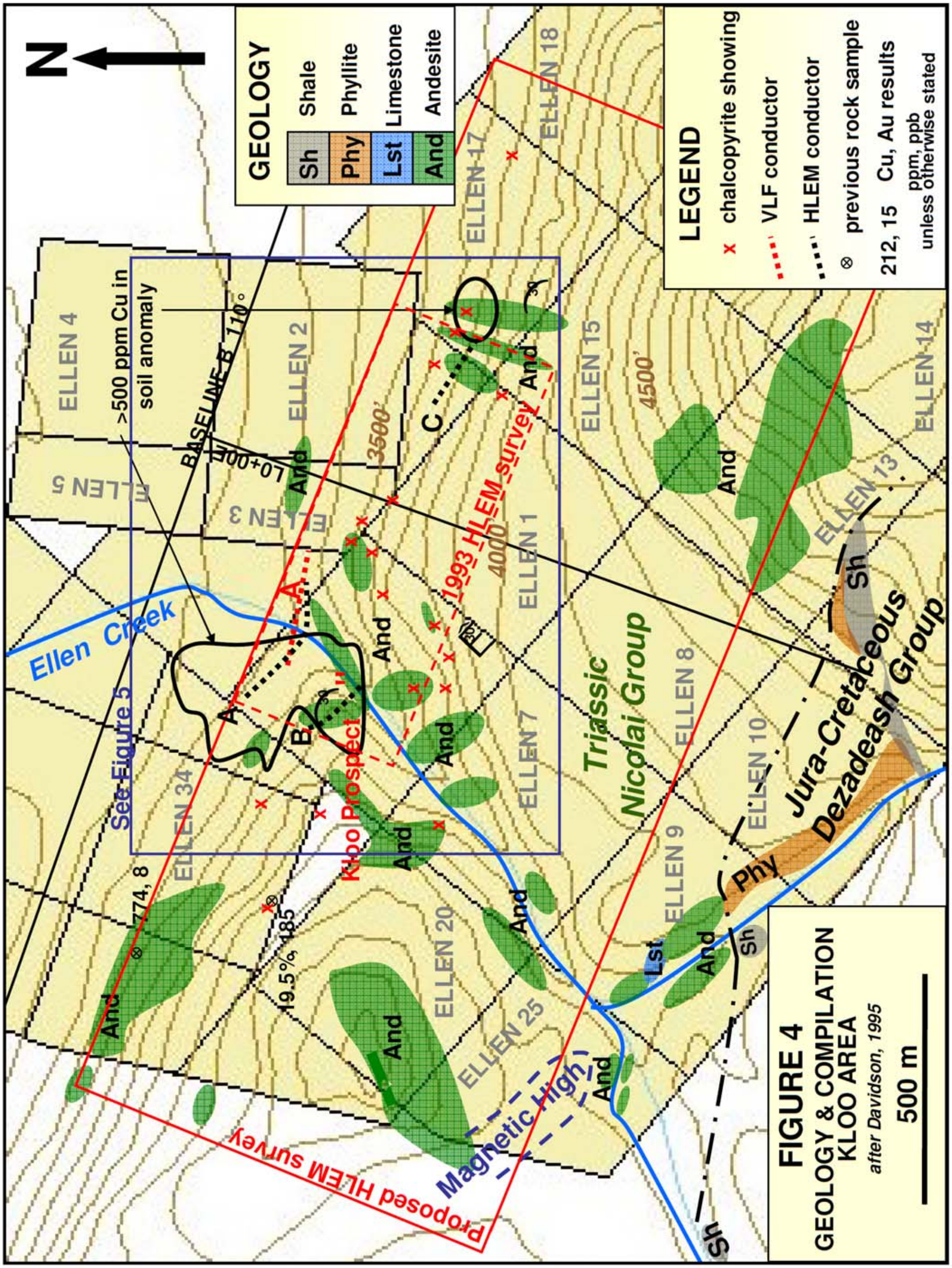
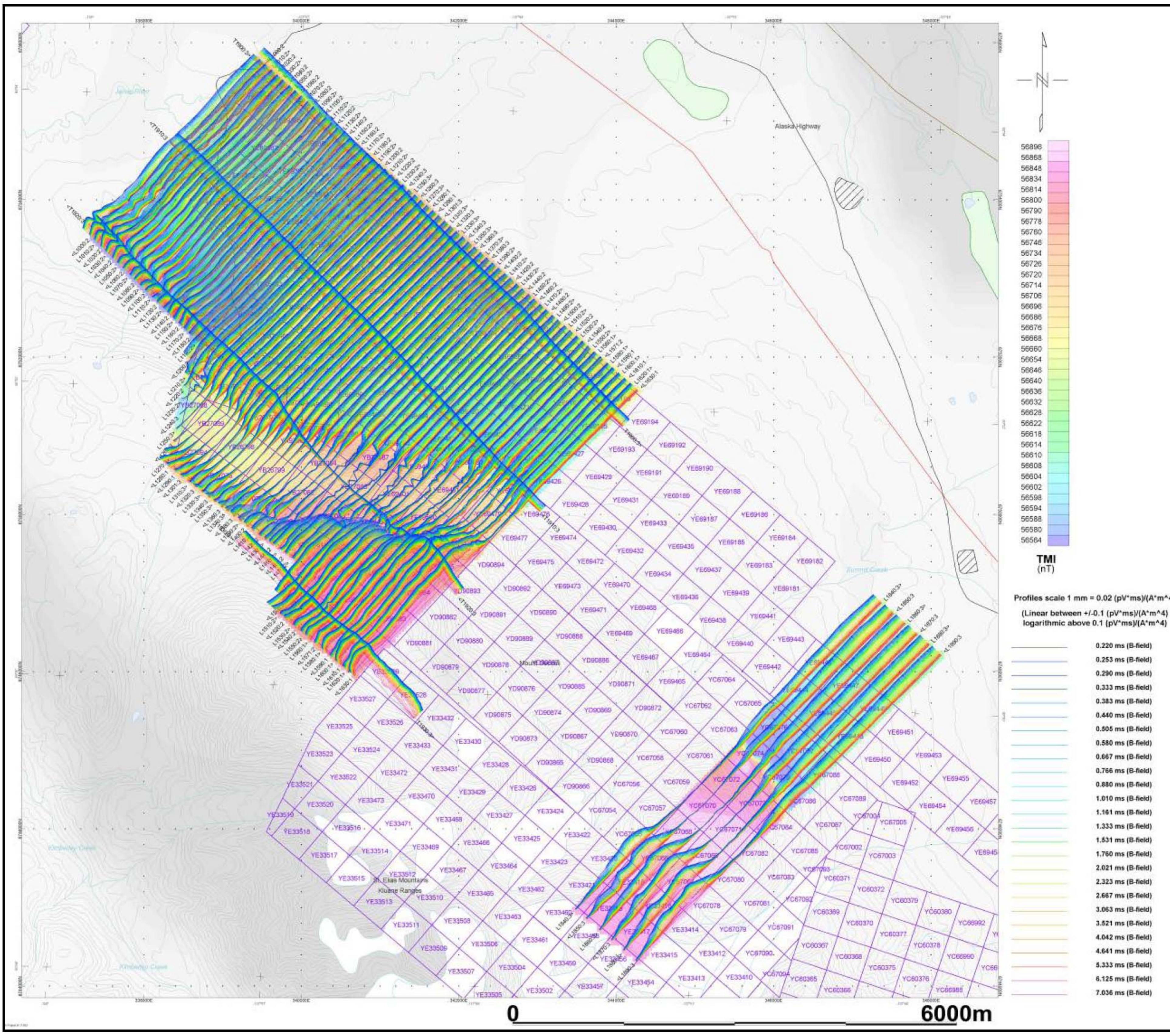


Figure 5: VTEM Survey



VTEM B-Field Z Component Profiles, Time Gates 0.220 to 7.036 ms

9 INTERPRETATION AND CONCLUSIONS

A helicopter-borne versatile time domain electromagnetic (VTEM) geophysical survey has been completed over the Ellen Property near Haines Junction, Yukon Territory.

The total area coverage is 32.5 km^2. Total survey line coverage is 304 line kilometres. The principal sensors included a Time Domain EM system and a magnetometer. Results have been presented as stacked profiles, and contour color images at a scale of 1:20,000. A formal Interpretation has not been included or requested.

Based on the geophysical results obtained, the area roughly consists of eight conductive zones as shown in appendix 2. All of these zones are considered as sub-horizontal lithological conductors, and gently to steeply dipping structural conductors

Conductive zone #1 is a steeply dipping, structural conductor of approximately 1900m long. The good conductive structure is oriented SE-NW, and it is associated with the magnetic low. According to detail resistivity depth imaging, the top of EM response is about 50m deep (See Appendix 2 L1020 RDI). The structure seems to be continuing past the NW edge of the block, and it is on the SW edge of the block, so further investigation is recommended

Conductive zones #2 & 3 are gently dipping moderate conductive structures and/or lithological conductors that seem to feed into conductive zone #4. Zones #2 & 3 are oriented SE-NW, and they are about 2100m long each. Zone #3 is associated with the magnetic high. According to detail resistivity depth imaging the top of the conductors varies in depth from near surface to about 50m deep. Zone #4 is a regional subhorizontal moderate conductive layer that is found near the centre of the block. According to detail resistivity depth imaging the subhorizontal lithologic conductor is approximately near surface (See Appendix 2 L1510 RDI).

Conductive zone #5 is good conductive structural conductor that is gently dipping to the south. The conductive zone is oriented almost E-W, and its length/ size is unknown because it is both on the edge and the unsurveyed part of the block. The zone is associated with the magnetic high. According to detail resistivity depth imaging, the top of EM response is near surface (See Appendix 2 L1520 RDI).

Near the south eastern edge of the block, is a small good conductive structure # 6, which is gently dipping to the NE. The length/ size of the structure is unknown because it is on the edge of the block. The structure is oriented SE-NW, and it is associated with the magnetic high. According to detail resistivity depth imaging, the top of the EM response is about 25m deep (See Appendix 2 L1880 RDI).

Zones # 7 & 8 are moderate conductive sub-horizontal layers. Zone #8 is associated with the magnetic high. These zones are also on the block edges and their sizes are unknown. According to detail resistivity depth imaging, the conductive zones are near the surface (See Appendix 2 L1880 RDI).

If the conductors correspond to an exploration model on the area it is recommended picking anomalies with conductance grading and center localization of the targets, detail resistivity depth imaging and plate Maxwell modelling with test drillhole parameters prior to ground follow up and drill testing are recommended.

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Tully, D.W., 1994. Geological evaluation report on the Ellen Mineral Claim Group.Report for Probe Resources Inc. Only select figures available

Certificate

I, GLEN MACDONALD, of 905-1600 M Beach Avenue, Vancouver, B.C., hereby certify that:

1. I am a graduate of the University of British Columbia with degrees in Economics (B.A., 1971) and Geology (B.Sc., 1973);
2. I have practiced my professional as a Geologist since graduation;
3. I have practiced Geology as an Independent Consulting Geologist since 1983;
4. I am a member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta (No. 36214);
5. I am a member of the Association of Professional Engineers and Geoscientists of the Province of British Columbia (No. 20464);
6. I supervised the exploration program reported herein.

Dated at Vancouver, B.C., this 20th day of January 2012

____

Glen Macdonald, P.Geol., P.Geo.

Appendix 1
Statement of Costs

STATEMENT OF COSTS, ELLEN CLAIMS

JP Exploration Services Inc. ....$ 5403.04

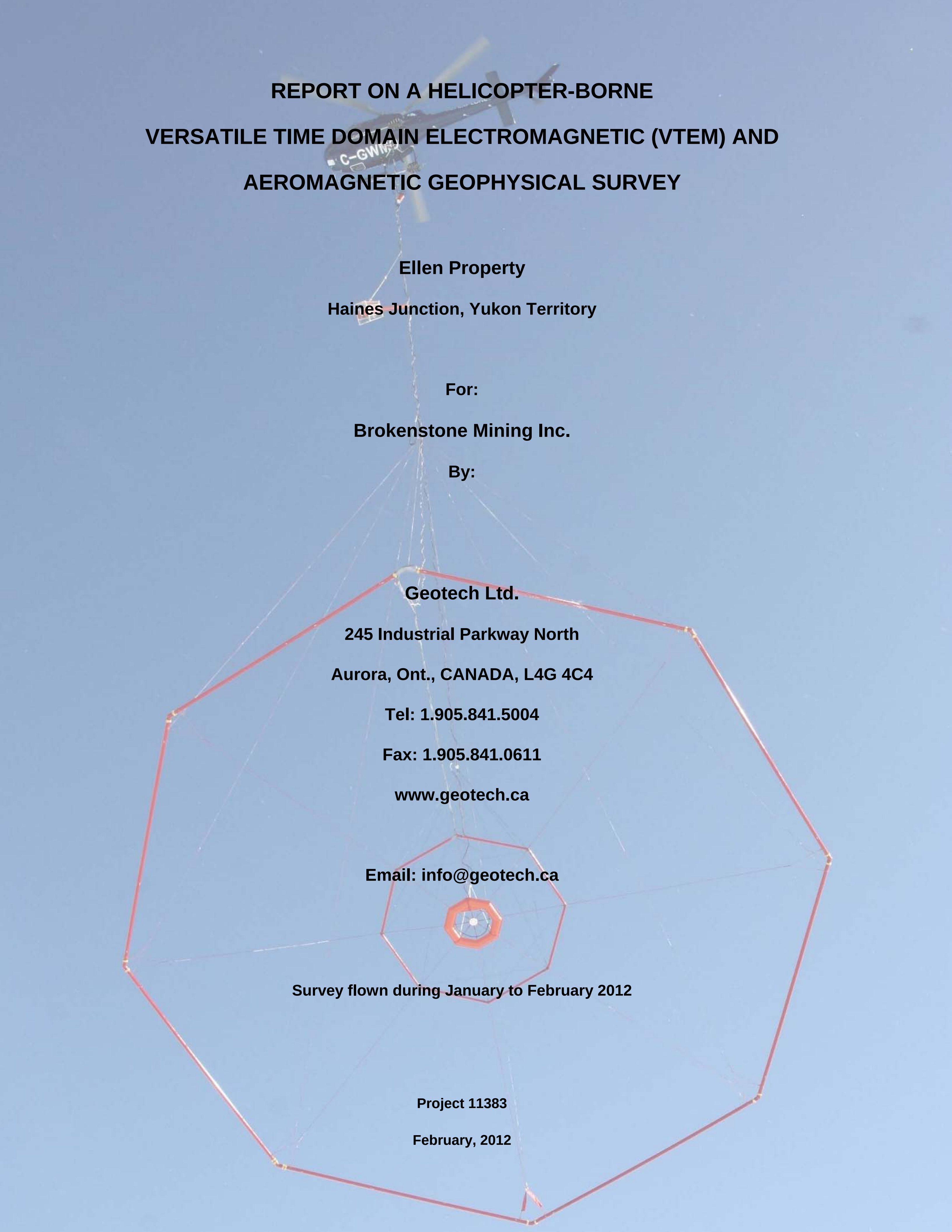
Geotech Ltd. (airborne geophysical survey) 73231.24

Total $78634.28

G. Macdonald

Glen Macdonald

Appendix 2



REPORT ON A HELICOPTER-BORNE VERSATILE TIME DOMAIN ELECTROMAGNETIC (VTEM) AND AEROMAGNETIC GEOPHYSICAL SURVEY

Ellen Property

Haines Junction, Yukon Territory

For:

Brokenstone Mining Inc.

By:

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Survey flown during January to February 2012

Project 11383

February, 2012

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REPORT ON A HELICOPTER-BORNE VERSATILE TIME DOMAIN ELECTROMAGNETIC (VTEM) and AEROMAGNETIC SURVEY

Ellen Property
Haines Junction, Yukon Territory

Executive Summary

During January 27th to February 1st, 2012 Geotech Ltd. carried out a helicopter-borne geophysical survey over the Ellen Property located near Haines Junction, Yukon Territory, Canada.

Principal geophysical sensors included a versatile time domain electromagnetic (VTEM) system, and a cesium magnetometer. Ancillary equipment included a GPS navigation system and a radar altimeter. A total of 304 line-kilometres of geophysical data were acquired.

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 processed survey results are presented as the following maps:

- Total Magnetic Intensity
- B-Field Z Component Channel grid
- Calculated Time Constant (TAU)
- Electromagnetic stacked profiles of the B-field Z component
- Electromagnetic stacked profiles of the dB/dt Z component

Digital data includes all electromagnetic and magnetic products, ancillary data and the VTEM waveform.

The survey report describes the procedures for data acquisition, processing, final image presentation and the specifications for the digital data set.

1. INTRODUCTION

1.1 General Considerations

Geotech Ltd. performed a helicopter-borne geophysical survey over the Ellen Property located near Haines Junction, Yukon Territory, Canada (Figure 1 & 2).

Derrick Strickland represented Brokenstone Mining Inc during the data acquisition and data processing phases of this project.

The geophysical surveys consisted of helicopter borne EM using the versatile time-domain electromagnetic (VTEM) system with Z component measurements and aeromagnetics using a cesium magnetometer. A total of 304 line-km of geophysical data were acquired during the survey.

The crew was based out of Haines Junction, Yukon Territory for the acquisition phase of the survey. Survey flying started on January 27th, 2012 and was completed on February 1st, 2012.

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 data processing followed immediately after the end of the survey. Final reporting, data presentation and archiving were completed from the Aurora office of Geotech Ltd. in February, 2012.

Figure 1: Property Location

1.2 Survey and System Specifications

The Block is located approximately 18 kilometres northwest of Haines Junction, Yukon Territory (Figure 2).

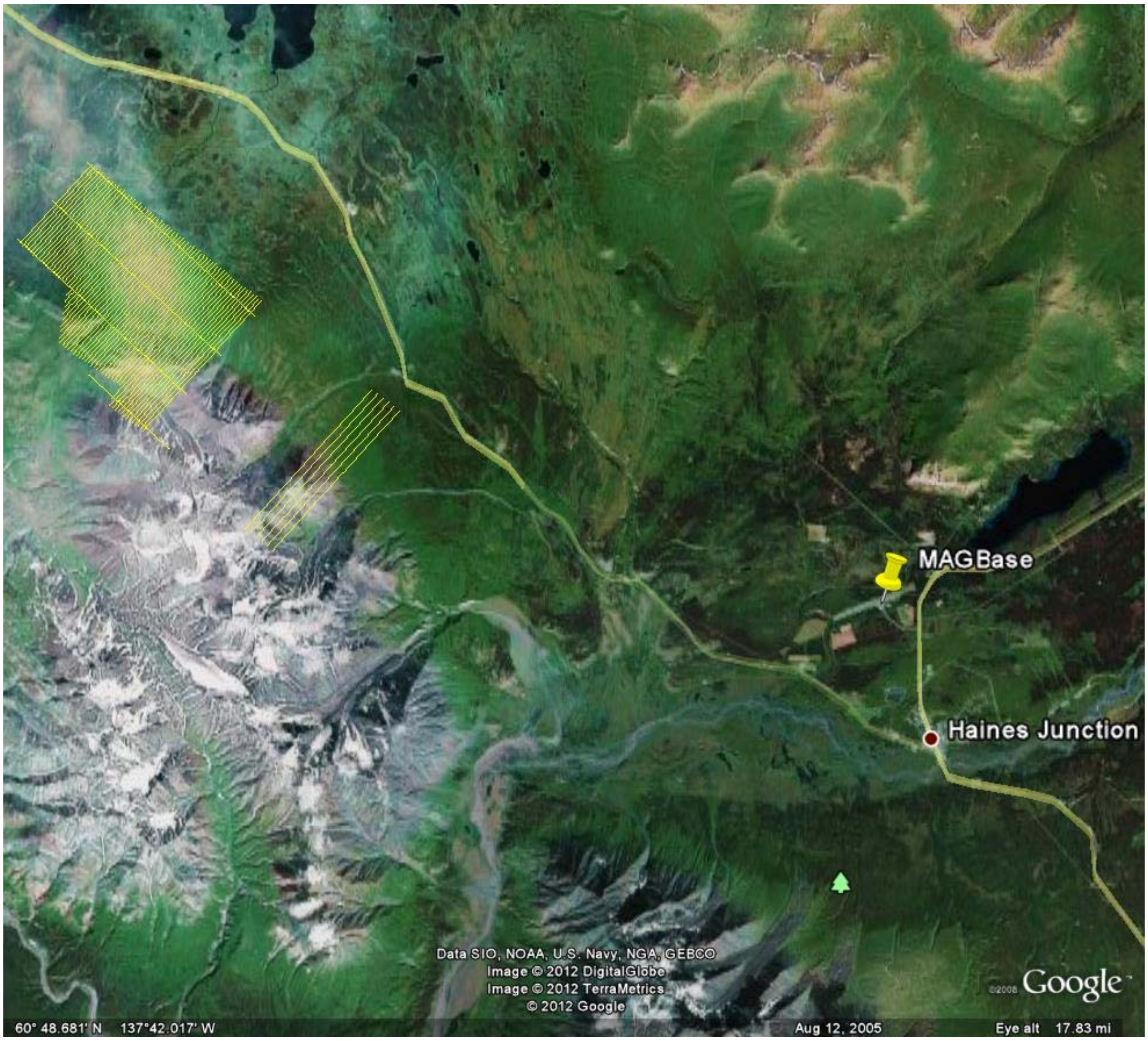


Figure 2: Survey area location on Google Earth

The block was flown in a southwest to northeast (N 45° E azimuth) direction with traverse line spacing of 100 metres and 200 metres as depicted in Figure 3. Tie lines were flown perpendicular to the traverse lines at a spacing of 1500 metres (N 135° E azimuth).

For more detailed information on the flight spacing and direction see Table 1.

1.3 Topographic Relief and Cultural Features

Topographically, the blocks exhibit a high relief with elevations ranging from 814 to 2111 metres above mean sea level over an area of 32.5 square kilometres (Figure 3).

There are various rivers and streams running through the survey area which connect various lakes and wetlands. The south west corner has numerous glaciers and the Kluane Wildlife Sanctuary is located in the middle of the block There no visible signs of culture inside the block however, along the north side of the survey there is a pipeline and the Alaska Highway.

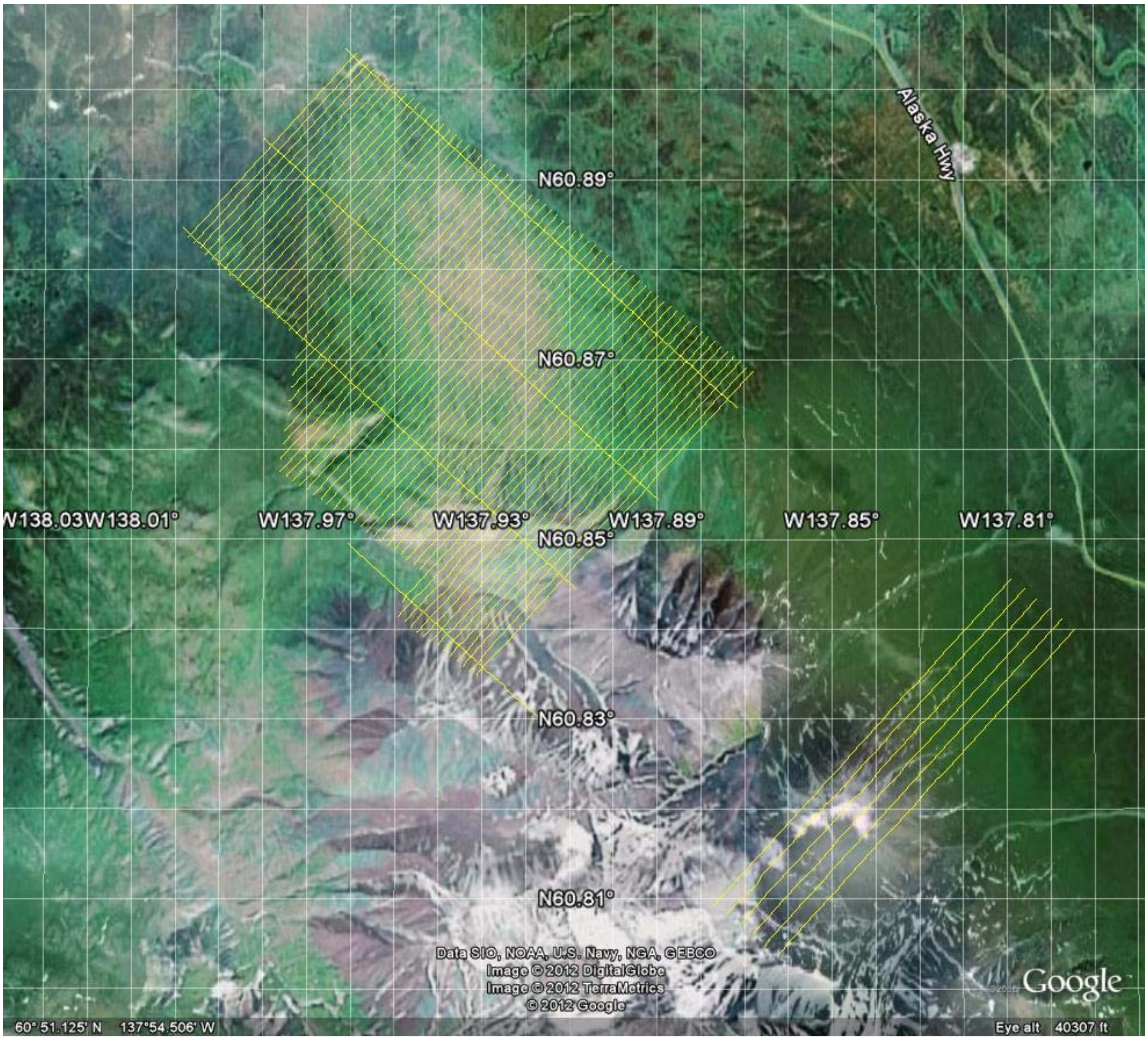


Figure 3: Flight path over a Google Earth Image

The survey area is covered by numerous mining claims, which are shown in Appendix A, and are plotted on all maps. The survey area is covered by NTS (National Topographic Survey) of Canada sheets 115A13 and 115B16.

