ALBANY PROJECT
BLOCK 4F-East

Assessment Report

Airborne Geophysical Survey, 2010
Porcupine Mining District, Ontario
Pitopiko River Township
NTS: 42K/01, 42F/16

ZENYATTA VENTURES
1224 Amber Drive
Thunder Bay, ON
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January 11, 2013

Glenda Carey, B.Sc.

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1.0 Summary

In March, 2010, Zenyatta Ventures Ltd. contracted Geotech Limited to conduct a helicopter-borne versatile time-domain electromagnetic (VTEM) and aeromagnetic geophysical survey on the Albany Project 28 claim blocks, which included the area within ***Block 4F-East***. Zenyatta is conducting staged exploration programs targeting nickel (Ni), copper (Cu), platinum group metals (PGMs), rare earth elements (REEs) and graphite. Recent advances in airborne electromagnetic (EM) technology have allowed for deeper penetration/resolution through the iron deficient shallow marine sediments and into the underlying basement rocks. The Block 4F - eastern claims are located in northwestern Ontario, Canada (see Figure 1).

Ontario Geological Survey (OGS) geologist Greg Stott, interpreted the region's Precambrian geology (Stott et. al., 2007) based on government airborne geophysical surveys and limited geological data from exploratory diamond drilling conducted in the area. Stott grouped the Precambrian basement rocks into separate terranes and basins. Claim Block 4F overlies the boundary between the "Quetico Basins" in the south and the "Marmion Terrane" rocks in the north of the claim block. Mineral exploration in the Block 4F-East region has been limited over the years. The only documented exploration assessment reports from the Ministry of Northern Development and Mines (MNDM) are reconnaissance airborne and ground geophysical surveys. Other surveys include government regional airborne surveys.

The Geotech Ltd. airborne magnetic and electromagnetic (VTEM) survey was flown over the entire Albany Project claim blocks during late winter and spring of 2010. The survey is described in the inserted Geotech 2010 Report, but the only results discussed in this report are for ***Block 4F East region***. Zenyatta also contracted Mira Geosciences' Advanced Geophysical Inversion Centre to complete EM modeling of the airborne electromagnetic data provided by the Geotech survey. The Mira inversions models provide a better understanding of the geology and prioritization of exploration targets. Parts of the Mira report pertaining to Albany claim blocks other than 4F-East, have been omitted from this assessment submittal.