2. DATA ACQUISITION

2.1 Survey Area

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

Table 1: Survey Specifications

Survey block	Traverse Line spacing (m)	Area (Km^2)	Planned[1] Line-km	Actual Line-km	Flight direction	Line numbers
Ellen	Traverse: 100 & 200	32.5	439	304	N 45° E / N 225° E	L1000-L1890
	Tie: 1500				N 135° E / N 315° E	T1900-T1930
TOTAL		32.5	439	304		

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

2.2 Survey Operations

Survey operations were based out of Haines Junction from January 27th, to February 1st, 2012. The following table shows the timing of the flying.

Table 2: Survey schedule

Date	Flight #	Flow km	Block	Crew location	Comments
27-Jan-2012	1	39	Phase1	Haines Junction,YT	39km flown
28-Jan-2012				Haines Junction,YT	System adjustments& testing done
29-Jan-2012				Haines Junction,YT	No production due to weather
30-Jan-2012	2,3	265	Phase1	Haines Junction,YT	265km flown
31-Jan-2012				Haines Junction,YT	No production due to weather
1-Feb-2012				Haines Junction,YT	Job terminated as per client

[1] Note: Actual Line kilometres represent the total line kilometres in the final database. These line-km normally exceed the Planned line-km, as indicated in the survey NAV files. However, the survey was stopped early as per the client.

2.3 Flight Specifications

During the survey the helicopter was maintained at a mean altitude of 94 metres above the ground with an average survey speed of 80 km/hour. This allowed for an average EM bird terrain clearance of 48 metres and a magnetic sensor clearance of 81 metres.

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 features.

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 qualified personnel.

2.4 Aircraft and Equipment

2.4.1 Survey Aircraft

The survey was flown using a Eurocopter Aerospatiale (Astar) 350 B3 helicopter, registration C-GTEQ. The helicopter is owned and operated by Geotech Aviation. Installation of the geophysical and ancillary equipment was carried out by a Geotech Ltd crew.

2.4.2 Electromagnetic System

The electromagnetic system was a Geotech Time Domain EM (VTEM) system. VTEM, with the serial number 17 had been used for the survey. The configuration is as indicated in Figure 5.

The VTEM Receiver and transmitter coils were in concentric-coplanar and Z-direction oriented configuration. The EM bird was towed at a mean distance of 35 metres below the aircraft as shown in Figure 5 and Figure 6. The receiver decay recording scheme is shown diagrammatically in Figure 4.

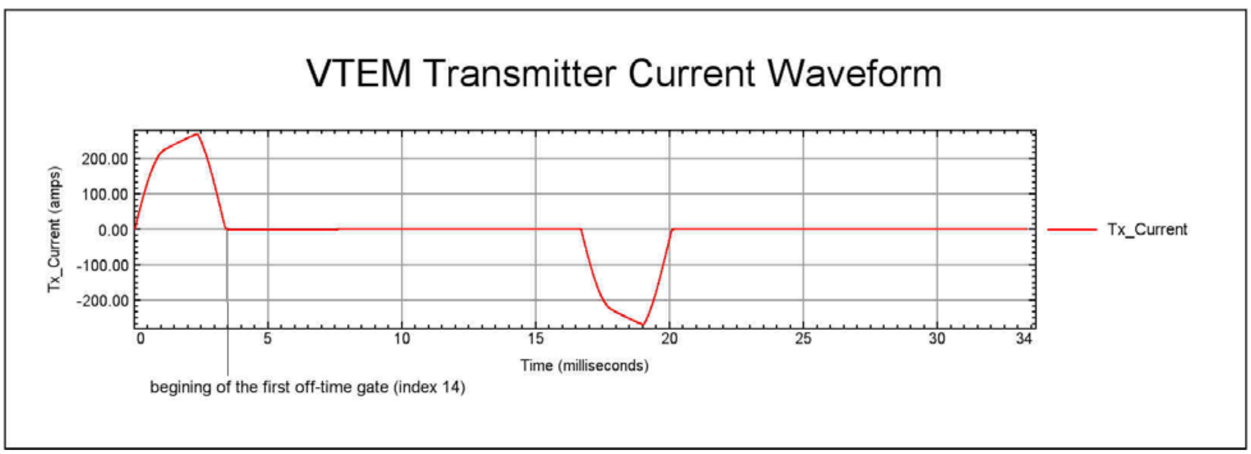


Figure 4: VTEM Waveform

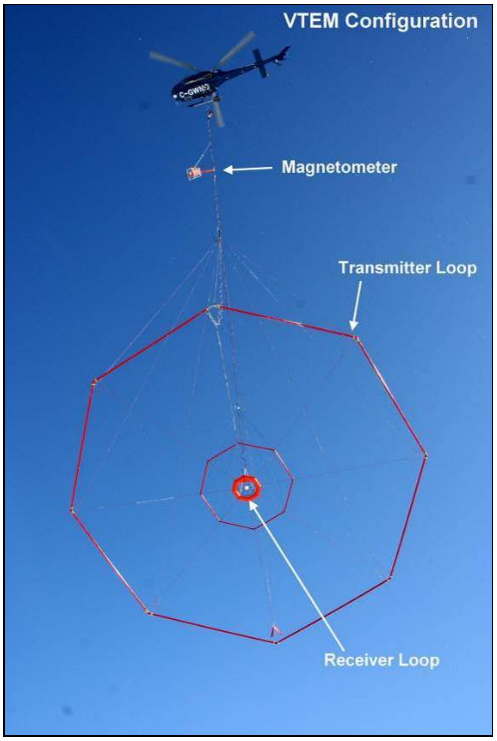


Figure 5: VTEM Configuration, with magnetometer.

The VTEM decay sampling scheme is shown in Table 3 below. Thirty-two time measurement gates were used for the final data processing in the range from 0.096 to 7.036 msec.

Table 3: Off-Time Decay Sampling Scheme

VTEM Decay Sampling Scheme			
Index	**Middle**	**Start**	**End**
Milliseconds			
14	0.096	0.090	0.103
15	0.110	0.103	0.118
16	0.126	0.118	0.136
17	0.145	0.136	0.156
18	0.167	0.156	0.179
19	0.192	0.179	0.206
20	0.220	0.206	0.236
21	0.253	0.236	0.271
22	0.290	0.271	0.312
23	0.333	0.312	0.358
24	0.383	0.358	0.411
25	0.440	0.411	0.472
26	0.505	0.472	0.543
27	0.580	0.543	0.623
28	0.667	0.623	0.716
29	0.766	0.716	0.823
30	0.880	0.823	0.945
31	1.010	0.945	1.086
32	1.161	1.086	1.247
33	1.333	1.247	1.432
34	1.531	1.432	1.646
35	1.760	1.646	1.891
36	2.021	1.891	2.172
37	2.323	2.172	2.495
38	2.667	2.495	2.865
39	3.063	2.865	3.292
40	3.521	3.292	3.781
41	4.042	3.781	4.341
42	4.641	4.341	4.987
43	5.333	4.987	5.729
44	6.125	5.729	6.581
45	7.036	6.581	7.560

Z Component: 14-45 time gates
X Component: 20-45 time gates.

VTEM system specification:

<u>Transmitter</u>

- Transmitter coil diameter: 17.6 m
- Number of turns: 4
- Effective coil area: 973 m^2
- Transmitter base frequency: 30 Hz
- Peak current: 270 A
- Pulse width: 3.42 ms
- Wave form shape: trapezoid
- Peak dipole moment: 262,750 nIA
- Actual Average EM Bird terrain clearance: 48 metres above the ground

<u>Receiver</u>

- Z-Coil coil diameter: 1.2 m
- Number of turns: 100
- Effective coil area: 113.04 m^2

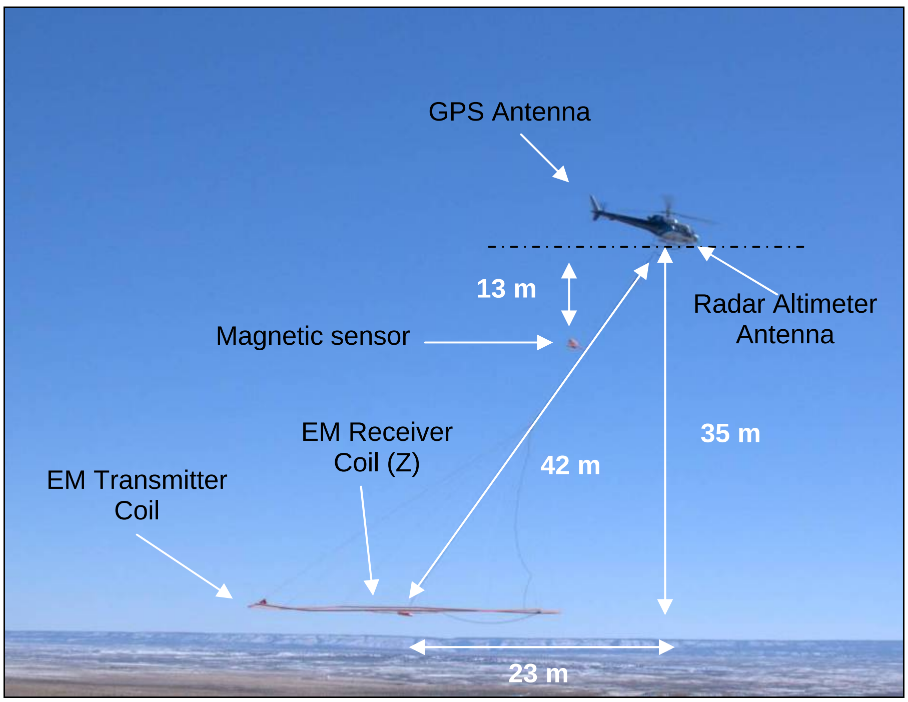


Figure 6: VTEM System Configuration

2.4.3 Airborne magnetometer

The magnetic sensor utilized for the survey was Geometrics optically pumped cesium vapour magnetic field sensor mounted 13 metres below the helicopter, as shown in Figure 6. The sensitivity of the magnetic sensor is 0.02 nanoTesla (nT) at a sampling interval of 0.1 seconds.

2.4.4 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 (Figure 6).

2.4.5 GPS Navigation System

The navigation system used was a Geotech PC104 based navigation system utilizing a NovAtel's WAAS(Wide Area Augmentation System) enable OEM4-G2-3151W GPS receiver, Geotech navigate software, a full screen display with controls in front of the pilot to direct the flight and an NovAtel GPS antenna mounted on the helicopter tail (Figure 6). As many as 11 GPS and two WAAS satellites may be monitored at any one time. The positional accuracy or circular error probability (CEP) is 1.8 m, with WAAS active, it is 1.0 m. The co-ordinates of the block were set-up prior to the survey and the information was fed into the airborne navigation system.

2.4.6 Digital Acquisition System

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 4.

Table 4: Acquisition Sampling Rates

Data Type	Sampling
TDEM	0.1 sec
Magnetometer	0.1 sec
GPS Position	0.2 sec
Radar Altimeter	0.2 sec

2.5 Base Station

A combined magnetometer/GPS base station was utilized on this project. A Geometrics Cesium 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 sensor was installed at Haines Junction airport in wooded area (60º 47.3879'N, 137º 32.2584'W); 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:	Adrian Sarmasag (office)
Data QA/QC:	Emilio Schein (office)
Crew Chief:	Benjamin Bruder
System Operators:	Claudiu Chirigel

The survey pilot and the mechanical engineer were employed directly by the helicopter operator – Geotech Aviation.

Pilot:	Guy Poirier
Mechanical Engineer:	Greg Hynes

Office:

Preliminary Data Processing:	Emilio Schein
Final Data Processing:	Keeme Mokubung
Final Data QA/QC:	Alexander Prikhodko
Reporting/Mapping:	Wendy Acorn

Data acquisition phase was carried out under the supervision of Andrei Bagrianski, P. Geo, Chief Operations Officer. The processing and interpretation phase was under the supervision of Alexander Prikhodko, P. Geo, Ph.D. The overall contract management and customer relations were by Mandy Long.

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 WGS84 Datum, UTM Zone 8 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 Electromagnetic Data

A three stage digital filtering process was used to reject major sferic events and to reduce system noise. Local sferic activity can produce sharp, large amplitude events that cannot be removed by conventional filtering procedures. Smoothing or stacking will reduce their amplitude but leave a broader residual response that can be confused with geological phenomena. To avoid this possibility, a computer algorithm searches out and rejects the major sferic events.

The signal to noise ratio was further improved by the application of a low pass linear digital filter. This filter has zero phase shift which prevents any lag or peak displacement from occurring, and it suppresses only variations with a wavelength less than about 1 second or 15 metres. This filter is a symmetrical 1 sec linear filter.

The results are presented as stacked profiles of EM voltages for the time gates, in linear - logarithmic scale for the B-field Z component and dB/dt responses in the Z. B-field Z component time channel recorded at 0.880 milliseconds after the termination of the impulse is also presented as a color image. Calculated Time Constant (TAU) with anomaly contours of Calculated Vertical Derivative of TMI is presented in Appendix C and E. Tau was calculated for B-Field and dB/dt. Resistivity Depth Image (RDI) is also presented in Appendix C and F.

VTEM receiver coil orientation Z-axis coil is oriented parallel to the transmitter coil axis and is horizontal to the ground. Generalized modeling results of VTEM data, are shown in Appendix D.

Z component data produce double peak type anomalies for "thin" subvertical targets and single peak for "thick" targets.

The limits and change-over of "thin-thick" depends on dimensions of a TEM system the system's height and depth of a target. For example see Appendix D, Fig.D-16.

4.3 Magnetic Data

The processing of the magnetic 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 approximately 35 metres at the mapping scale. 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 for best representation of the survey size and line spacing. The coordinate/projection system used was WGS84 Datum, UTM Zone 8 North. All maps show the mining claims, 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 EM profiles, a late-time gate gridded EM channel, and a color magnetic TMI contour map. The following maps are presented on paper;

- VTEM dB/dt profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
- VTEM B-Field profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
- VTEM B-Field late time Z Component colour image.
- Total Magnetic Intensity (TMI) colour image and contours.
- VTEM dB/dt Calculated Time Constant (TAU) with contours of anomaly areas of the Calculated Vertical Derivative of TMI

5.3 Digital Data

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

- DVD structure.

Data	contains databases, grids and maps, 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 5.

Table 5: Geosoft GDB Data Format

Channel name	Units	Description
X:	metres	UTM Easting WGS84 Zone 8 North
Y:	metres	UTM Northing WGS84 Zone 8 North
Z:	metres	GPS antenna elevation (above Geoid)
Longitude:	Decimal Degrees	WGS 84 Longitude data
Latitude:	Decimal Degrees	WGS 84 Latitude data
Radar:	metres	helicopter terrain clearance from radar altimeter
Radarb:	metres	Calculated EM bird terrain clearance from radar altimeter
DEM:	metres	Digital Elevation Model
Gtime:	Seconds of the day	GPS time
Mag1:	nT	Raw Total Magnetic field data
Basemag:	nT	Magnetic diurnal variation data
Mag2:	nT	Diurnal corrected Total Magnetic field data
Mag3:	nT	Levelled Total Magnetic field data
SFz[14]:	$pV/(A*m^4)$	Z dB/dt 96 microsecond time channel
SFz[15]:	$pV/(A*m^4)$	Z dB/dt 110 microsecond time channel
SFz[16]:	$pV/(A*m^4)$	Z dB/dt 126 microsecond time channel
SFz[17]:	$pV/(A*m^4)$	Z dB/dt 145 microsecond time channel
SFz[18]:	$pV/(A*m^4)$	Z dB/dt 167 microsecond time channel
SFz[19]:	$pV/(A*m^4)$	Z dB/dt 192 microsecond time channel
SFz[20]:	$pV/(A*m^4)$	Z dB/dt 220 microsecond time channel
SFz[21]:	$pV/(A*m^4)$	Z dB/dt 253 microsecond time channel
SFz[22]:	$pV/(A*m^4)$	Z dB/dt 290 microsecond time channel
SFz[23]:	$pV/(A*m^4)$	Z dB/dt 333 microsecond time channel
SFz[24]:	$pV/(A*m^4)$	Z dB/dt 383 microsecond time channel
SFz[25]:	$pV/(A*m^4)$	Z dB/dt 440 microsecond time channel
SFz[26]:	$pV/(A*m^4)$	Z dB/dt 505 microsecond time channel
SFz[27]:	$pV/(A*m^4)$	Z dB/dt 580 microsecond time channel
SFz[28]:	$pV/(A*m^4)$	Z dB/dt 667 microsecond time channel
SFz[29]:	$pV/(A*m^4)$	Z dB/dt 766 microsecond time channel
SFz[30]:	$pV/(A*m^4)$	Z dB/dt 880 microsecond time channel
SFz[31]:	$pV/(A*m^4)$	Z dB/dt 1010 microsecond time channel
SFz[32]:	$pV/(A*m^4)$	Z dB/dt 1161 microsecond time channel
SFz[33]:	$pV/(A*m^4)$	Z dB/dt 1333 microsecond time channel
SFz[34]:	$pV/(A*m^4)$	Z dB/dt 1531 microsecond time channel
SFz[35]:	$pV/(A*m^4)$	Z dB/dt 1760 microsecond time channel
SFz[36]:	$pV/(A*m^4)$	Z dB/dt 2021 microsecond time channel
SFz[37]:	$pV/(A*m^4)$	Z dB/dt 2323 microsecond time channel
SFz[38]:	$pV/(A*m^4)$	Z dB/dt 2667 microsecond time channel
SFz[39]:	$pV/(A*m^4)$	Z dB/dt 3063 microsecond time channel
SFz[40]:	$pV/(A*m^4)$	Z dB/dt 3521 microsecond time channel
SFz[41]:	$pV/(A*m^4)$	Z dB/dt 4042 microsecond time channel
SFz[42]:	$pV/(A*m^4)$	Z dB/dt 4641 microsecond time channel
SFz[43]:	$pV/(A*m^4)$	Z dB/dt 5333 microsecond time channel
SFz[44]:	$pV/(A*m^4)$	Z dB/dt 6125 microsecond time channel
SFz[45]:	$pV/(A*m^4)$	Z dB/dt 7036 microsecond time channel
BFz	$(pV*ms)/(A*m^4)$	Z B-Field data for time channels 14 to 45
PLM:		60 Hz power line monitor
CVG	nT/m	Calculated Magnetic Vertical Gradient
TauSF	milliseconds	Time Constant (Tau) calculated from dB/dt data
TauBF	milliseconds	Time Constant (Tau) calculated from B-Field data
Nchan_BF		Last channel where the Tau algorithm stops calculation, B-Field data
Nchan_SF		Last channel where the Tau algorithm stops calculation, dB/dt data

Electromagnetic B-field and dB/dt Z component data is found in array channel format between indexes 14 – 45.

- Database of the VTEM Waveform "11383_waveform_final.gdb" in Geosoft GDB format, containing the following channels:

Time:	Sampling rate interval, 5.2083 milliseconds
Rx_Volt:	Output voltage of the receiver coil (Volt)
Tx_Current:	Output current of the transmitter (Amp)

- Grids in Geosoft GRD format, as follows:

TMI:	Total Magnetic Intensity (nT)
BFz30:	B-Field Z Component Channel 30 (Time Gate 0.880 ms)
TAUSFz:	dB/dt Calculated Time Constant (TAU)
TAUBFz:	B-Field Calculated Time Constant (TAU)
CVG:	Calculated Vertical Derivative of TMI (CVG)
DEM:	Digital Elevation Model

A Geosoft .GRD file has a .GI metadata file associated with it, containing grid projection information. A grid cell size of 35 metres was used.

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

11383_20K_dBdt:	dB/dt profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
11383_20K_Bfield:	B-field profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
11383_20K_BFz30:	B-Field late time Z Component Channel 30, Time Gate 0.880 ms colour image.
11383_20K_TMI:	Total Magnetic Intensity (TMI) colour image and contours.
11383_20K_TauSF:	dB/dt Calculated Time Constant (TAU) with contours of anomaly areas of the Calculated Vertical Derivative of TMI

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 *11383_Brokenstone.kml* showing the flight path of the block is included. Free versions of Google Earth software from: http://earth.google.com/download-earth.html

6. CONCLUSIONS AND RECOMMENDATIONS

A helicopter-borne versatile time domain electromagnetic (VTEM) geophysical survey has been completed over the Ellen Property near Haines Junction, Yukon Territory.

The total area coverage is 32.5 km^2. Total survey line coverage is 304 line kilometres. The principal sensors included a Time Domain EM system and a magnetometer. Results have been presented as stacked profiles, and contour color images at a scale of 1:20,000. A formal Interpretation has not been included or requested.

Based on the geophysical results obtained, the area roughly consists of eight conductive zones as shown in (Figure 7). All of these zones are considered as sub-horizontal lithological conductors, and gently to steeply dipping structural conductors.

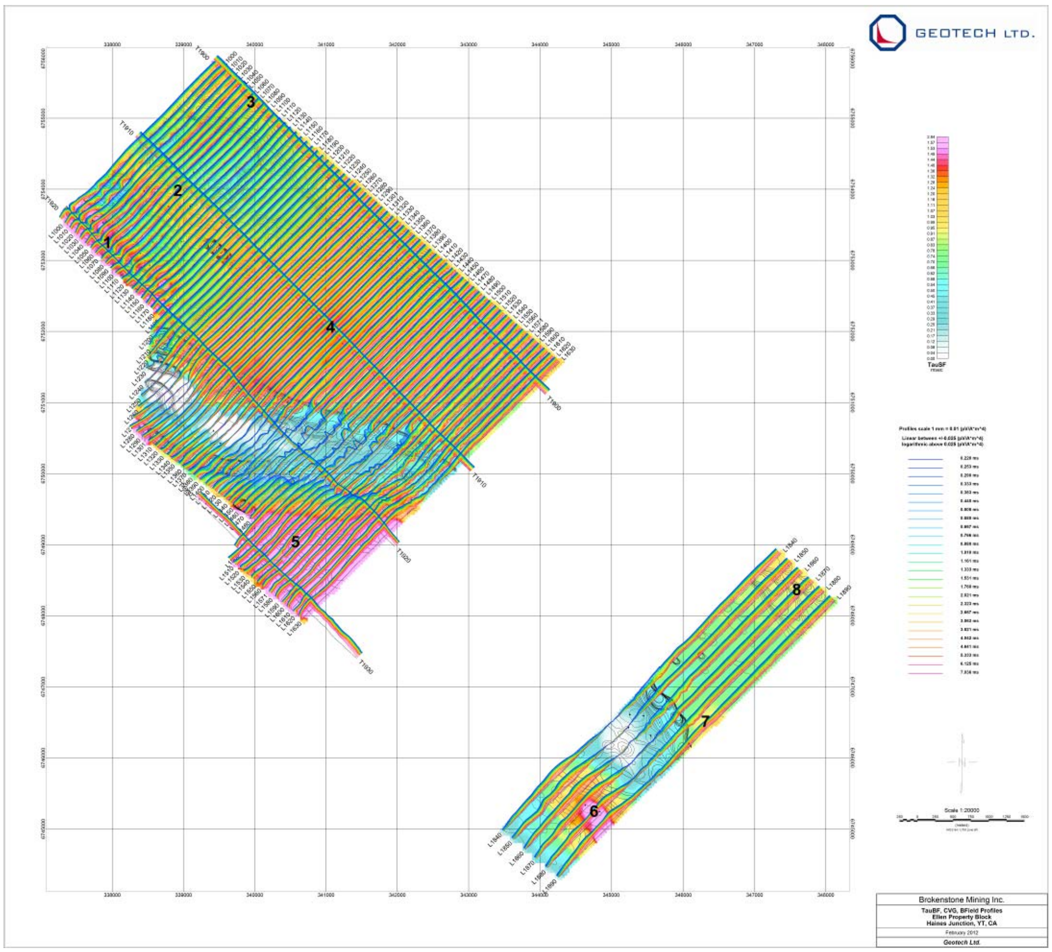


Figure 7 - CVG, Tau & B-Field Profiles

Conductive zone #1 is a steeply dipping, structural conductor of approximately 1900m long. The good conductive structure is oriented SE-NW, and it is associated with the magnetic low. According to detail resistivity depth imaging, the top of EM response is about 50m deep (See Appendix C L1020 RDI). The structure seems to be continuing past the NW edge of the block, and it is on the SW edge of the block, so further investigation is recommended.

Conductive zones #2 & 3 are gently dipping moderate conductive structures and/or lithological conductors that seem to feed into conductive zone #4. Zones #2 & 3 are oriented SE-NW, and they are about 2100m long each. Zone #3 is associated with the magnetic high. According to detail resistivity depth imaging the top of the conductors varies in depth from near surface to about 50m deep (See Appendix C L1020 RDI). Zone #4 is a regional subhorizontal moderate conductive layer that is found near the centre of the block. According to detail resistivity depth imaging the subhorizontal lithologic conductor is approximately near surface (See Appendix C L1510 RDI).

Conductive zone #5 is good conductive structural conductor that is gently dipping to the south. The conductive zone is oriented almost E-W, and its length/ size is unknown because it is both on the edge and the unsurveyed part of the block. The zone is associated with the magnetic high. According to detail resistivity depth imaging, the top of EM response is near surface (See Appendix C L1520 RDI).

Near the south eastern edge of the block, is a small good conductive structure # 6, which is gently dipping to the NE. The length/ size of the structure is unknown because it is on the edge of the block. The structure is oriented SE-NW, and it is associated with the magnetic high. According to detail resistivity depth imaging, the top of the EM response is about 25m deep (See Appendix C L1880 RDI).

Zones # 7 & 8 are moderate conductive sub-horizontal layers. Zone #8 is associated with the magnetic high. These zones are also on the block edges and their sizes are unknown. According to detail resistivity depth imaging, the conductive zones are near the surface (See Appendix C L1880 RDI).

If the conductors correspond to an exploration model on the area it is recommended picking anomalies with conductance grading and center localization of the targets, detail resistivity depth imaging and plate Maxwell modelling with test drillhole parameters prior to ground follow up and drill testing are recommended.

Respectfully submitted[6],

Emilio Schein
Geotech Ltd.

Keeme Mokubung
Geotech Ltd.

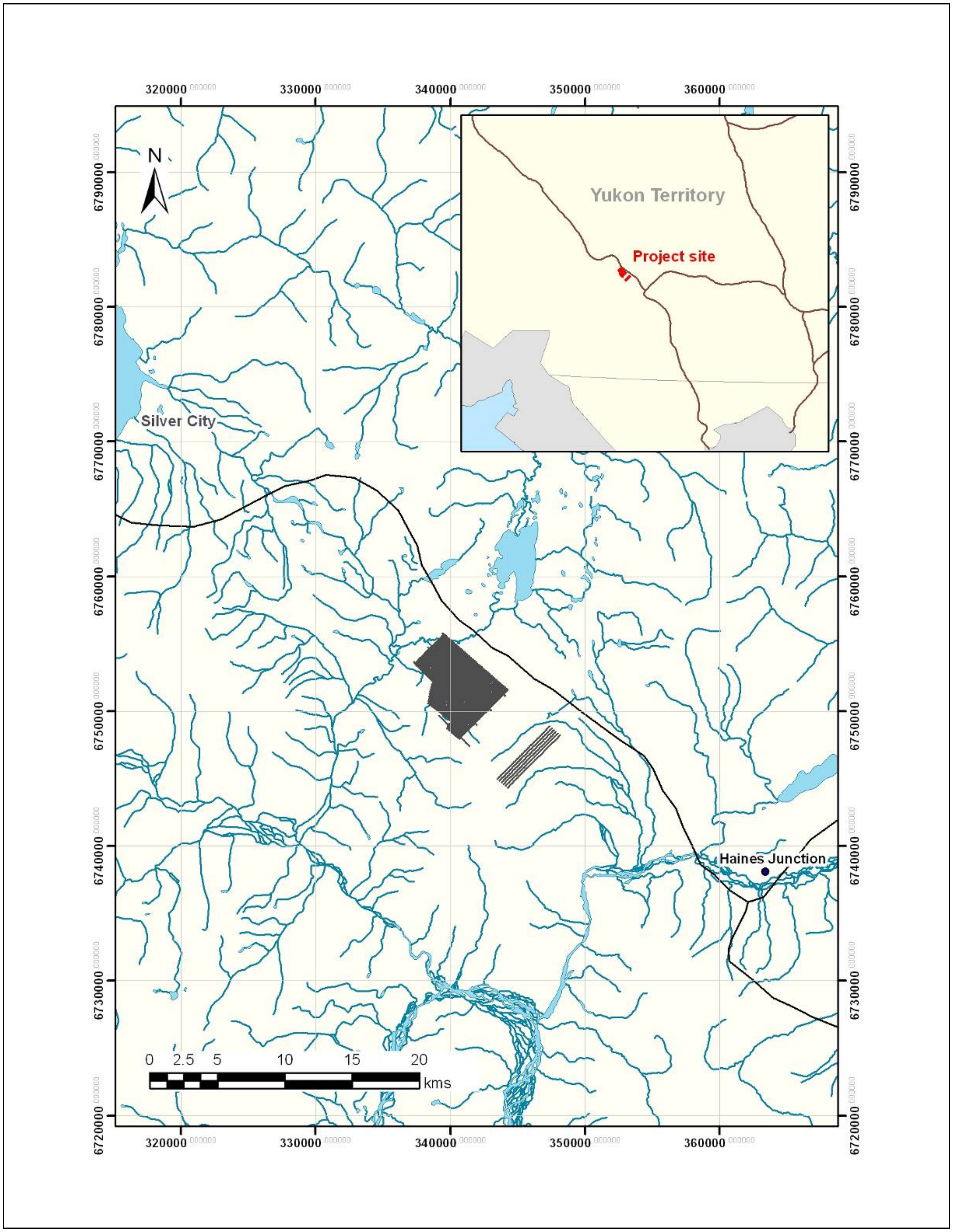
Alexander Prikhodko, P. Geo
Geotech Ltd.

February 2012

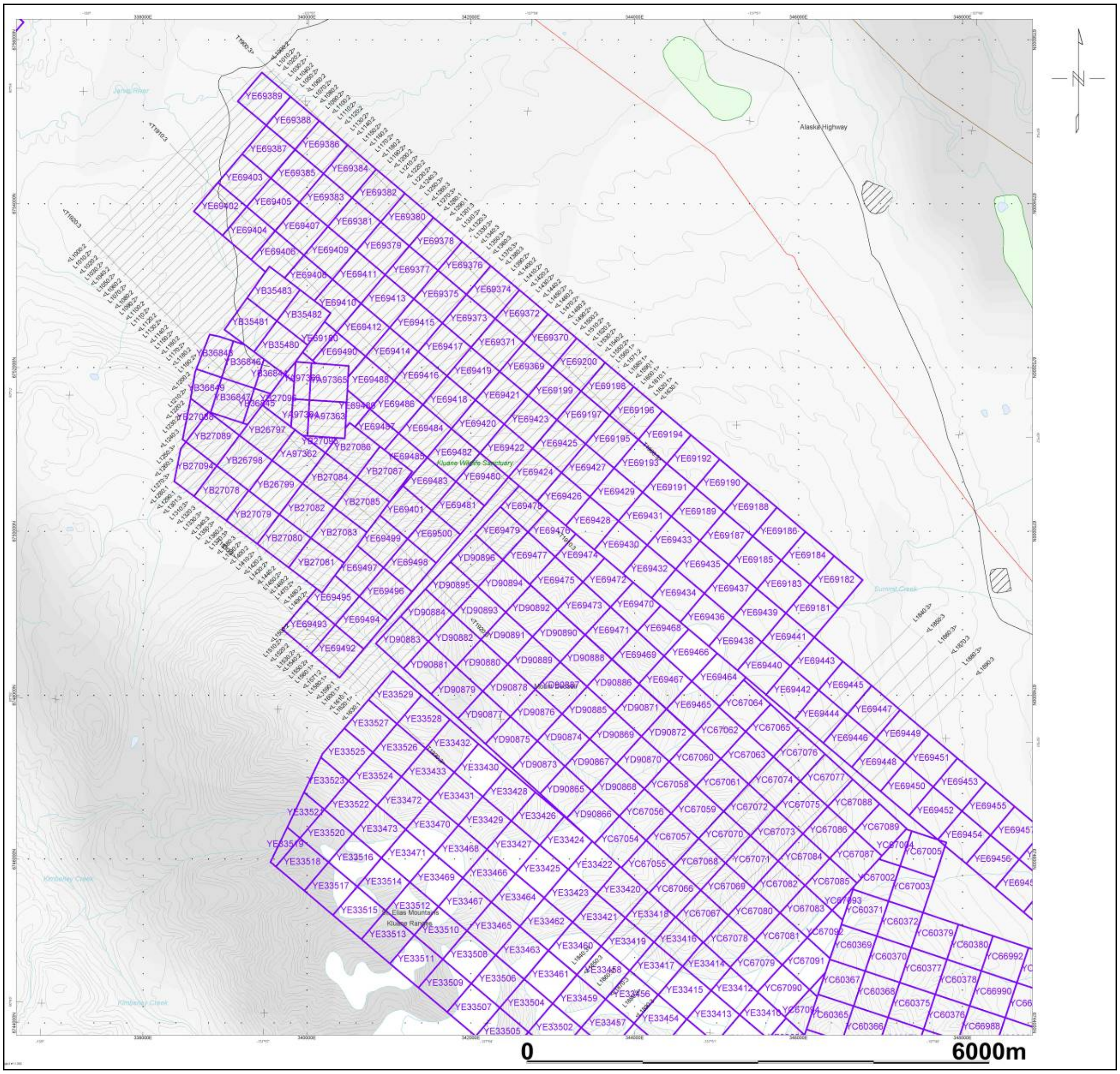
[6]Final data processing of the EM and magnetic data were carried out by Emilio Schein and Keeme Mokubung, from the office of Geotech Ltd. in Aurora, Ontario, under the supervision of Alexander Prikhodko, P.Geo., PhD, Senior Geophysicist, VTEM Interpretation Supervisor.

APPENDIX A

SURVEY BLOCK LOCATION MAP



Survey Overview of the Block



Mining Claims

APPENDIX B

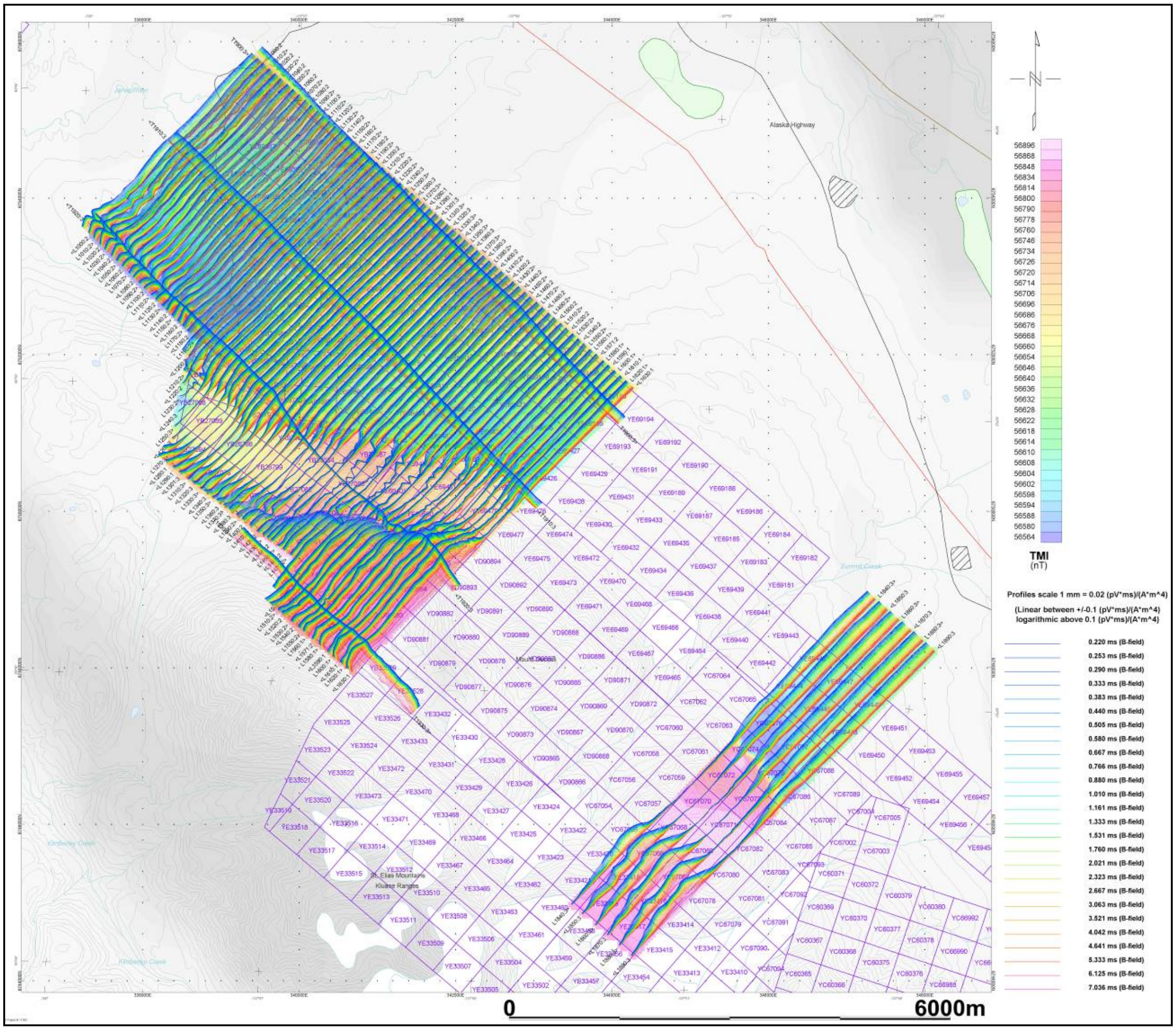
SURVEY BLOCK COORDINATES

(WGS 84, UTM Zone 8 North)

X	Y
339490.1	6755687.6
337368.8	6753566.3
338747.2	6752204.2
338650.7	6751980.8
338381.5	6750610.6
340119.3	6749301.2
339700.7	6748804.2
340751.5	6747946.2
344258.3	6751523.1
344322.3	6751468.8
348097.5	6748173.0
344283.2	6744358.7
340468.4	6747614.9

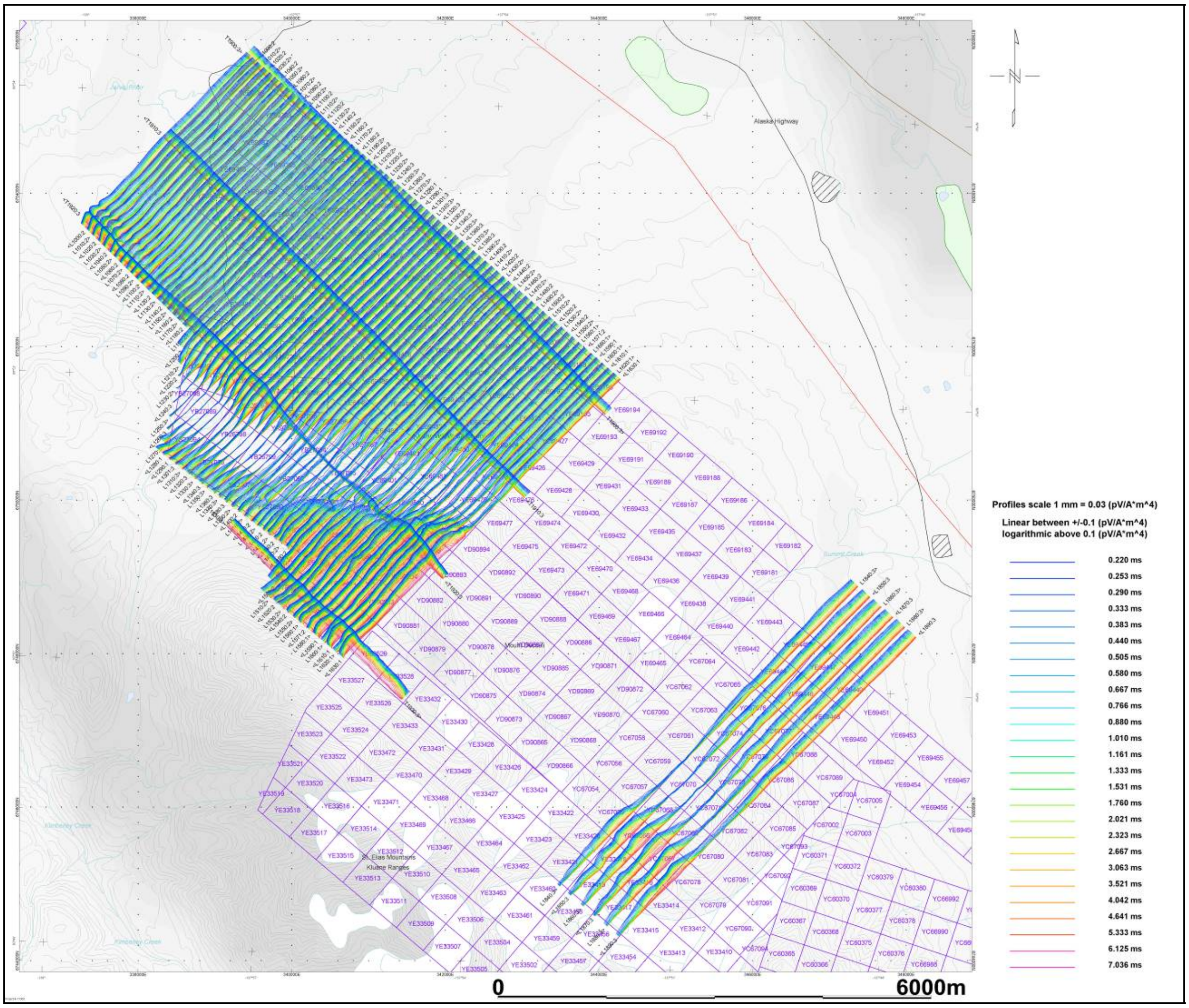
APPENDIX C

GEOPHYSICAL MAPS[1]

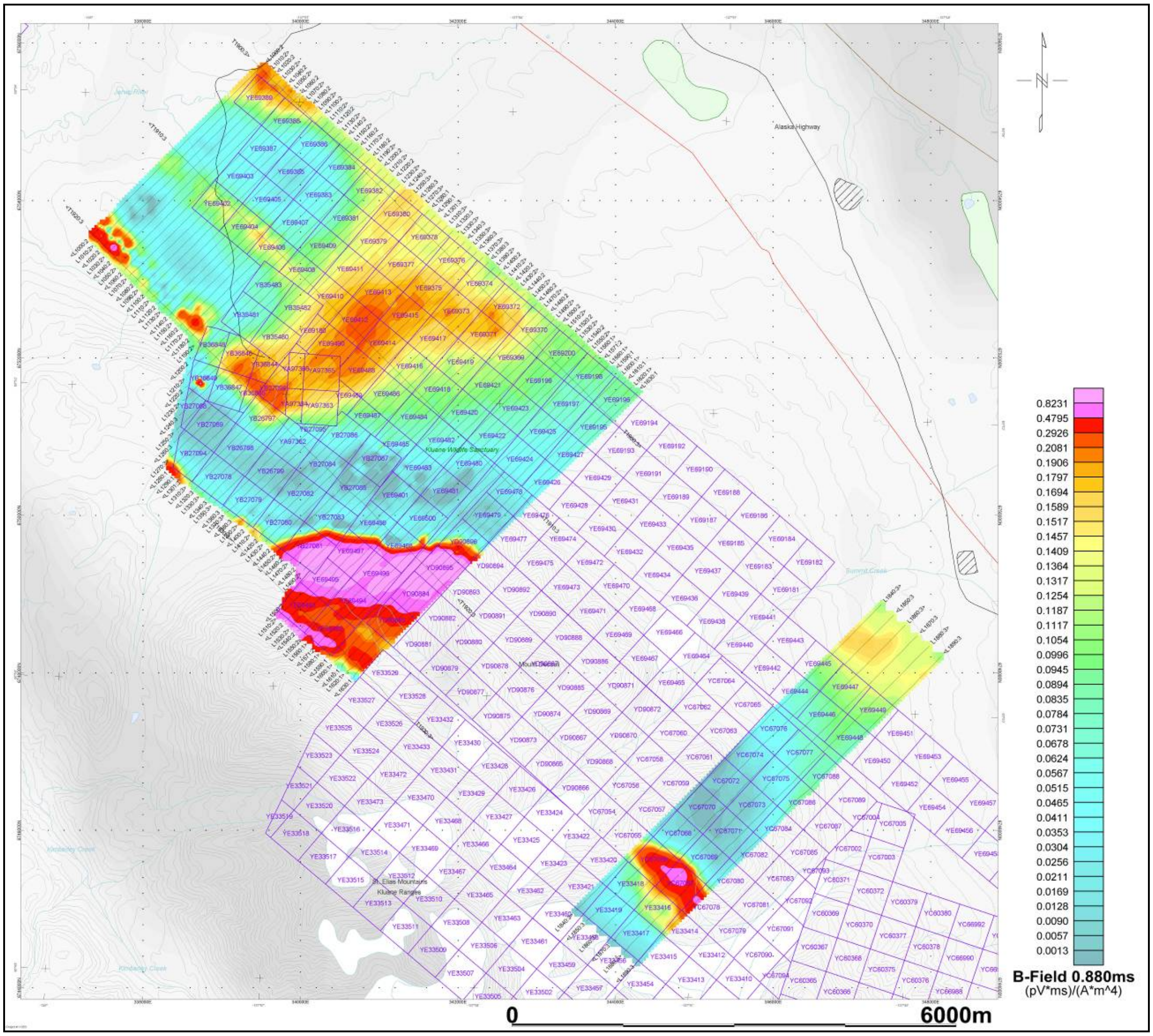


VTEM B-Field Z Component Profiles, Time Gates 0.220 to 7.036 ms

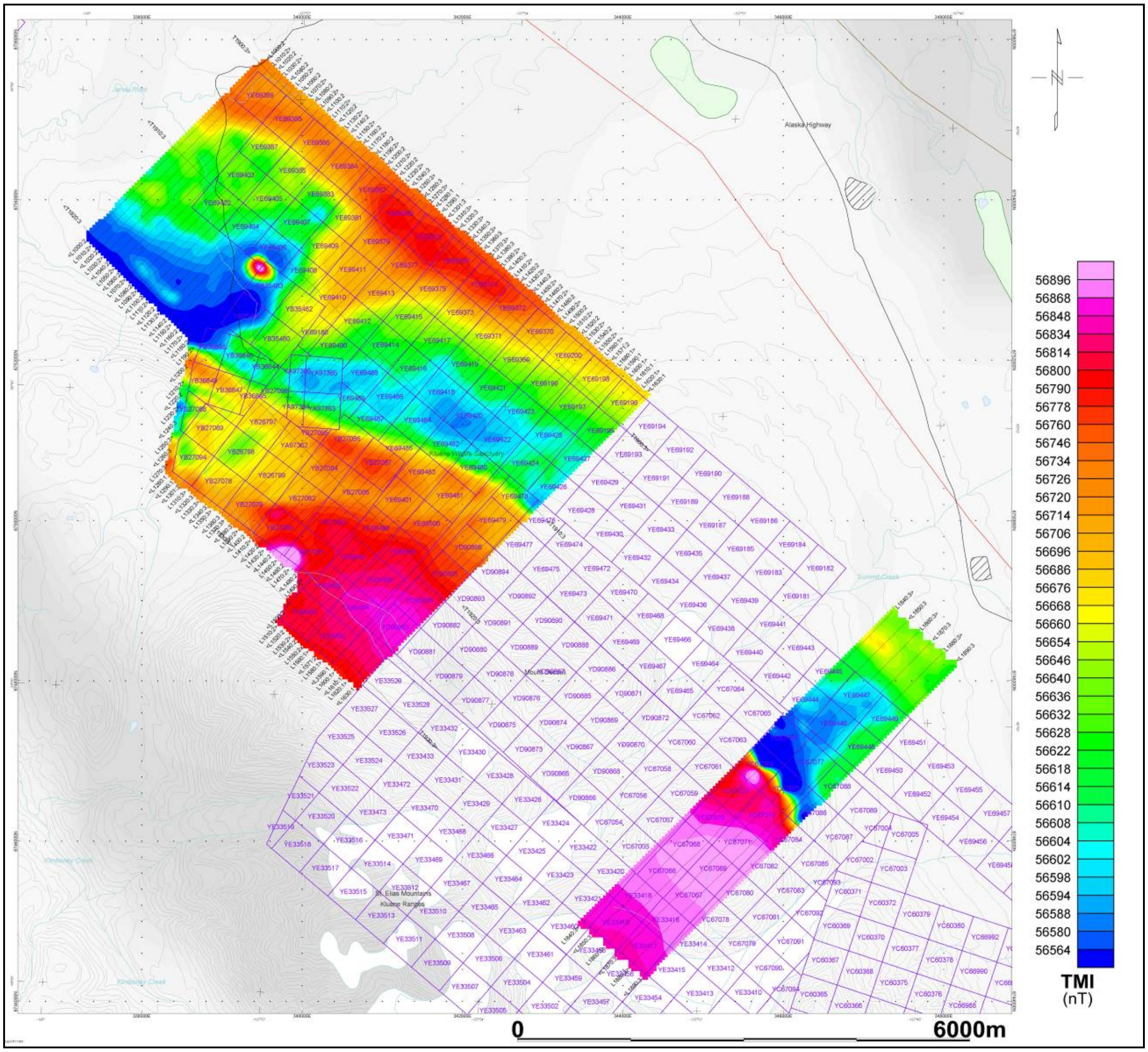
[1] Full size geophysical maps are also available in PDF format on the final DVD



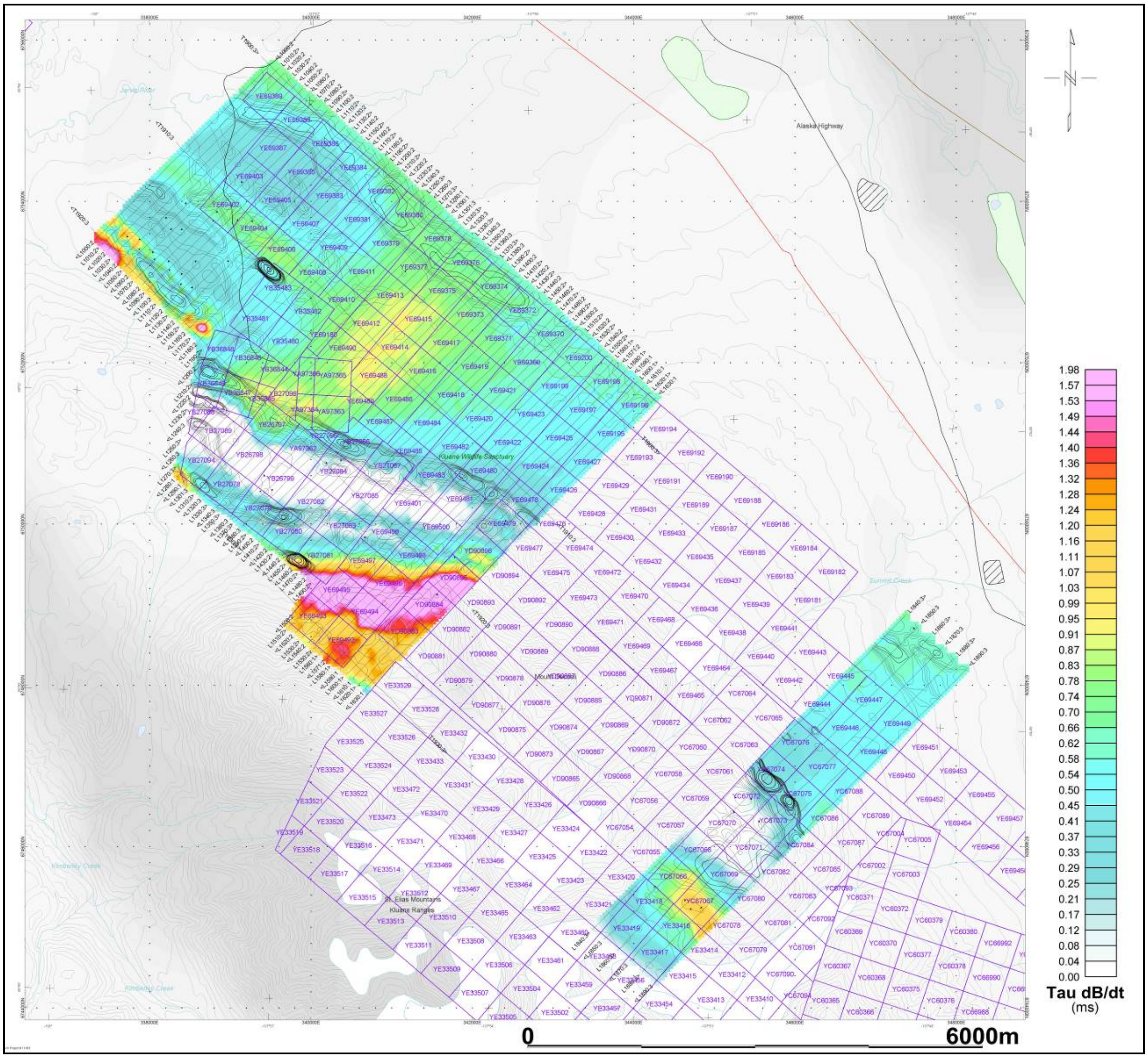
VTEM dB/dt Z Component Profiles, Time Gates 0.220 to 7.036 ms



VTEM B-Field Channel 30, Time Gate 0.880 ms

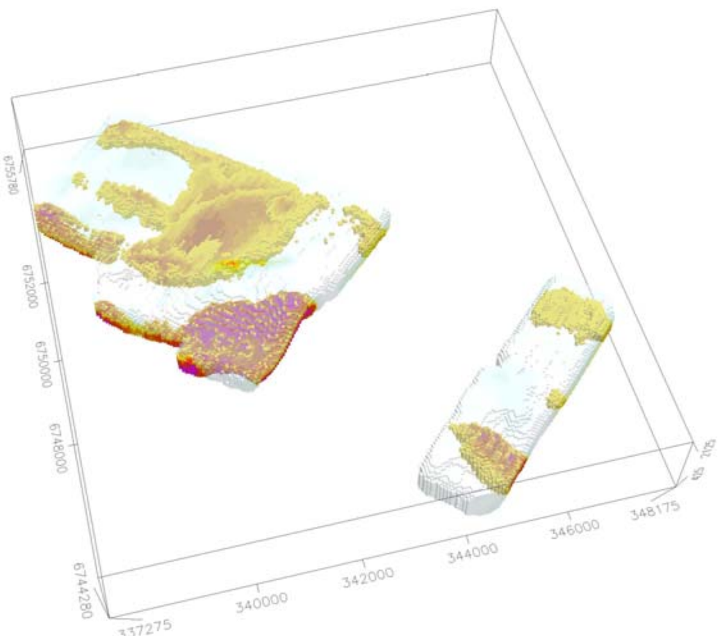


Total Magnetic Intensity

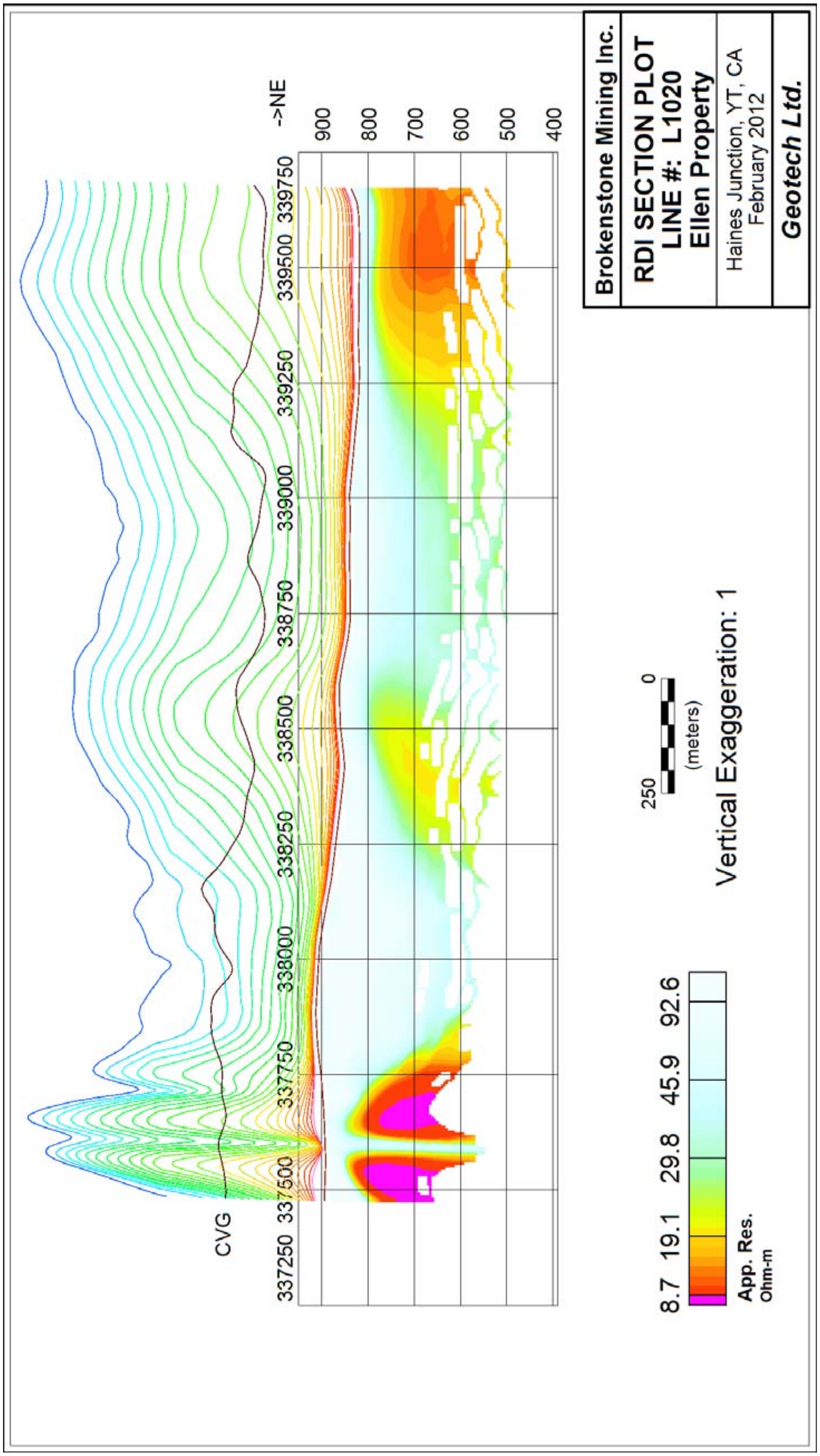


VTEM dB/dt Calculated Time Constant (TAU) with contours of anomaly areas of the Calculated Vertical Derivative of TMI

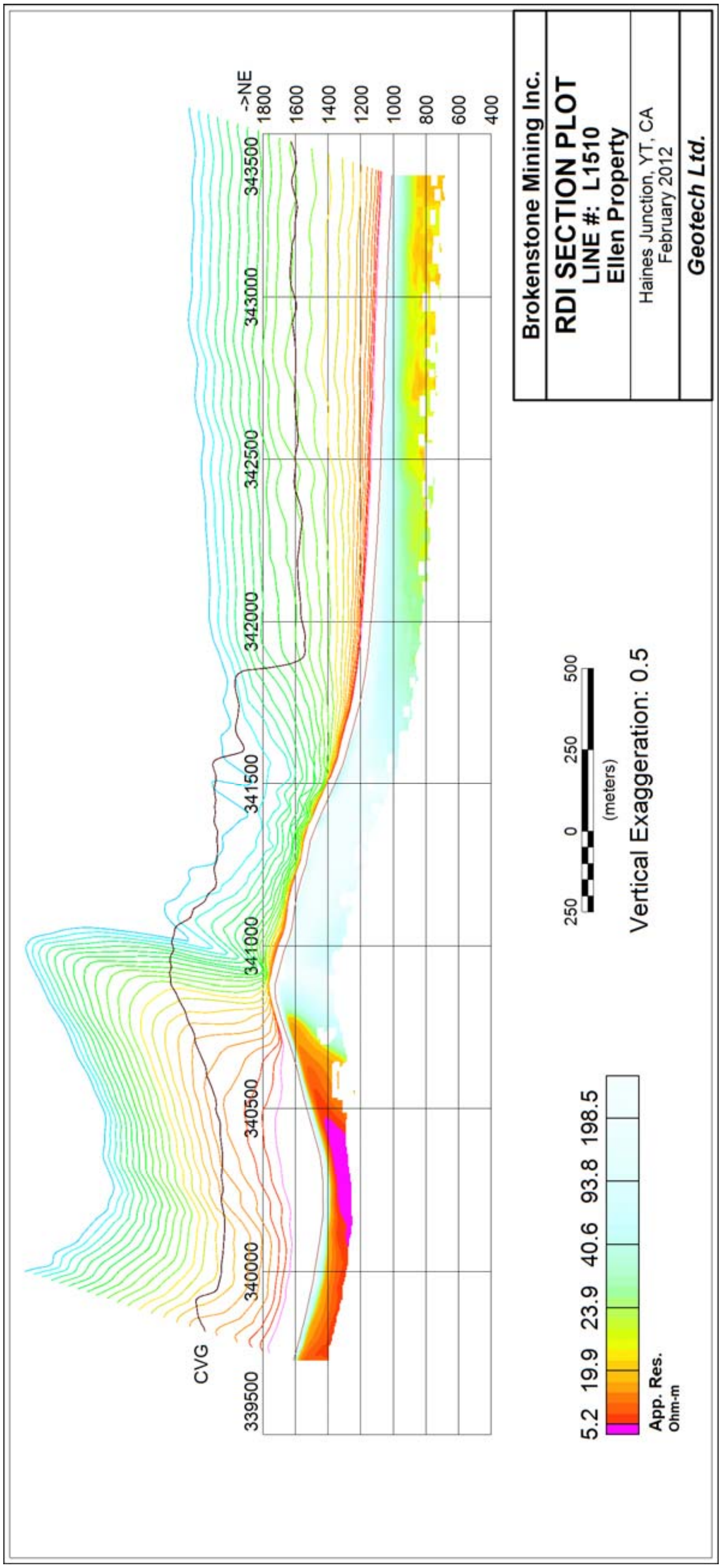
Resistivity Depth Image (RDI) MAPS



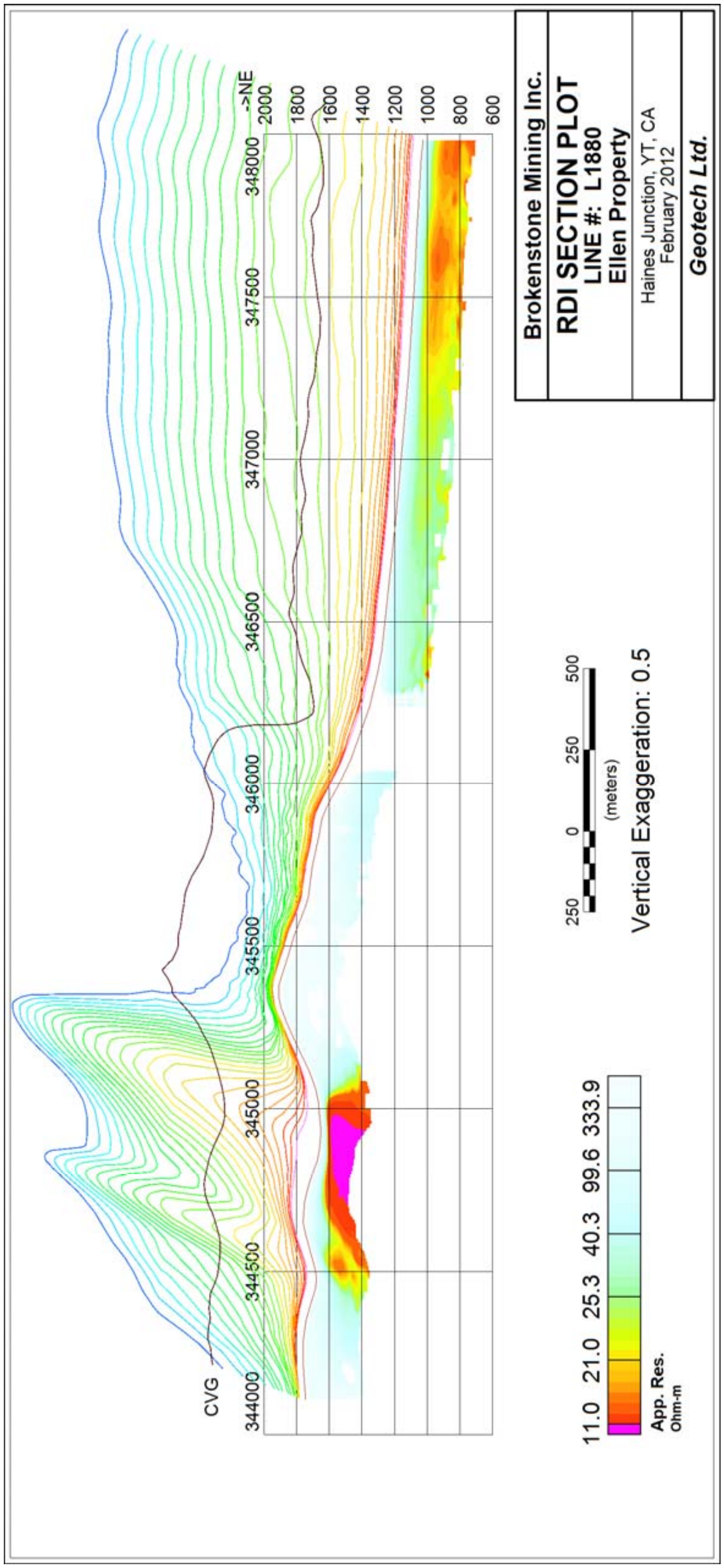
3D Resistivity-Depth Image (RDI)


Brokenstone Mining Inc.
RDI SECTION PLOT
LINE #: L1020
Ellen Property
Haines Junction, YT, CA
February 2012
Geotech Ltd.
CVG
->NE
337250 337500 337750 338000 338250 338500 338750 339000 339250 339500 339750
900
800
700
600
500
400
8.7 19.1 29.8 45.9 92.6
App. Res.
Ohm-m
250
0
(meters)
Vertical Exaggeration: 1

Line 1020


Brokenstone Mining Inc.
RDI SECTION PLOT
LINE #: L1510
Ellen Property
Haines Junction, YT, CA
February 2012
Geotech Ltd.
->NE
CVG
339500
340000
340500
341000
341500
342000
342500
343000
343500
1800
1600
1400
1200
1000
800
600
400
250
0
250
500
(meters)
Vertical Exaggeration: 0.5
5.2 19.9 23.9 40.6 93.8 198.5
App. Res.
Ohm-m

Line 1510


Brokenstone Mining Inc.
RDI SECTION PLOT
LINE #: L1880
Ellen Property
Haines Junction, YT, CA
February 2012
Geotech Ltd.
Vertical Exaggeration: 0.5
250 0 250 500
(meters)
11.0 21.0 25.3 40.3 99.6 333.9
App. Res.
Ohm-m
CVG
->NE
344000 344500 345000 345500 346000 346500 347000 347500 348000
2000 1800 1600 1400 1200 1000 800 600

Line 1880

APPENDIX D

GENERALIZED MODELING RESULTS OF THE VTEM SYSTEM

Introduction

The VTEM system is based on a concentric or central loop design, whereby, the receiver is positioned at the centre of a transmitter loop that produces a primary field. The wave form is a bi-polar, modified square wave with a turn-on and turn-off at each end.

During turn-on and turn-off, a time varying field is produced (dB/dt) and an electro-motive force (emf) is created as a finite impulse response. A current ring around the transmitter loop moves outward and downward as time progresses. When conductive rocks and mineralization are encountered, a secondary field is created by mutual induction and measured by the receiver at the centre of the transmitter loop.

Efficient modeling of the results can be carried out on regularly shaped geometries, thus yielding close approximations to the parameters of the measured targets. The following is a description of a series of common models made for the purpose of promoting a general understanding of the measured results.

A set of models has been produced for the Geotech VTEM® system dB/dT Z and X components (see models D1 to D15). The Maxwell ™ modeling program (EMIT Technology Pty. Ltd. Midland, WA, AU) used to generate the following responses assumes a resistive half-space. The reader is encouraged to review these models, so as to get a general understanding of the responses as they apply to survey results. While these models do not begin to cover all possibilities, they give a general perspective on the simple and most commonly encountered anomalies.

As the plate dips and departs from the vertical position, the peaks become asymmetrical.

As the dip increases, the aspect ratio (Min/Max) decreases and this aspect ratio can be used as an empirical guide to dip angles from near 90º to about 30º. The method is not sensitive enough where dips are less than about 30º.

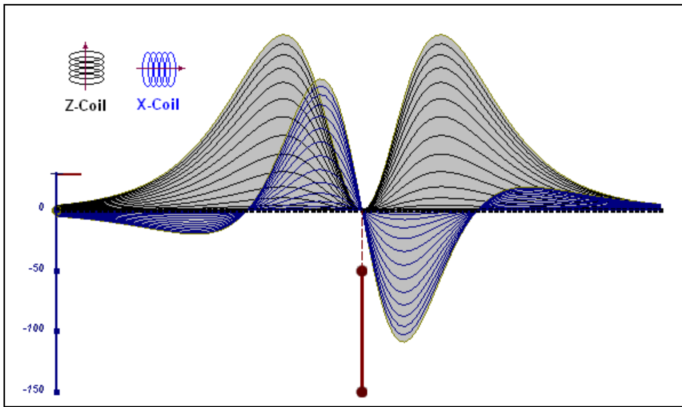


Figure D-1: vertical thin plate

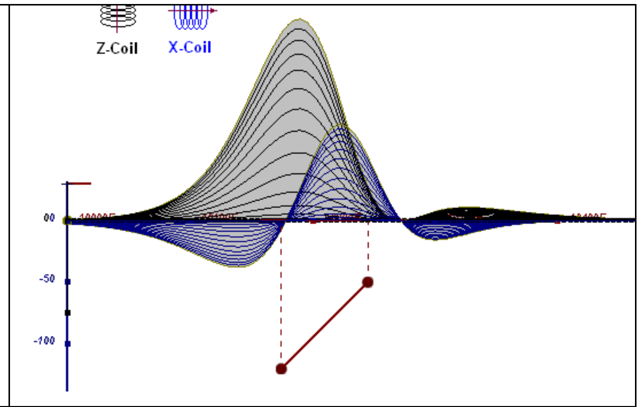


Figure D-2: inclined thin plate

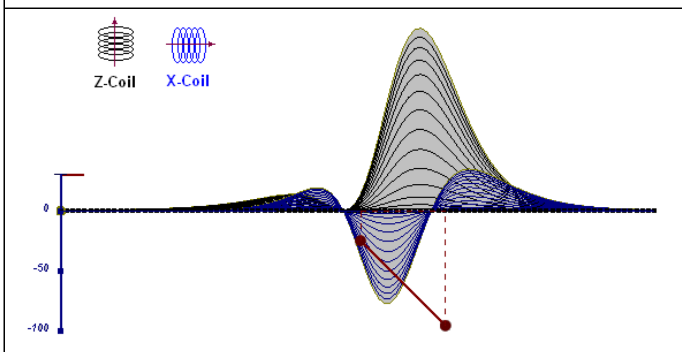


Figure D-3: inclined thin plate

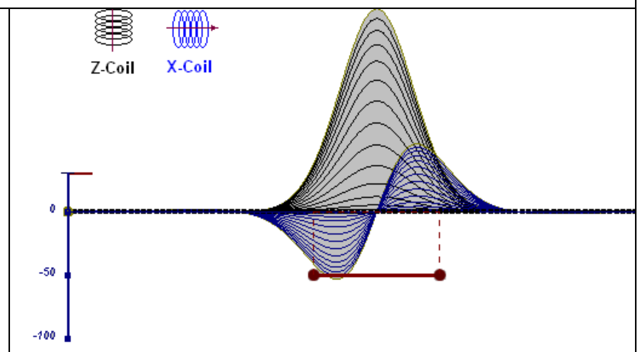


Figure D-4: horizontal thin plate

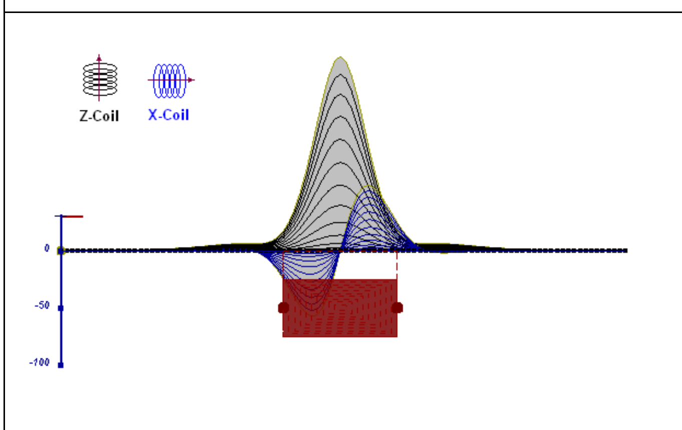


Figure D-5: horizontal thick plate (linear scale of the response)

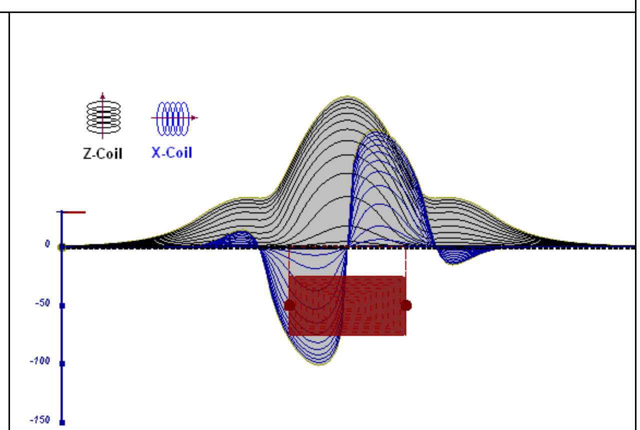


Figure D-6: horizontal thick plate (log scale of the response)

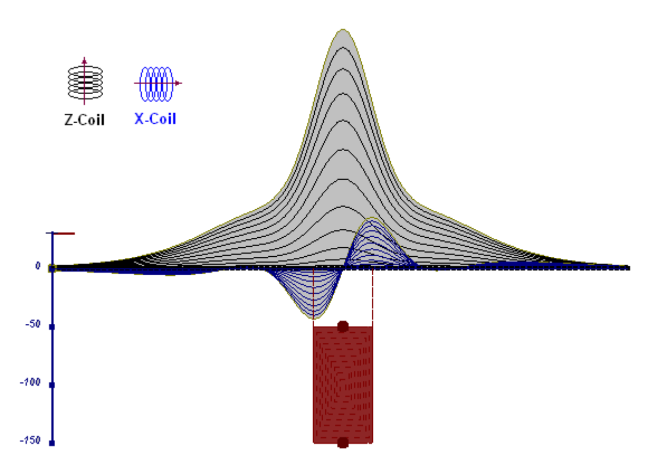


Figure D-7: vertical thick plate (linear scale of the response). 50 m depth

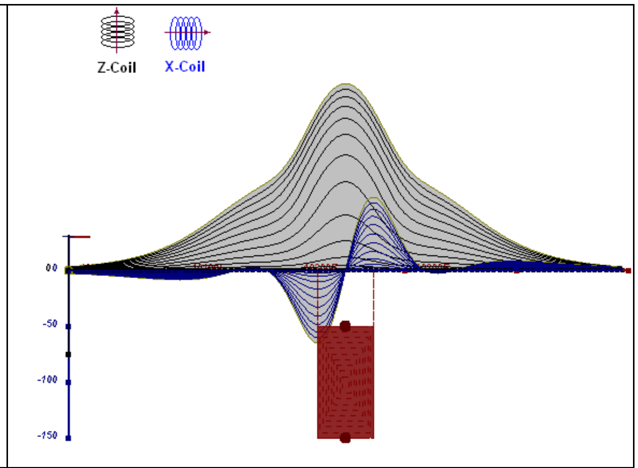


Figure D-8: vertical thick plate (log scale of the response). 50 m depth

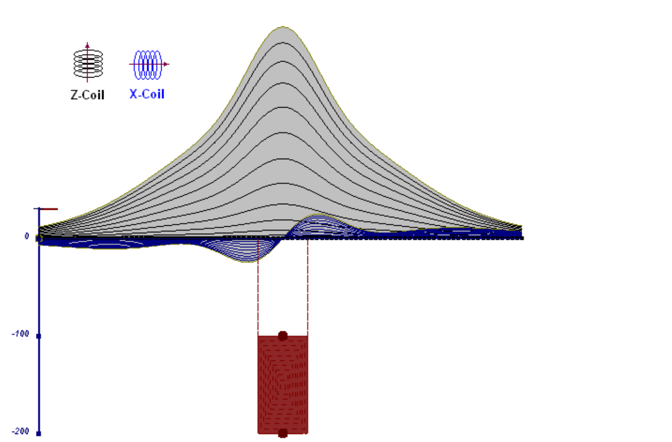


Figure D-9: vertical thick plate (linear scale of the response). 100 m depth

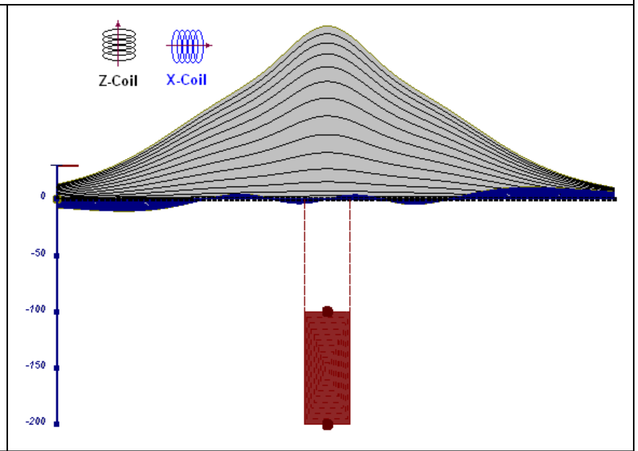


Figure D-10: vertical thick plate (linear scale of the response). Depth/hor.thickness=2.5

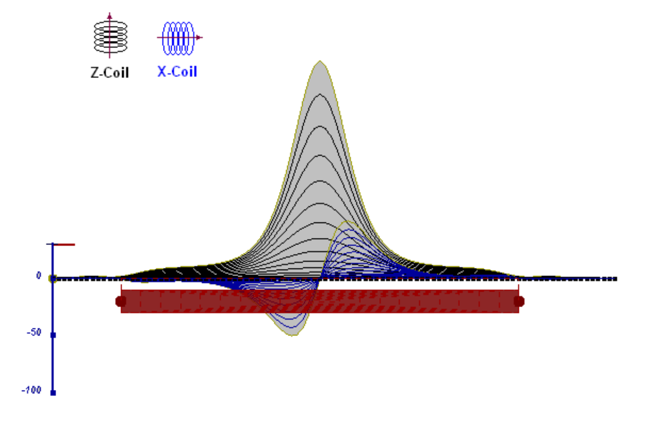


Figure D-10: horizontal thick plate (linear scale of the response)

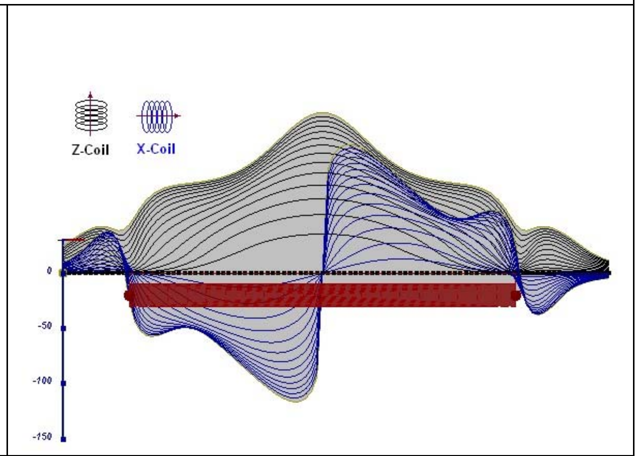


Figure D-11: horizontal thick plate (log scale of the response)

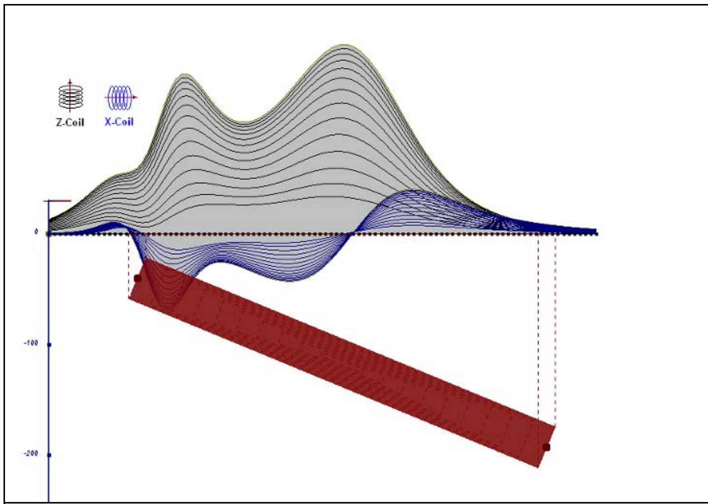


Figure D-12: inclined long thick plate

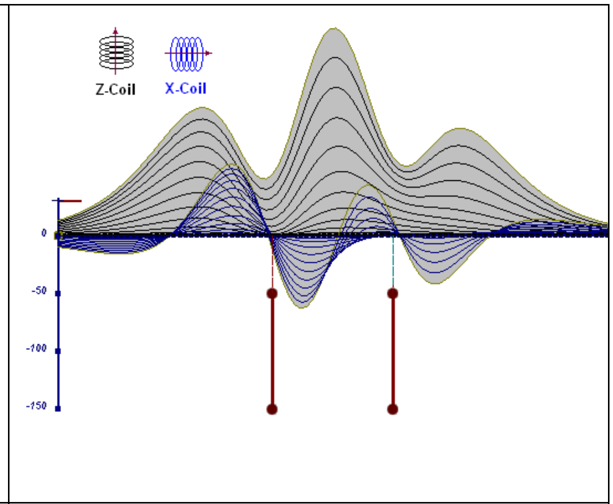


Figure D-13: two vertical thin plates

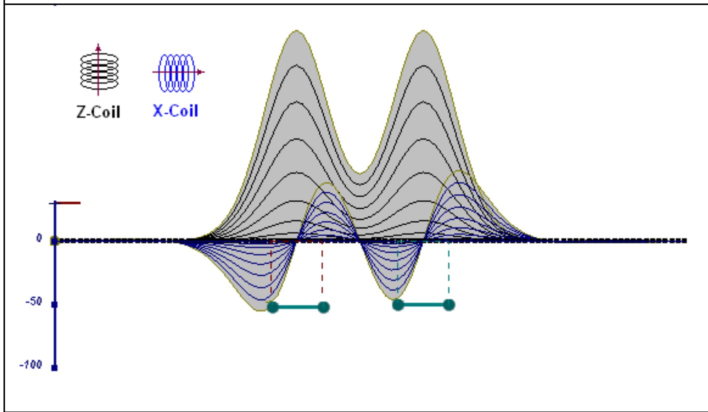


Figure D-14: two horizontal thin plates

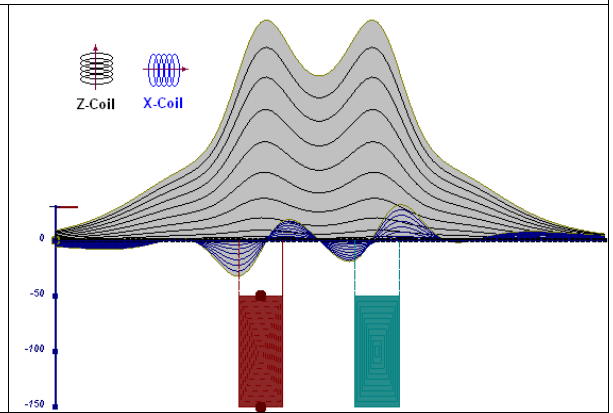


Figure D-15: two vertical thick plates

The same type of target but with different thickness, for example, creates different form of the response:

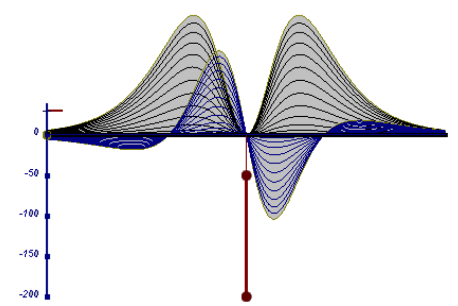
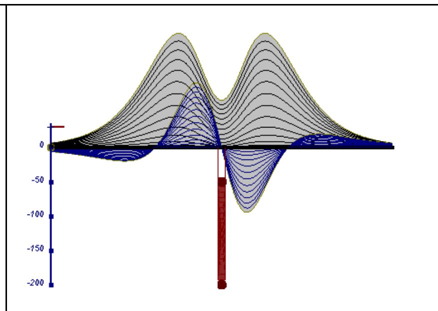
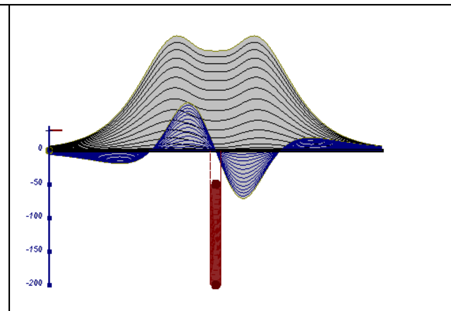
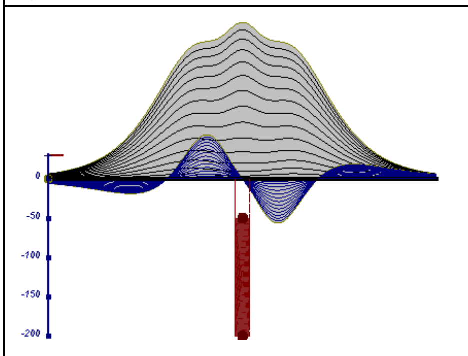
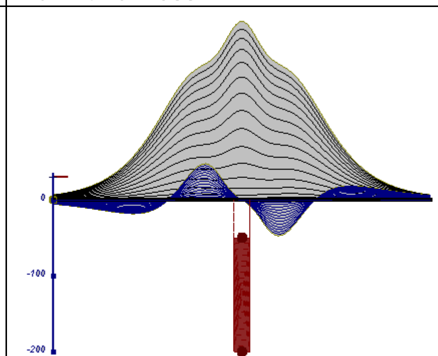
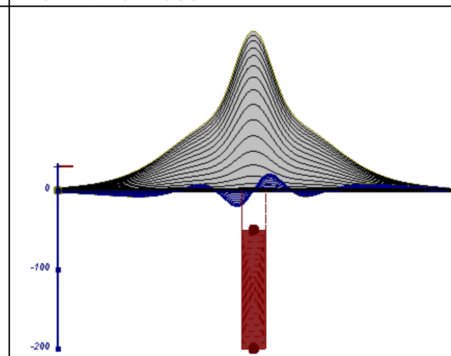
		
“thin”	10 m thickness	15 m thickness
		
18 m thickness	20 m thickness	30 m thickness

Figure D-16: Conductive vertical plate, depth 50 m, strike length 200 m, depth extend 150 m.

Alexander Prikhodko, PhD, P.Geo
Geotech Ltd.

September 2010

APPENDIX E

EM TIME CONSTANT (TAU) ANALYSIS

Estimation of time constant parameter[1] in transient electromagnetic method is one of the steps toward the extraction of the information about conductances beneath the surface from TEM measurements.

The most reliable method to discriminate or rank conductors from overburden, background or one and other is by calculating the EM field decay time constant (TAU parameter), which directly depends on conductance despite their depth and accordingly amplitude of the response.

Theory

As established in electromagnetic theory, the magnitude of the electro-motive force (emf) induced is proportional to the time rate of change of primary magnetic field at the conductor. This emf causes eddy currents to flow in the conductor with a characteristic transient decay, whose Time Constant (Tau) is a function of the conductance of the survey target or conductivity and geometry (including dimensions) of the target. The decaying currents generate a proportional secondary magnetic field, the time rate of change of which is measured by the receiver coil as induced voltage during the Off time.

The receiver coil output voltage (**e_0**) is proportional to the time rate of change of the secondary magnetic field and has the form,

$$e_0 \; \alpha \; (1 / \tau) \; e^{-(t / \tau)}$$

Where,
τ = L/R is the characteristic time constant of the target (TAU)
R = resistance
L = inductance

From the expression, conductive targets that have small value of resistance and hence large value of τ yield signals with small initial amplitude that decays relatively slowly with progress of time. Conversely, signals from poorly conducting targets that have large resistance value and small τ, have high initial amplitude but decay rapidly with time[1] (Figure E-1).

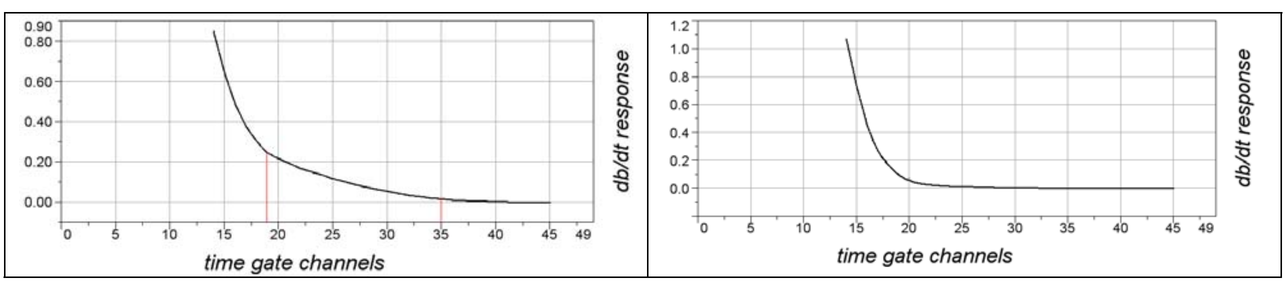


Figure E-1: Left – presence of good conductor, right – poor conductor.

[1] McNeill, JD, 1980, "Applications of Transient Electromagnetic Techniques", Technical Note TN-7 page 5, Geonics Limited, Mississauga, Ontario.

EM Time Constant (Tau) Calculation

The EM Time-Constant (TAU) is a general measure of the speed of decay of the electromagnetic response and indicates the presence of eddy currents in conductive sources as well as reflecting the “conductance quality” of a source. Although TAU can be calculated using either the measured dB/dt decay or the calculated B-field decay, dB/dt is commonly preferred due to better stability (S/N) relating to signal noise. Generally, TAU calculated on base of early time response reflects both near surface overburden and poor conductors whereas, in the late ranges of time, deep and more conductive sources, respectively. For example early time TAU distribution in an area that indicates conductive overburden is shown in Figure 2.

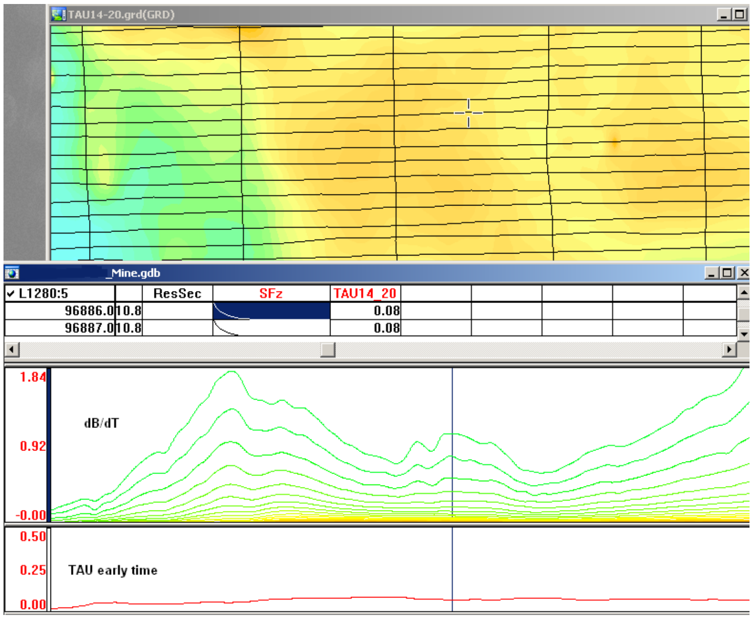


Figure E-2: Map of early time TAU Area with overburden conductive layer and local sources.

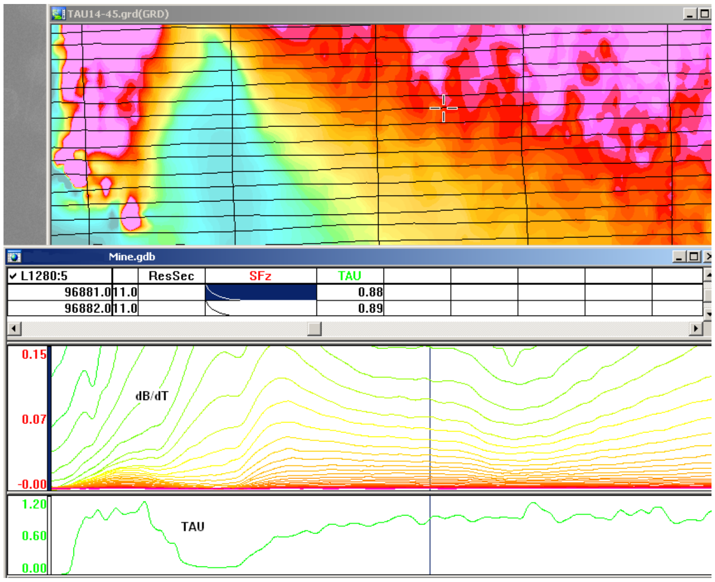


Figure E-3: Map of full time range TAU with EM anomaly due to deep highly conductive target.

There are many advantages of TAU maps:

- TAU depends only on one parameter (conductance) in contrast to response magnitude;
- TAU is integral parameter, which covers time range and all conductive zones and targets are displayed independently of their depth and conductivity on a single map.
- Very good differential resolution in complex conductive places with many sources with different conductivity.
- Signs of the presence of good conductive targets are amplified and emphasized independently of their depth and level of response accordingly.

In the example shown in Figure 4 and 5, three local targets are defined, each of them with a different depth of burial, as indicated on the resistivity depth image (RDI). All are very good conductors but the deeper target (number 2) has a relatively weak dB/dt signal yet also features the strongest total TAU (Figure 4). This example highlights the benefit of TAU analysis in terms of an additional target discrimination tool.

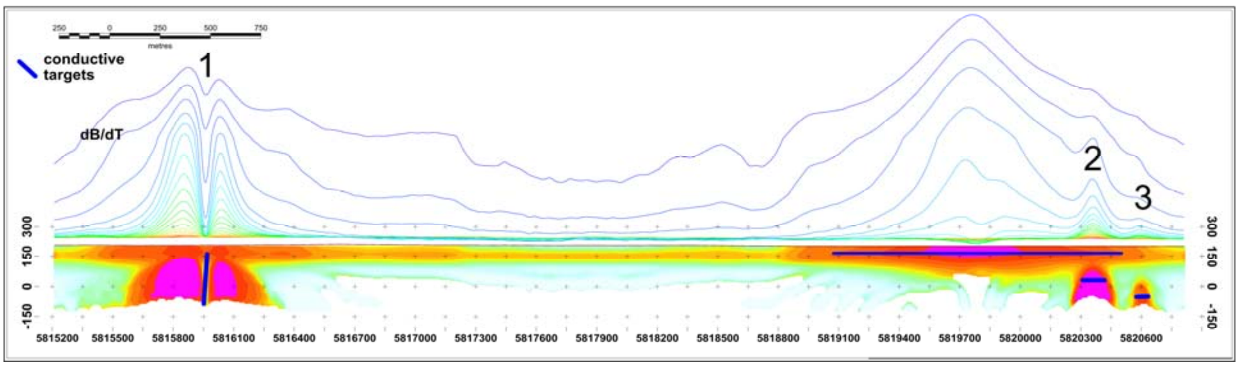


Figure E-4: dB/dt profile and RDI with different depths of targets.

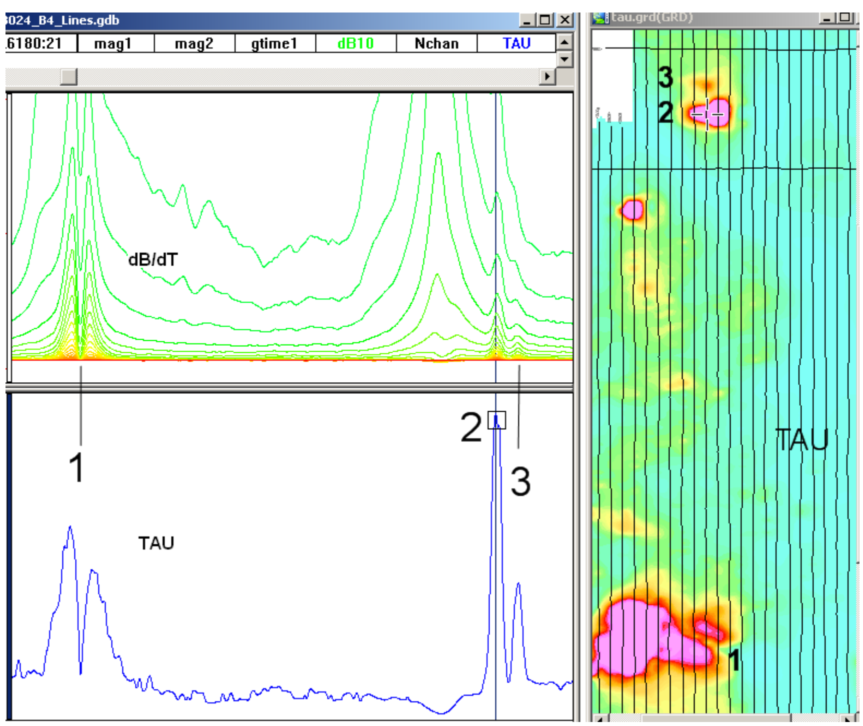


Figure E-5: Map of total TAU and dB/dt profile.

The EM Time Constants for dB/dt and B-field were calculated using the "sliding Tau" in-house program developed at Geotech[2]. The principle of the calculation is based on using of time window (4 time channels) which is sliding along the curve decay and looking for latest time channels which have a response above the level of noise and decay. The EM decays are obtained from all available decay channels, starting at the latest channel. Time constants are taken from a least square fit of a straight-line (log/linear space) over the last 4 gates above a pre-set signal threshold level (Figure E-6). Threshold settings are pointed in the "label" property of TAU database channels. The sliding Tau method determines that, as the amplitudes increase, the time-constant is taken at progressively later times in the EM decay. Conversely, as the amplitudes decrease, Tau is taken at progressively earlier times in the decay. If the maximum signal amplitude falls below the threshold, or becomes negative for any of the 4 time gates, then Tau is not calculated and is assigned a value of "dummy" by default.

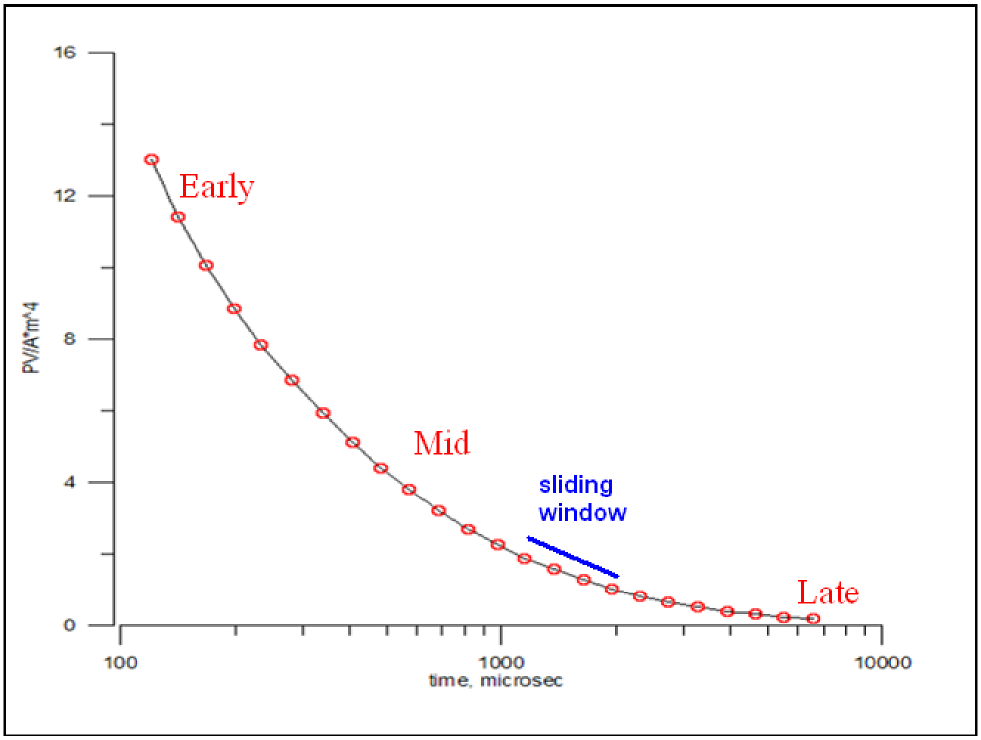


Figure E-6: Typical dB/dt decays of VTEM data

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Geotech Ltd.

September 2010

[2] by A.Prikhodko

APPENDIX F

TEM RESISTIVITY DEPTH IMAGING (RDI)

Resistivity depth imaging (RDI) is technique used to rapidly convert EM profile decay data into an equivalent resistivity versus depth cross-section, by deconvolving the measured TEM data. The used RDI algorithm of Resistivity-Depth transformation is based on scheme of the apparent resistivity transform of Maxwell A.Meju (1998)[1] and TEM response from conductive half-space. The program is developed by Alexander Prikhodko and depth calibrated based on forward plate modeling for VTEM system configuration (Fig. 1-10).

RDIs provide reasonable indications of conductor relative depth and vertical extent, as well as accurate 1D layered-earth apparent conductivity/resistivity structure across VTEM flight lines. Approximate depth of investigation of a TEM system, image of secondary field distribution in half space, effective resistivity, initial geometry and position of conductive targets is the information obtained on base of the RDIs.

Maxwell forward modeling with RDI sections from the synthetic responses (VTEM system)

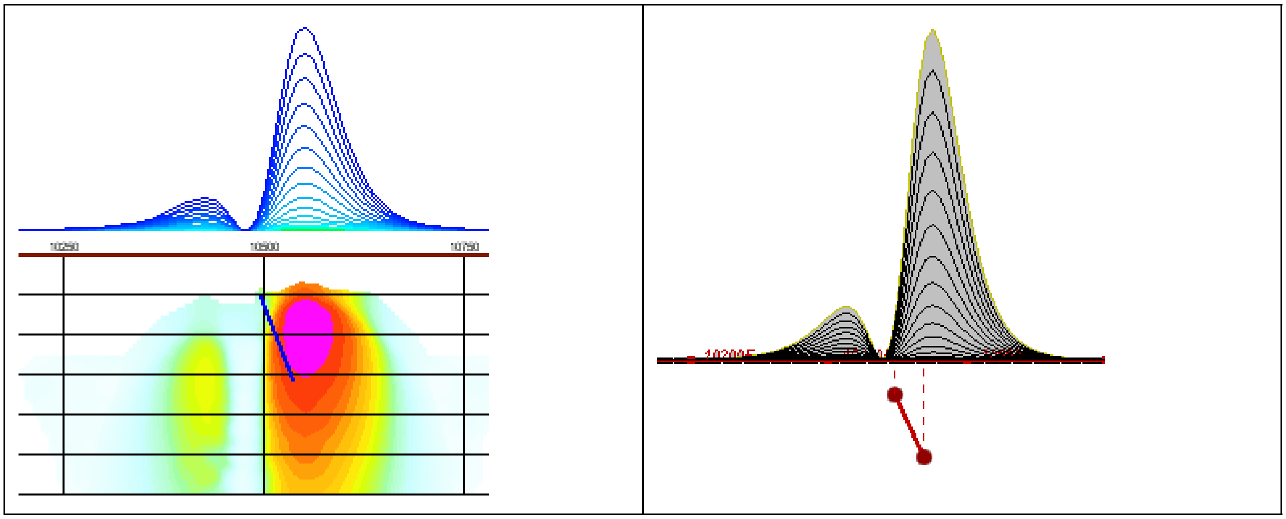


Figure F-1: Maxwell plate model and RDI from the calculated response for conductive "thin" plate (depth 50 m, dip 65 degree, depth extend 100 m).

[1] Maxwell A.Meju, 1998, Short Note: A simple method of transient electromagnetic data analysis, Geophysics, **63**, 405–410.

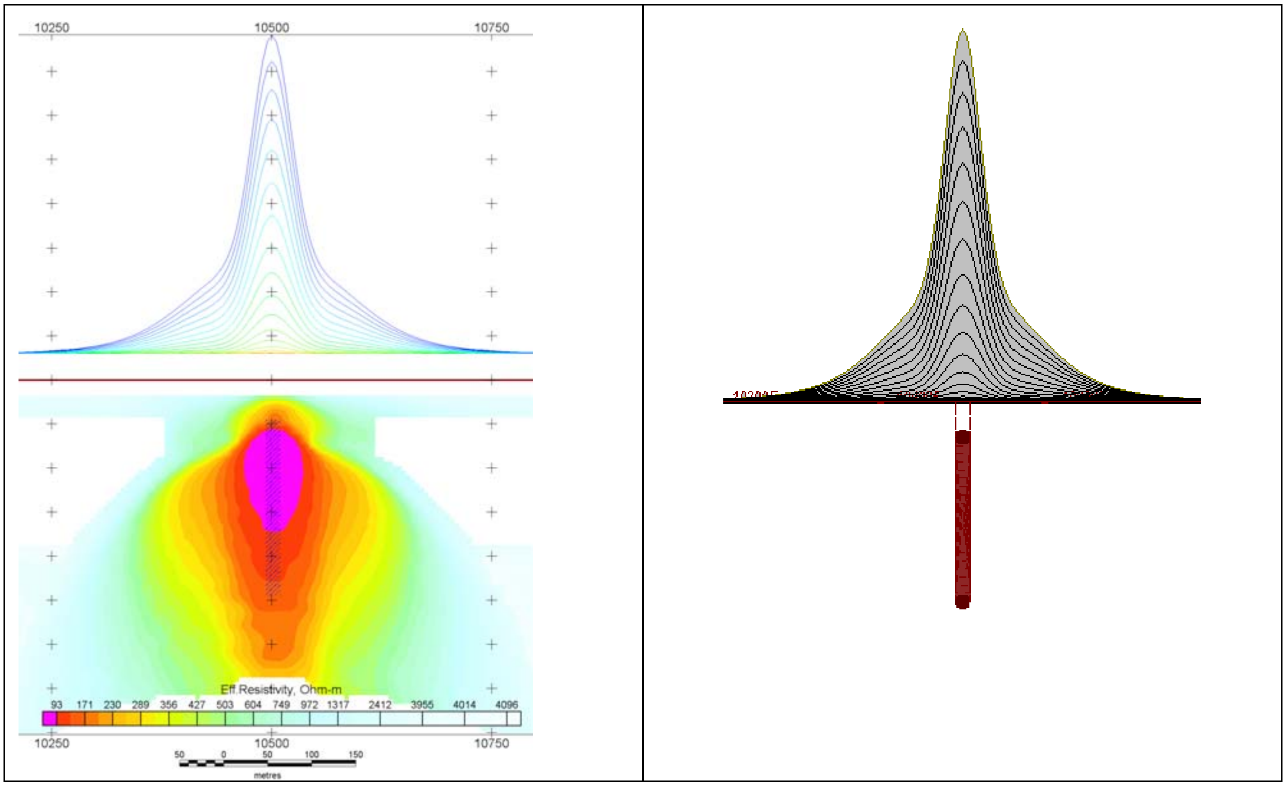


Figure F-2: Maxwell plate model and RDI from the calculated response for “thick” plate 18 m thickness, depth 50 m, depth extend 200 m).

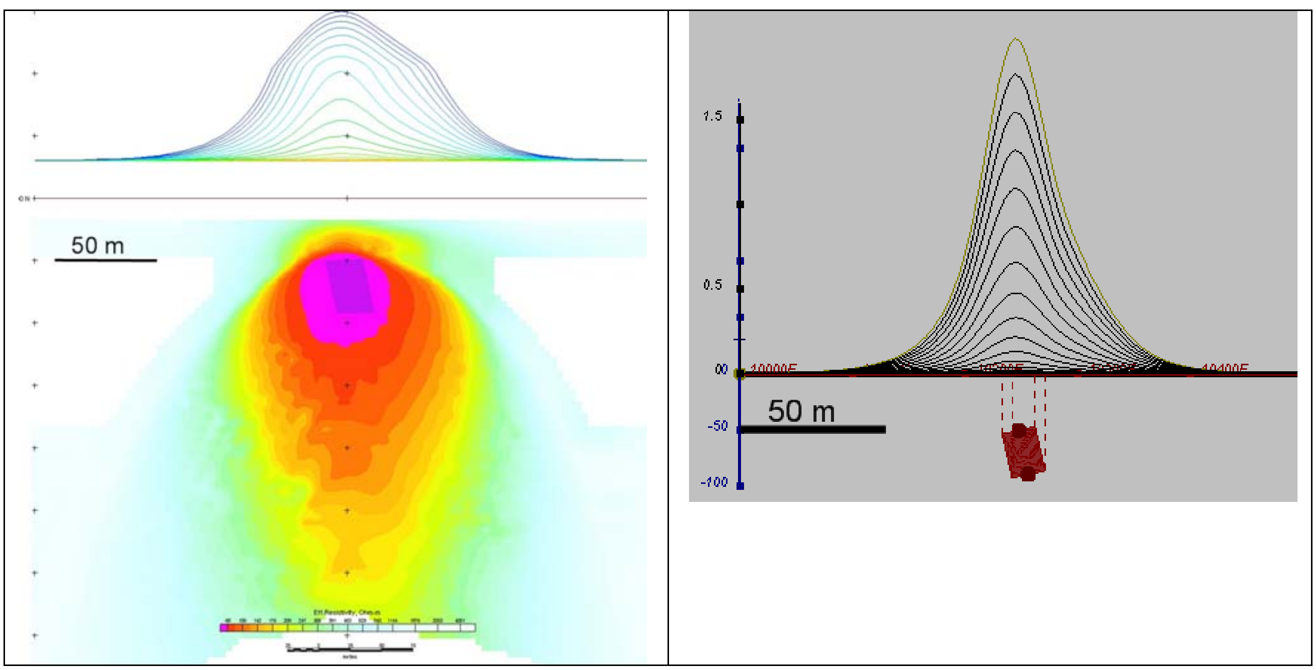


Figure F-3: Maxwell plate model and RDI from the calculated response for bulk (“thick”) 100 m length, 40 m depth extend, 30 m thickness

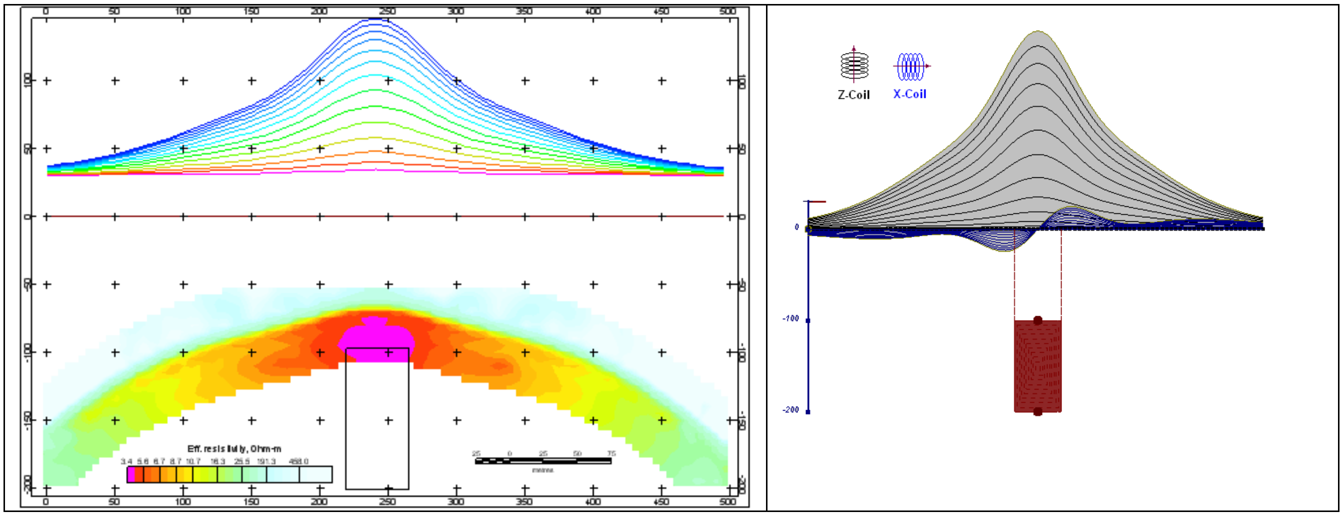


Figure F-4: Maxwell plate model and RDI from the calculated response for “thick” vertical target (depth 100 m, depth extend 100 m). 19-44 chan.

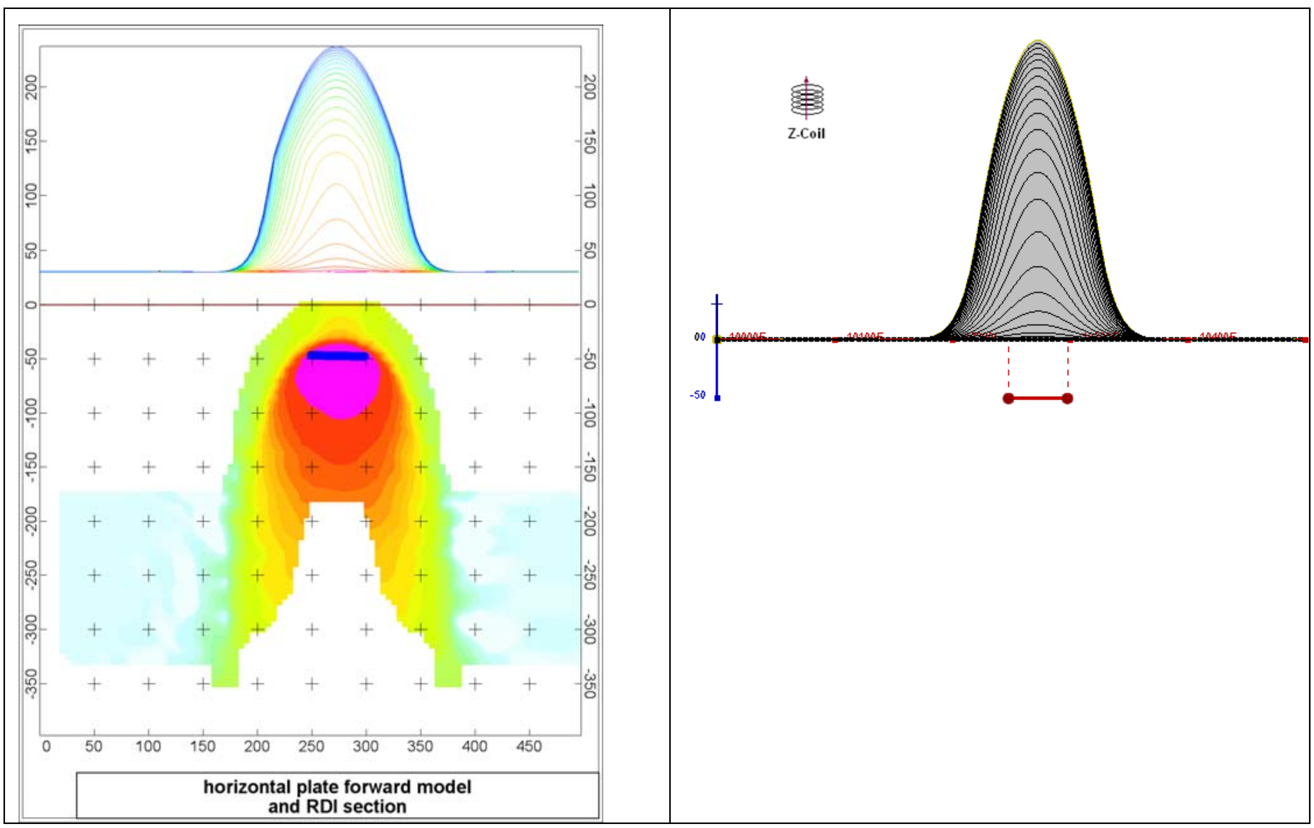


Figure F-5: Maxwell plate model and RDI from the calculated response for horizontal thin plate (depth 50 m, dim 50x100 m). 15-44 chan.

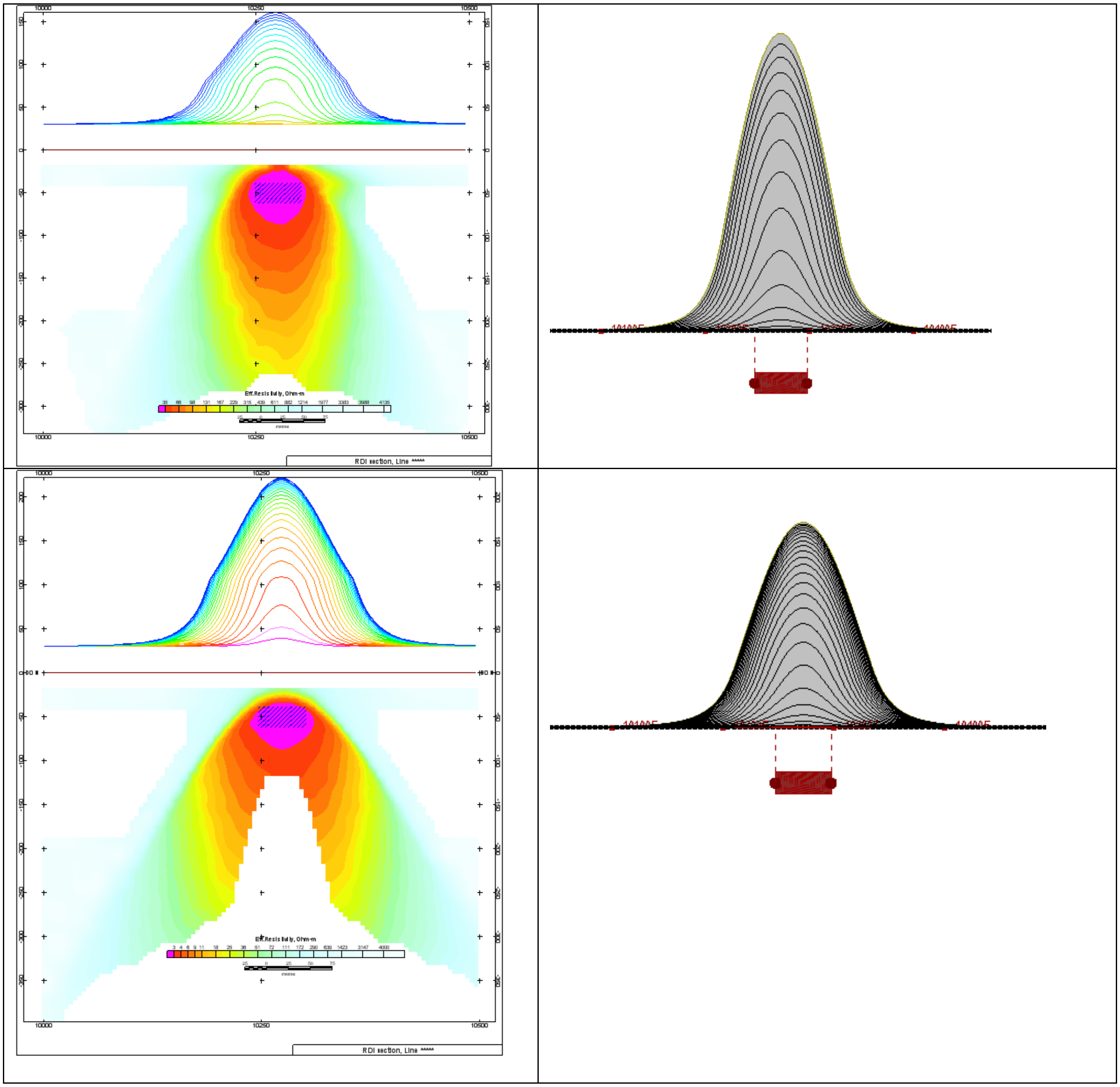


Figure F-6: Maxwell plate model and RDI from the calculated response for horizontal thick (20m) plate – less conductive (on the top), more conductive (below)

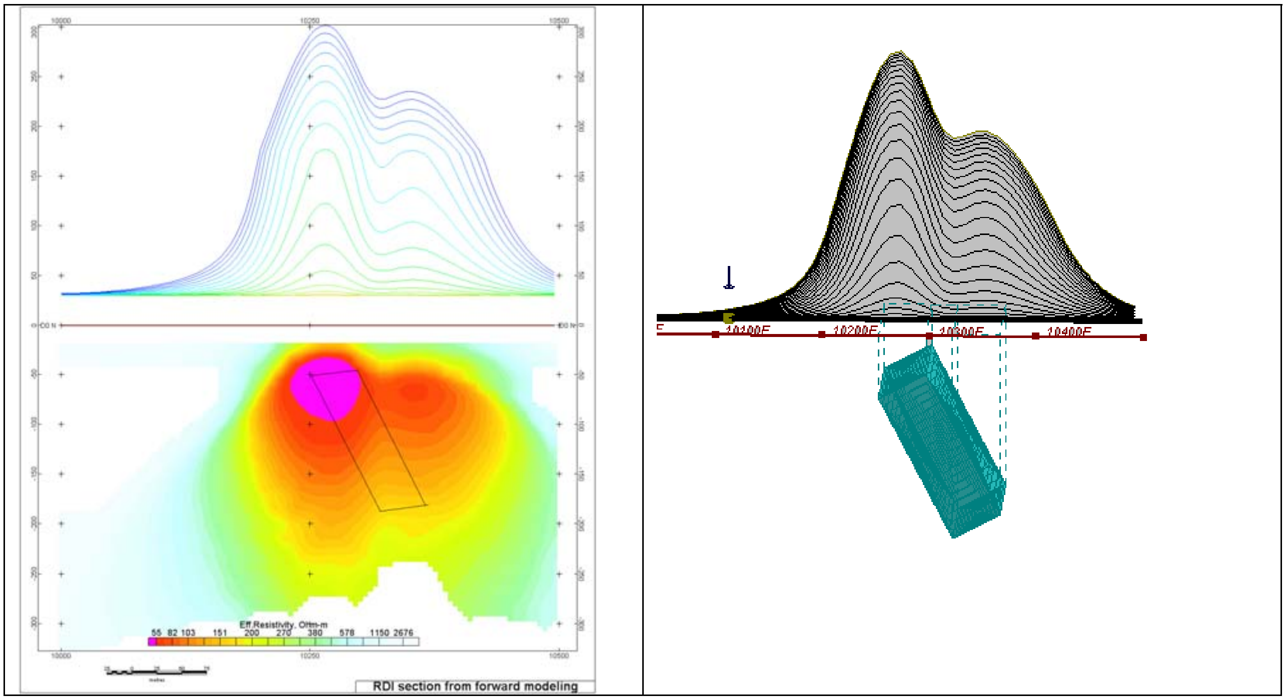


Figure G-7: Maxwell plate model and RDI from the calculated response for inclined thick (50m) plate. Depth extends 150 m, depth to the target 50 m.

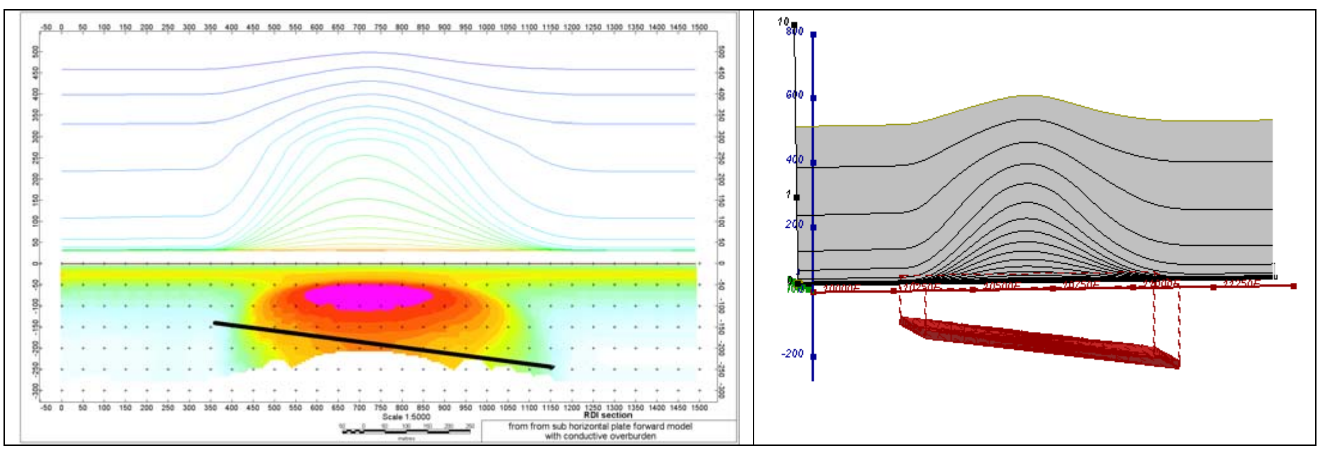


Figure F-8: Maxwell plate model and RDI from the calculated response for the long, wide and deep subhorizontal plate (depth 140 m, dim 25x500x800 m) with conductive overburden.

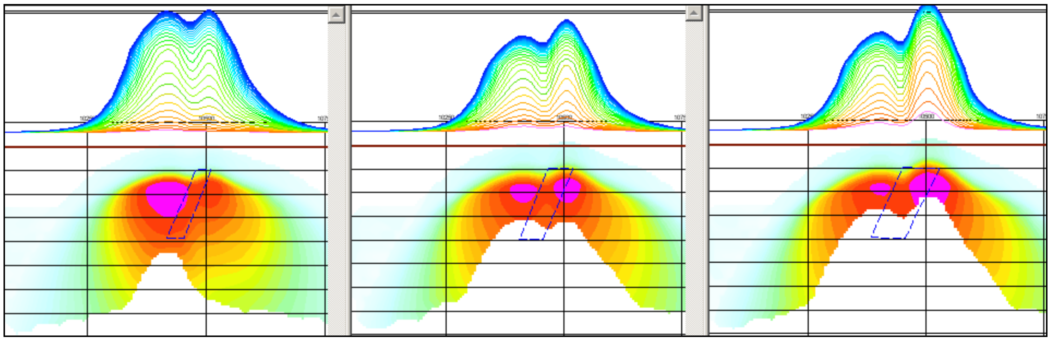


Figure F-9: Maxwell plate models and RDIs from the calculated response for “thick” dipping plates (35, 50, 75 m thickness), depth 50 m, conductivity 2.5 S/m.

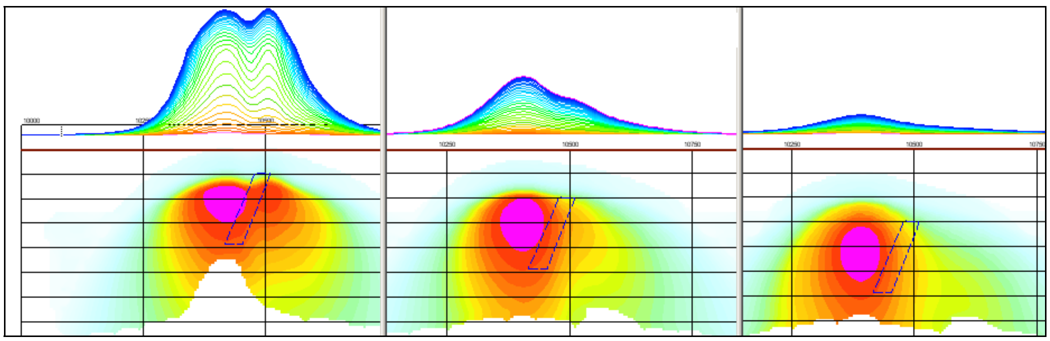


Figure F-10: Maxwell plate models and RDIs from the calculated response for “thick” (35 m thickness) dipping plate on different depth (50, 100, 150 m),, conductivity 2.5 S/m.

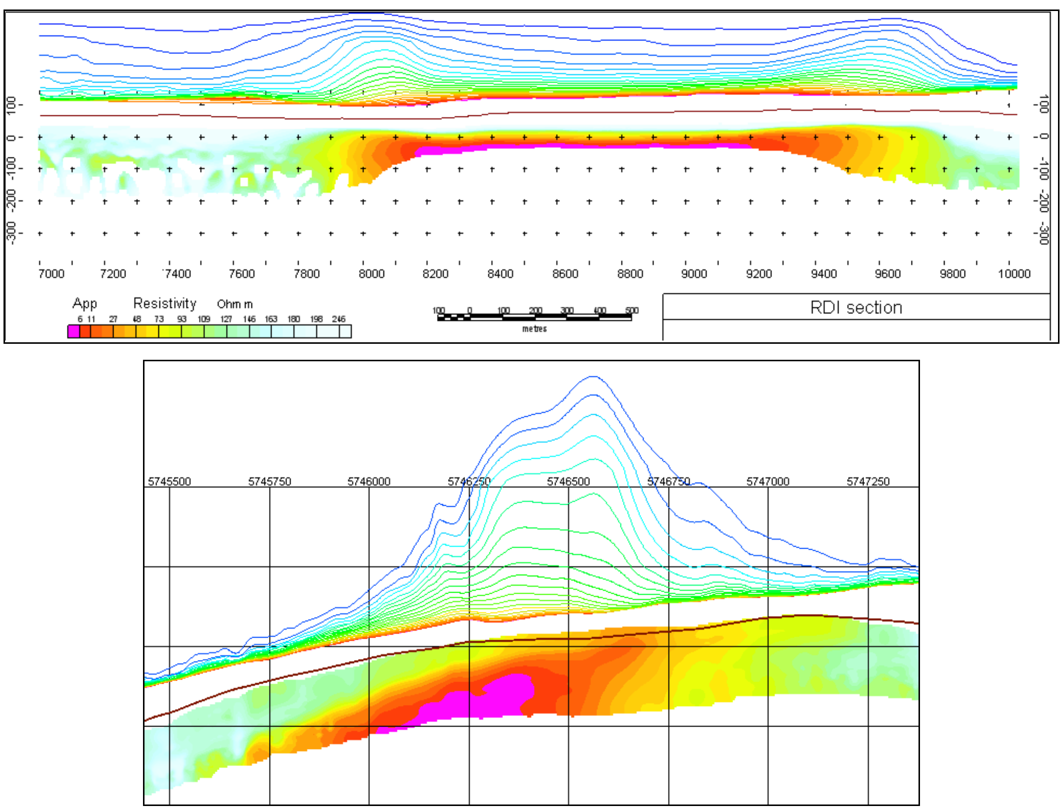
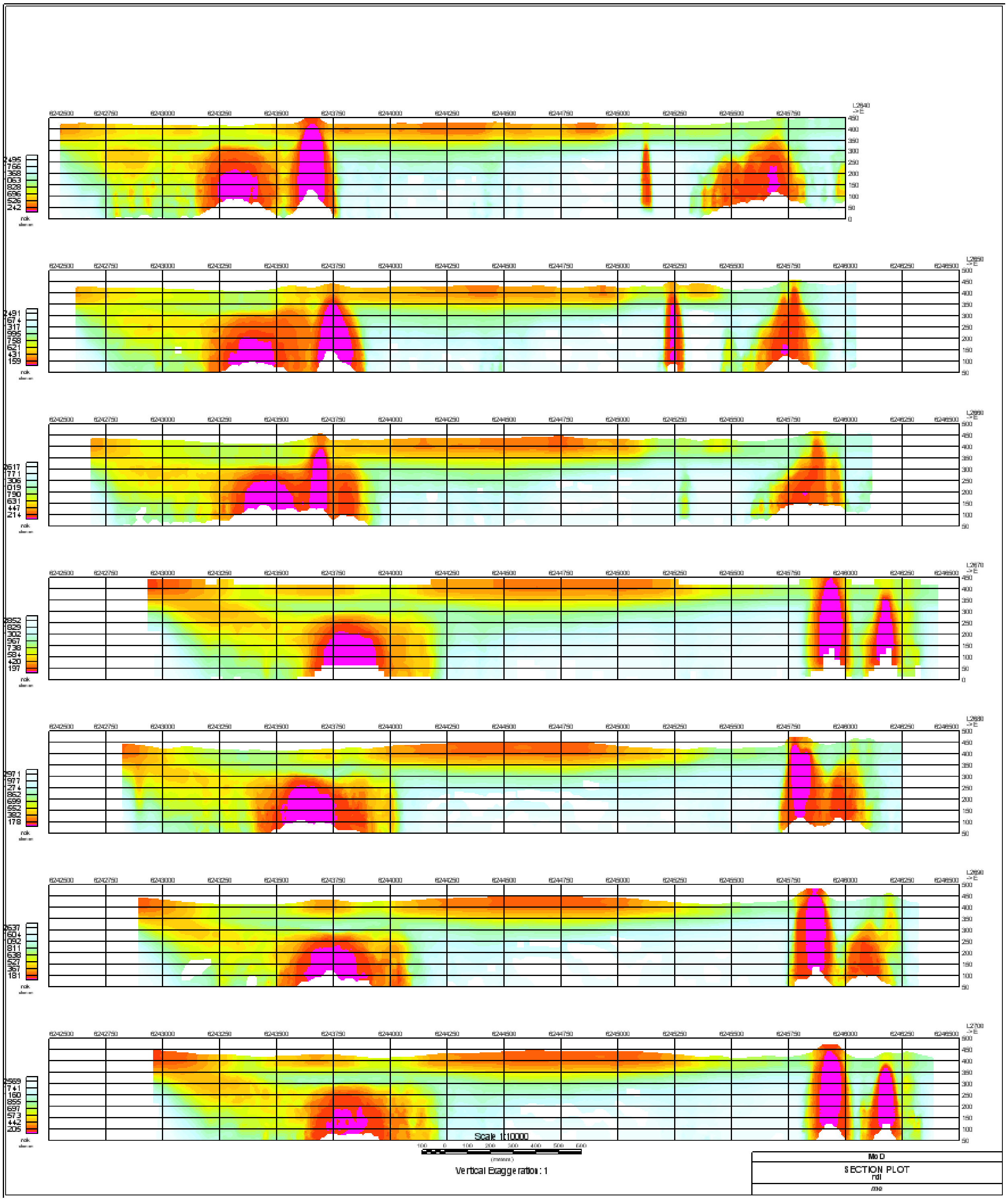


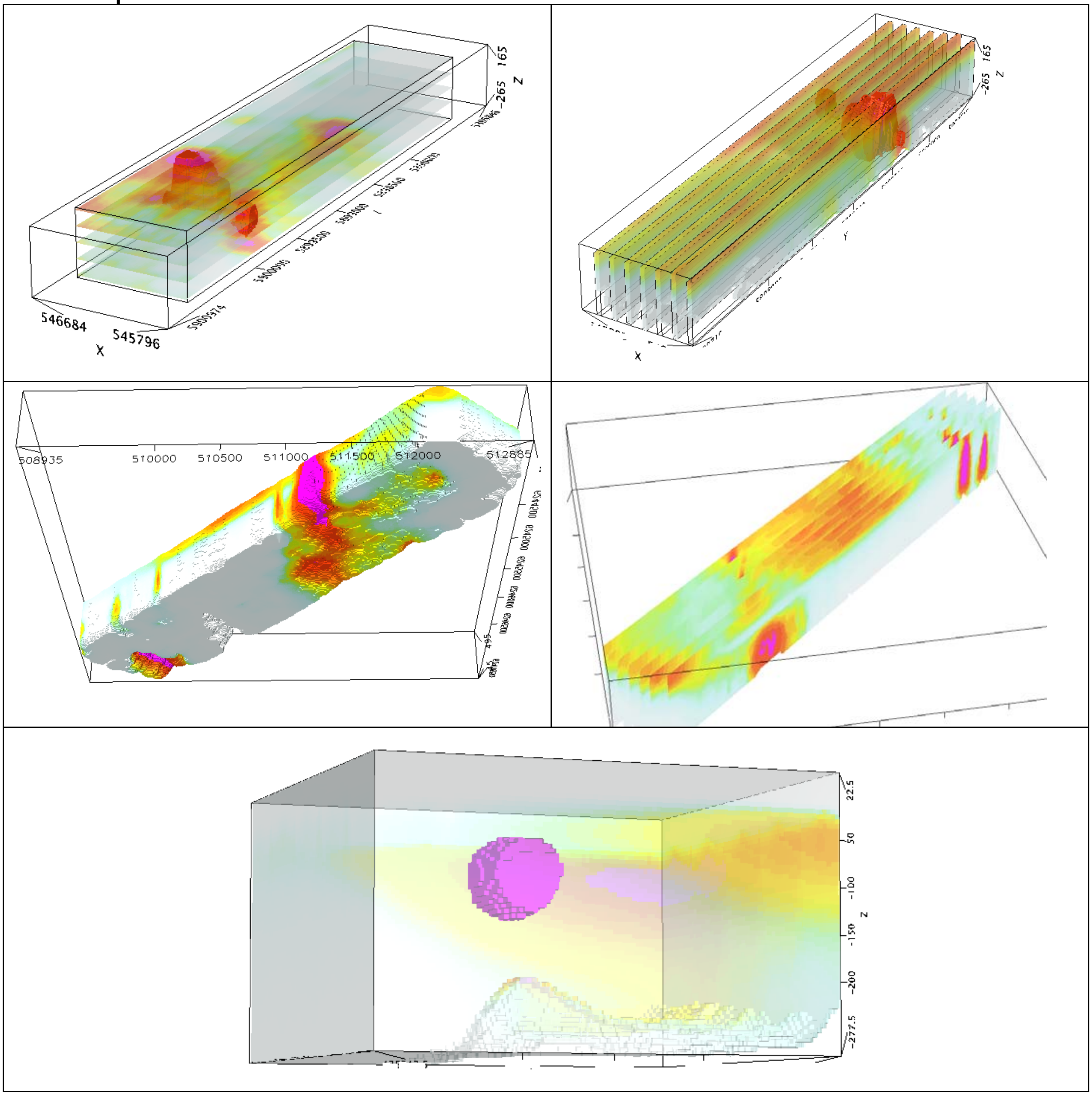
Figure F-11: RDI section for the real horizontal and slightly dipping conductive layers

FORMS OF RDI PRESENTATION

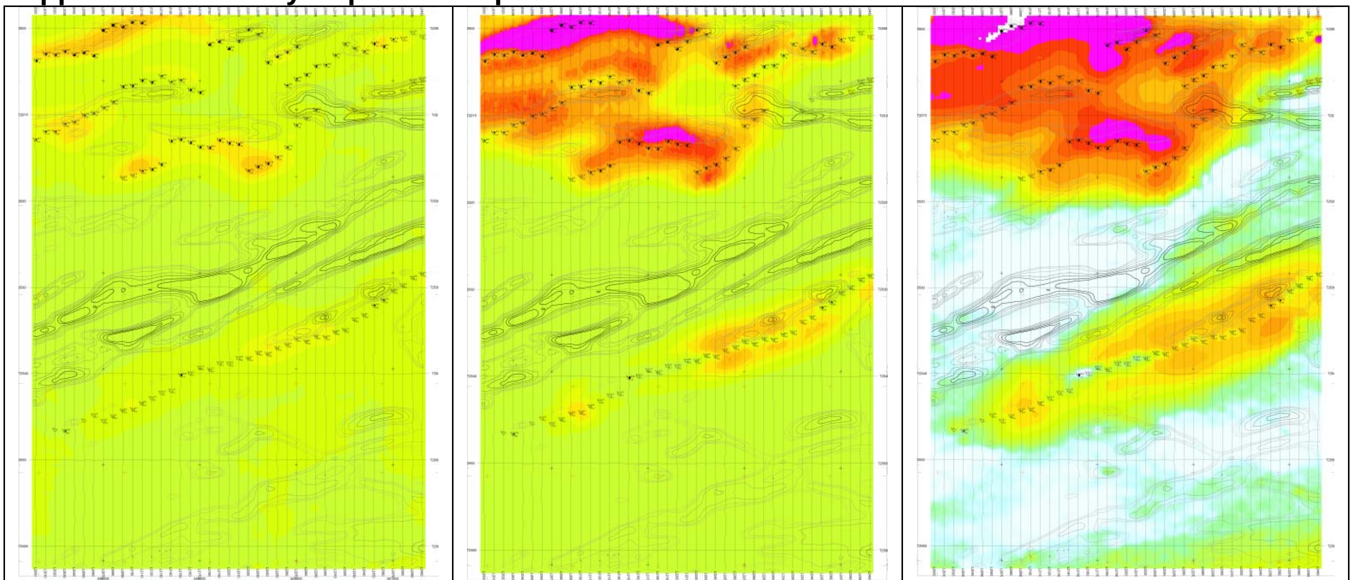
Presentation of series of lines



3d presentation of RDIs

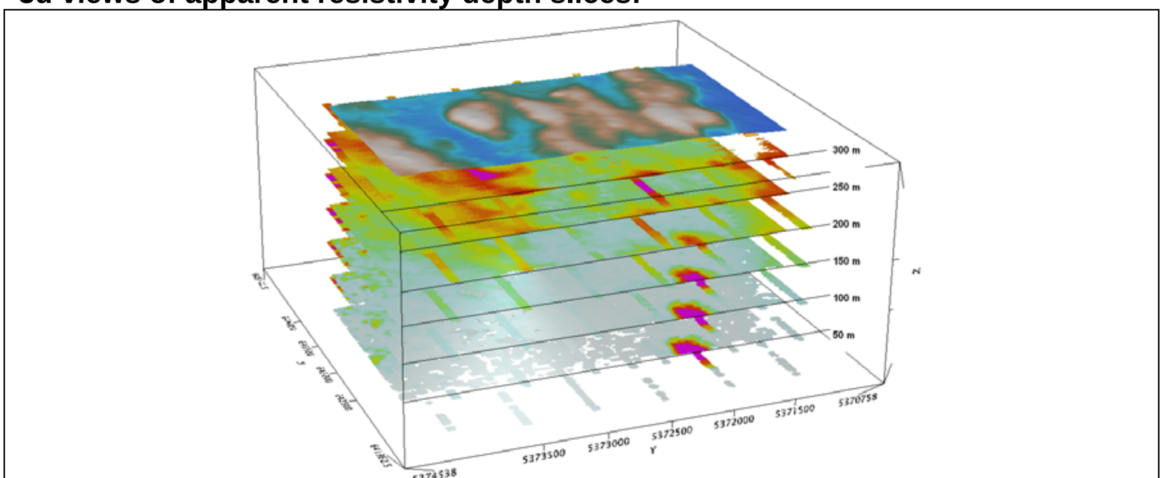


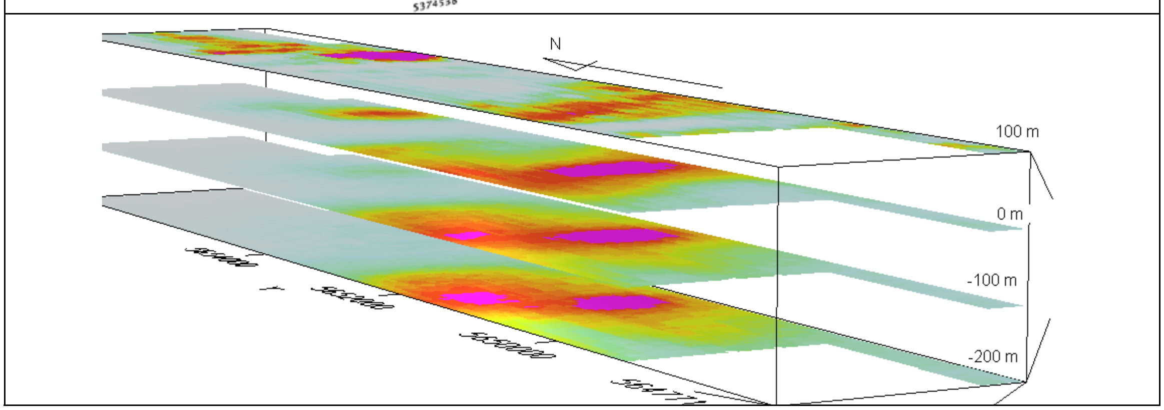
Apparent Resistivity Depth Slices plans:



0 m (surface)	-100 m	-200 m

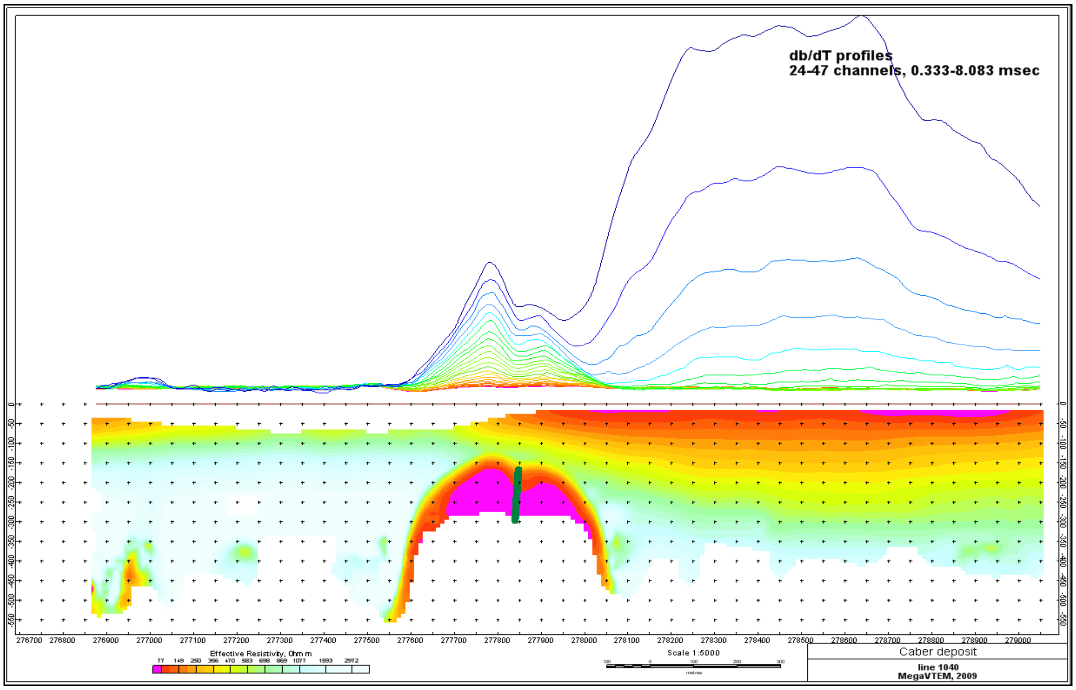
3d views of apparent resistivity depth slices:



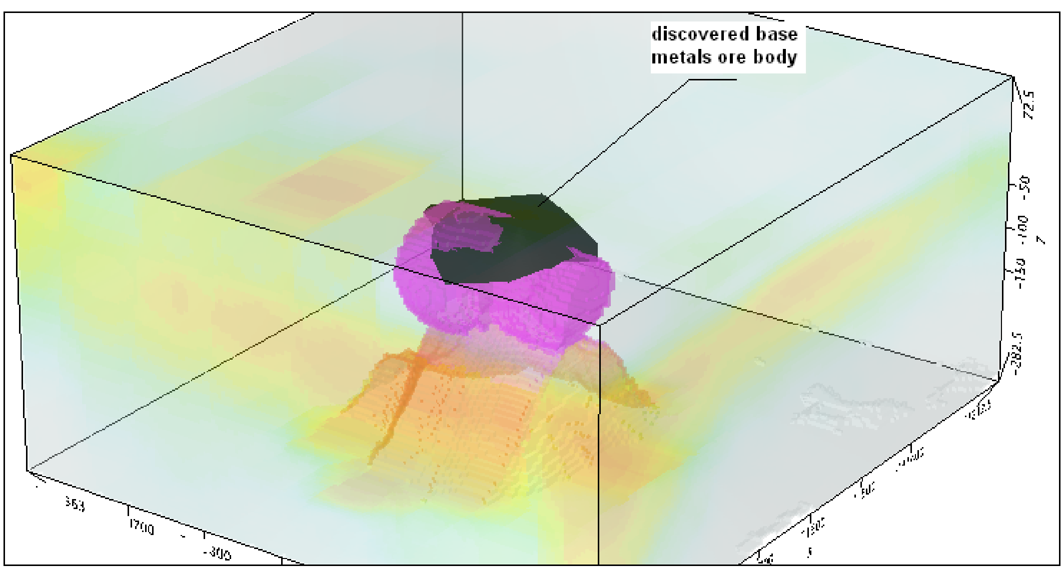


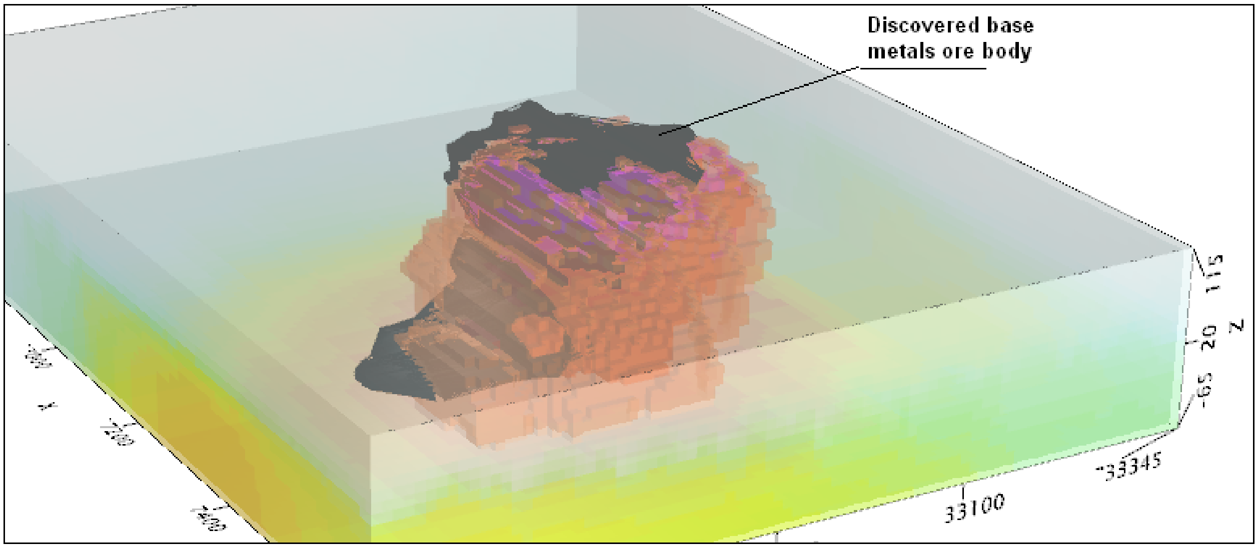
Real base metal targets in comparison with RDIs:

RDI section of the line over Caber deposit ("thin" subvertical plate target and conductive overburden).

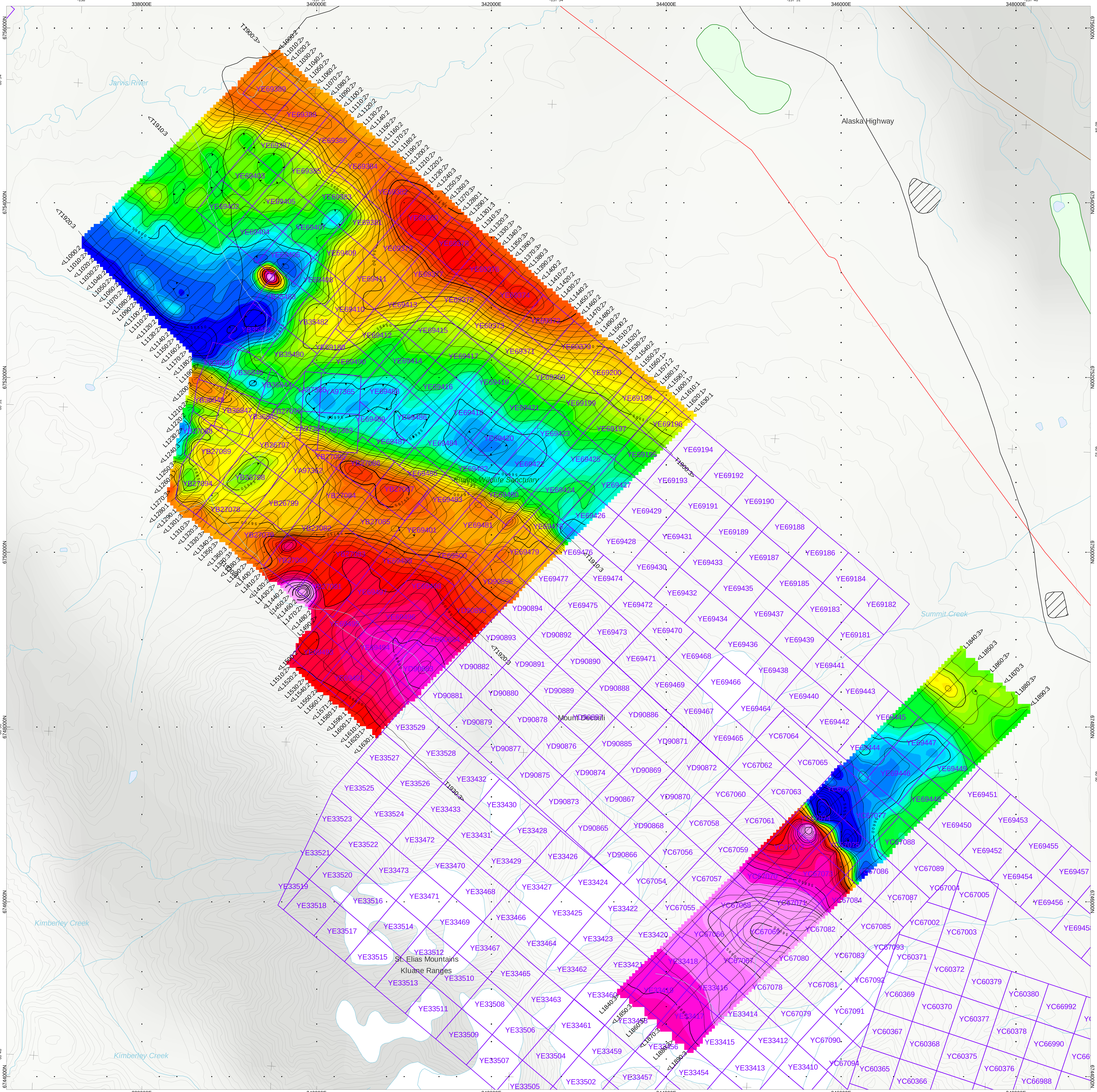


3d RDI voxels with base metals ore bodies (Middle East):





Alexander Prikhodko, PhD, P.Geo
Geotech Ltd.
April 2011



GEOTECH LTD.

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- Transmitter Wave Form: Trapezoid, Pulse Width 3.42 ms.
- Geometrics High Sensitivity Cesium Magnetometer
- Mag Resolution: 0.02 nT at 10 samples/sec

MAP PROJECTION
- Datum: WGS84
- Projection: Universal Transverse Mercator
- Central Meridian: 135°W (Zone 8N)
- Central Scale Factor: 0.9996
- False Easting/Northing: 500,000m/0m
- Major Axis: 6378137.000
- Eccentricity: 0.081819191
- NTS: 115A13 & 115B16

TMI Contour Intervals:
- 10 nT
- 50 nT
- 250 nT

TMI (nT)

56896, 56868, 56848, 56834, 56814, 56800, 56790, 56778, 56760, 56746, 56734, 56726, 56720, 56714, 56706, 56696, 56686, 56676, 56668, 56660, 56654, 56646, 56640, 56636, 56632, 56628, 56622, 56618, 56614, 56610, 56608, 56604, 56602, 56598, 56594, 56588, 56580, 56564

TOPOGRAPHIC LEGEND:
- Roads
- Trails
- Pipeline
- Streams / Rivers
- Contours
- Lakes / Ponds
- Wetlands
- Mining Area
- Glaciers
- Mining Claims

Scale 1:20000

250 0 250 500 750 1000 (meters)

WGS 84 / UTM zone 8N

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(www.geocomm.com)(www.geogratis.ca)(http://www.geomaticsyukon.ca)

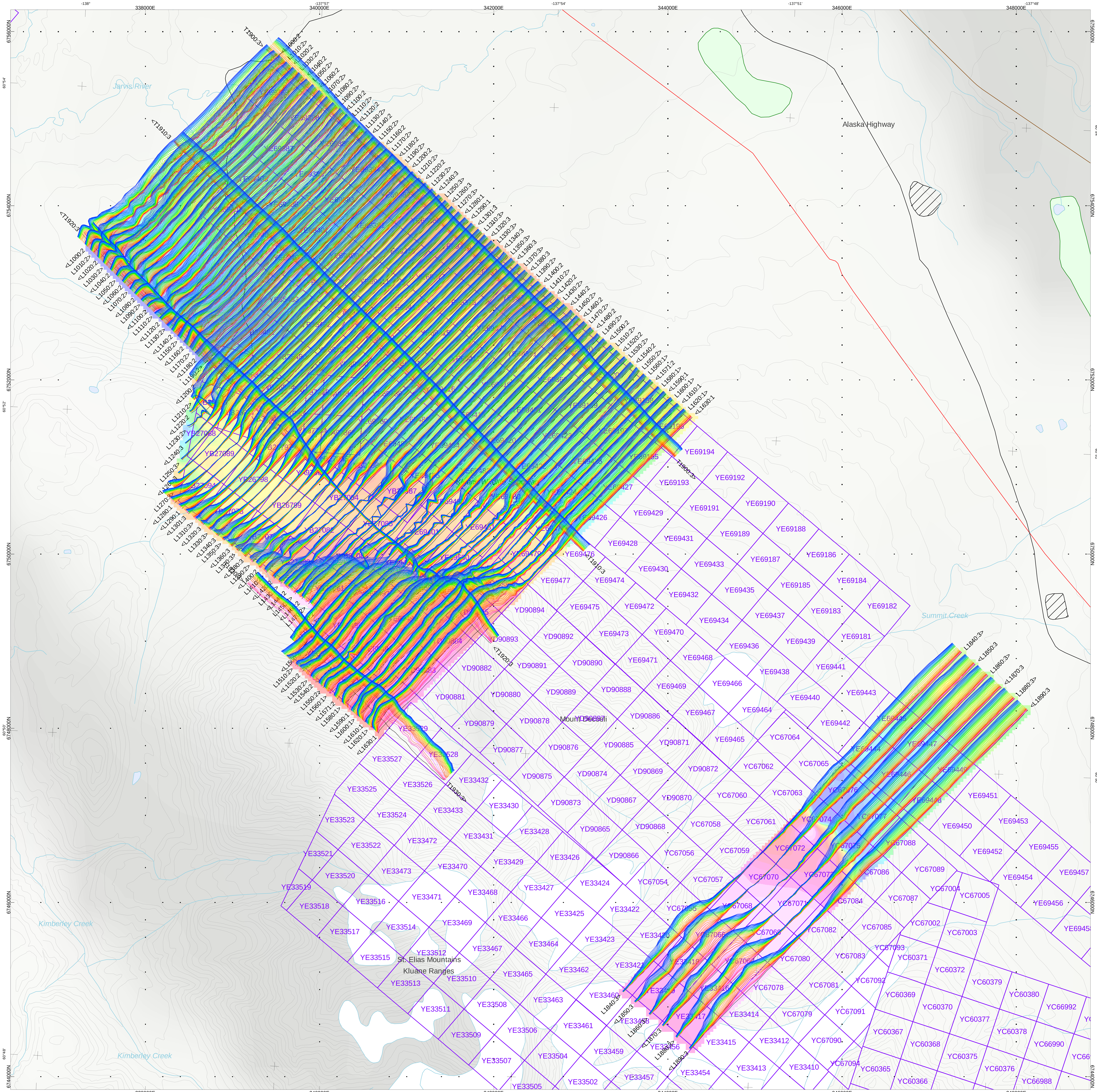
Brokenstone Mining Inc.
Ellen Property
Haines Junction, Yukon Territory

Geotech VTEM System
Total Magnetic Intensity (TMI)

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

February 2012

Geotech Project # 11383



GEOTECH LTD.

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- Mag Resolution: 0.02 nT at 10 samples/sec

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- Eccentricity: 0.081819191
- NTS: 115A13 & 115B16

Profiles scale 1 mm = 0.02 (pV*ms)/(A*m^4)

(Linear between +/-0.1 (pV*ms)/(A*m^4)
logarithmic above 0.1 (pV*ms)/(A*m^4)

0.220 ms (B-field)
0.253 ms (B-field)
0.290 ms (B-field)
0.333 ms (B-field)
0.383 ms (B-field)
0.440 ms (B-field)
0.505 ms (B-field)
0.580 ms (B-field)
0.667 ms (B-field)
0.766 ms (B-field)
0.880 ms (B-field)
1.010 ms (B-field)
1.161 ms (B-field)
1.333 ms (B-field)
1.531 ms (B-field)
1.760 ms (B-field)
2.021 ms (B-field)
2.323 ms (B-field)
2.667 ms (B-field)
3.063 ms (B-field)
3.521 ms (B-field)
4.042 ms (B-field)
4.641 ms (B-field)
5.333 ms (B-field)
6.125 ms (B-field)
7.036 ms (B-field)

TMI (nT): 56896, 56868, 56848, 56834, 56824, 56814, 56800, 56790, 56778, 56770, 56760, 56746, 56734, 56726, 56720, 56714, 56706, 56696, 56686, 56676, 56668, 56660, 56654, 56646, 56640, 56636, 56632, 56628, 56622, 56618, 56614, 56610, 56608, 56604, 56602, 56598, 56594, 56588, 56580, 56564

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- Mining Claims

Scale 1:20000

250 0 250 500 750 1000

(meters)

WGS 84 / UTM zone 8N

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Brokenstone Mining Inc.
Ellen Property
Haines Junction, Yukon Territory

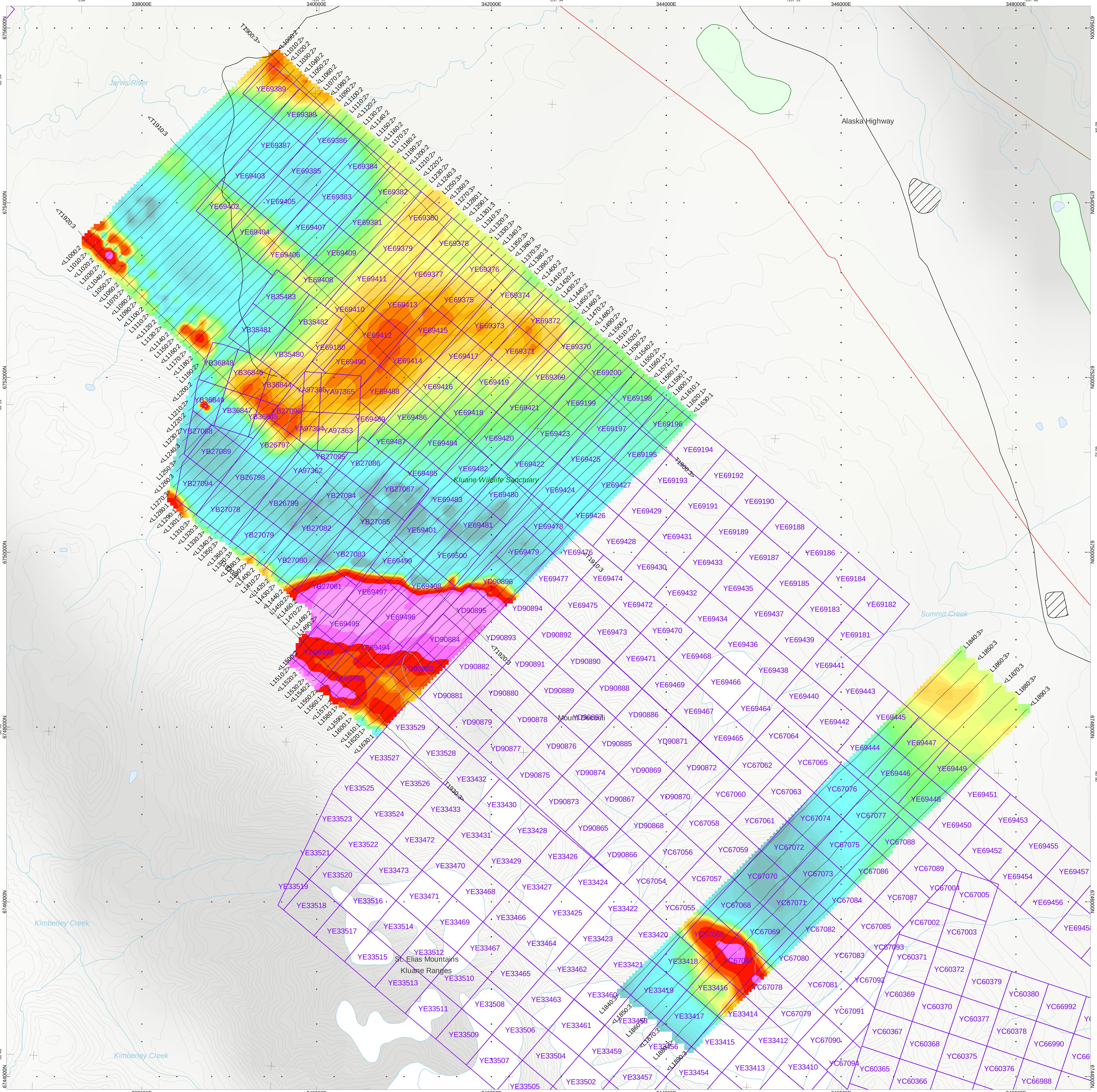
Geotech VTEM System
VTEM B-Field Profiles
Time Gate 0.220 - 7.036 ms
over Total Magnetic Intensity

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

February 2012

Geotech Project # 11383

GEOTECH LTD.



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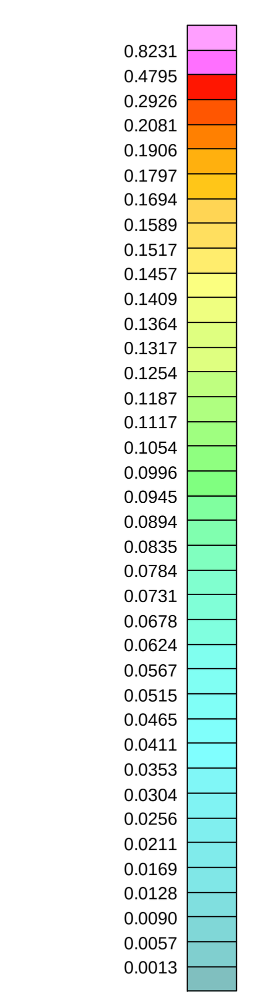
- Major Axis: 6378137.000
- Eccentricity: 0.081819191
- NTS: 115A13 & 115B16



B-Field 0.880ms
(pV*ms)/(A*m^4)

TOPOGRAPHIC LEGEND:
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Scale 1:20000

250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 8N

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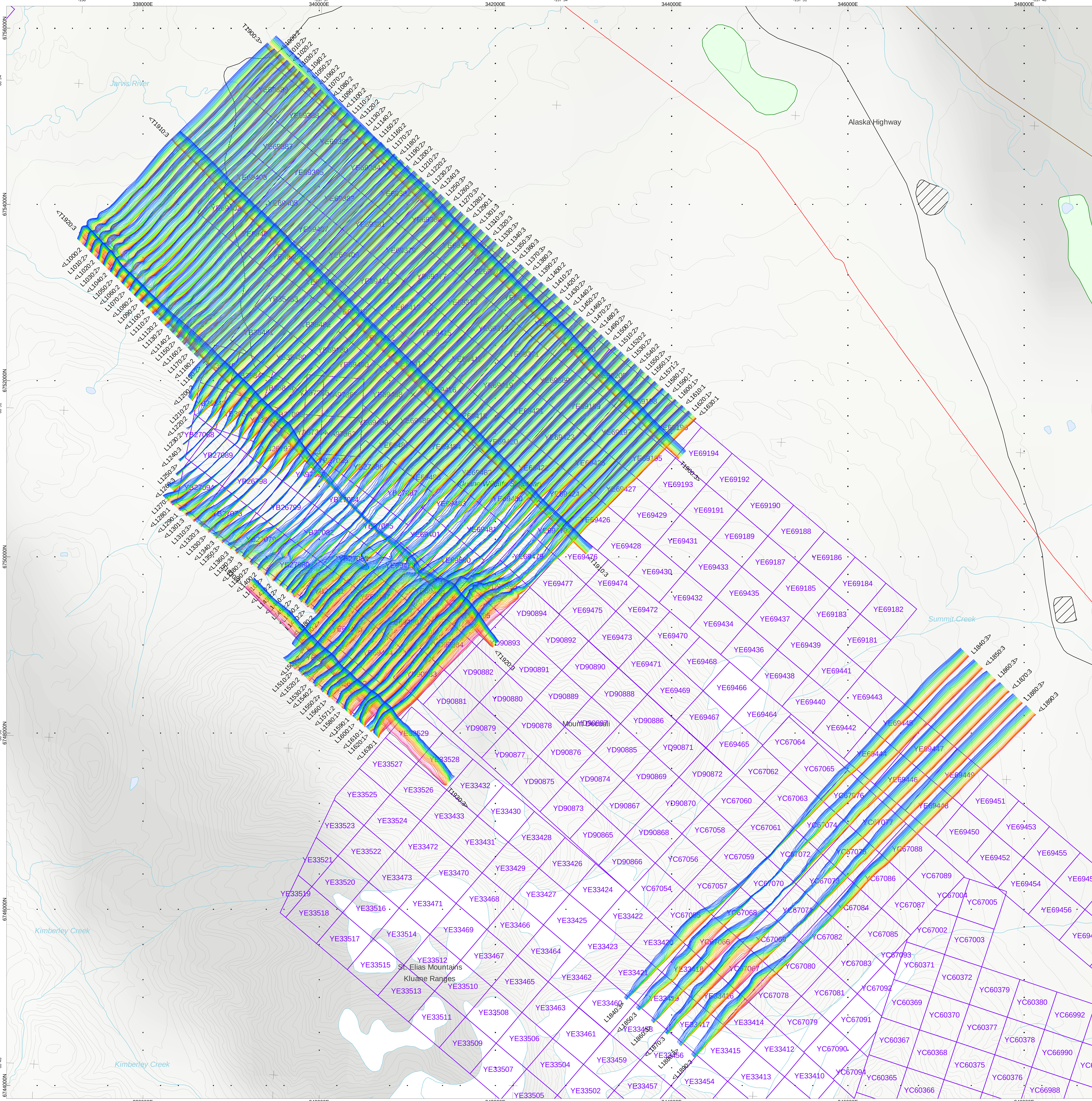
Brokenstone Mining Inc.
Ellen Property
Haines Junction, Yukon Territory

Geotech VTEM System
VTEM B-Field Z Component
Channel 30, Time Gate 0.880 ms

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

February 2012

Geotech Project # 11383



GEOTECH LTD.

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Linear between +/-0.1 (pV/A*m^4)
logarithmic above 0.1 (pV/A*m^4)

0.220 ms
0.253 ms
0.290 ms
0.333 ms
0.383 ms
0.440 ms
0.505 ms
0.580 ms
0.667 ms
0.766 ms
0.880 ms
1.010 ms
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2.021 ms
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2.667 ms
3.063 ms
3.521 ms
4.042 ms
4.641 ms
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6.125 ms
7.036 ms

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Scale 1:20000

250 0 250 500 750 1000
(meters)
WGS 84 / UTM zone 8N

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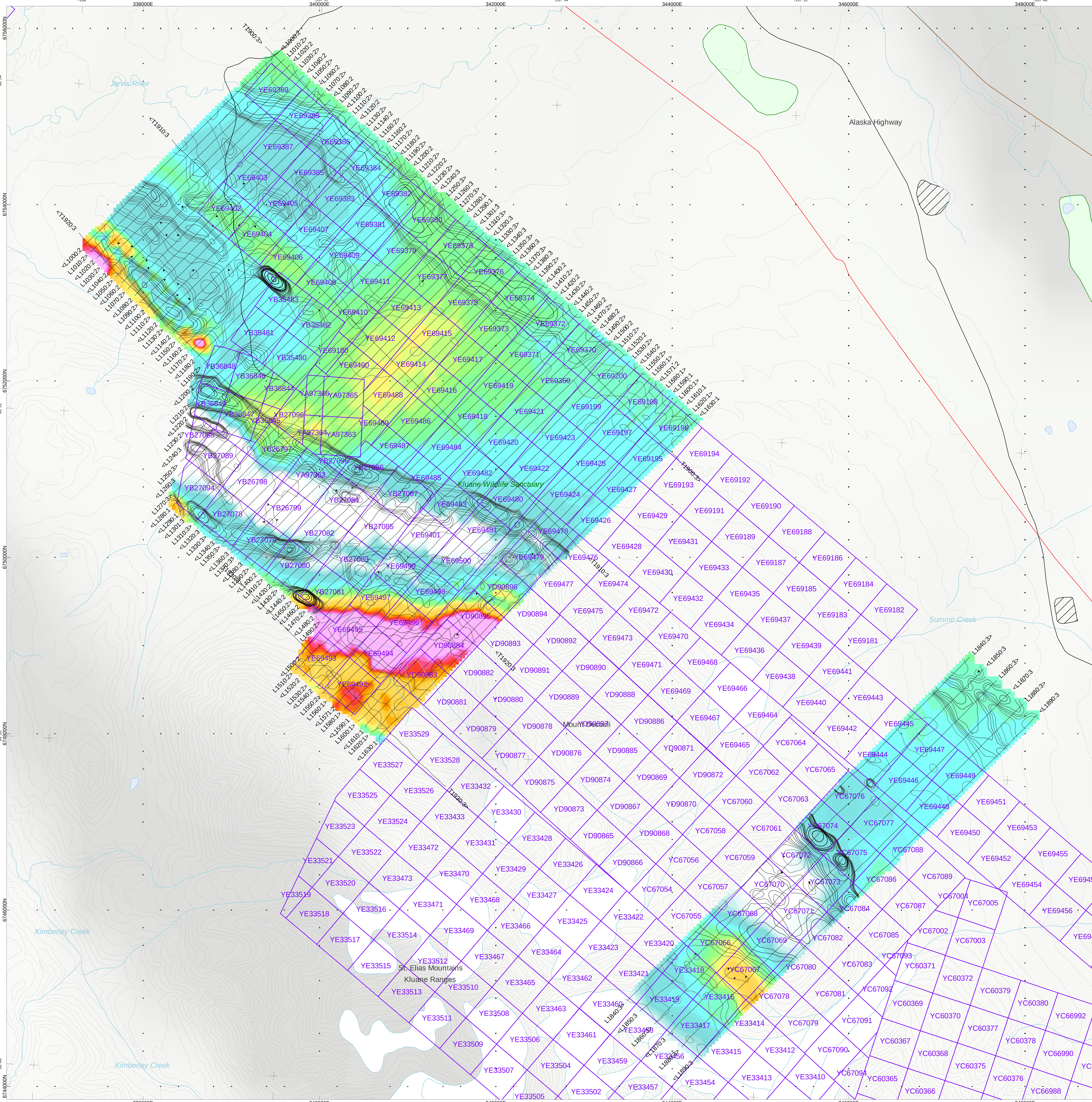
Brokenstone Mining Inc.
Ellen Property
Haines Junction, Yukon Territory

Geotech VTEM System
VTEM dB/dt Profiles
Time Gate 0.220 - 7.036 ms

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

February 2012

Geotech Project # 11383



GEOTECH LTD.

Scale 1:10,000,000

100 0 100 200 (kilometers) WGS 84 / UTM zone 8N

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1.98 1.57 1.53 1.49 1.44 1.40 1.36 1.32 1.28 1.24 1.20 1.16 1.11 1.07 1.03 0.99 0.95 0.91 0.87 0.83 0.78 0.74 0.70 0.66 0.62 0.58 0.54 0.50 0.45 0.41 0.37 0.33 0.29 0.25 0.21 0.17 0.12 0.08 0.04 0.00

Tau dB/dt
(ms)

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- Mining Claims

Scale 1:20000

250 0 250 500 750 1000
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Brokenstone Mining Inc.
Ellen Property
Haines Junction, Yukon Territory

Geotech VTEM System
dB/dt Calculated Time Constant (Tau) with contours of anomaly areas of the Calculated Vertical Derivative of TMI

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

February 2012

Geotech Project # 11383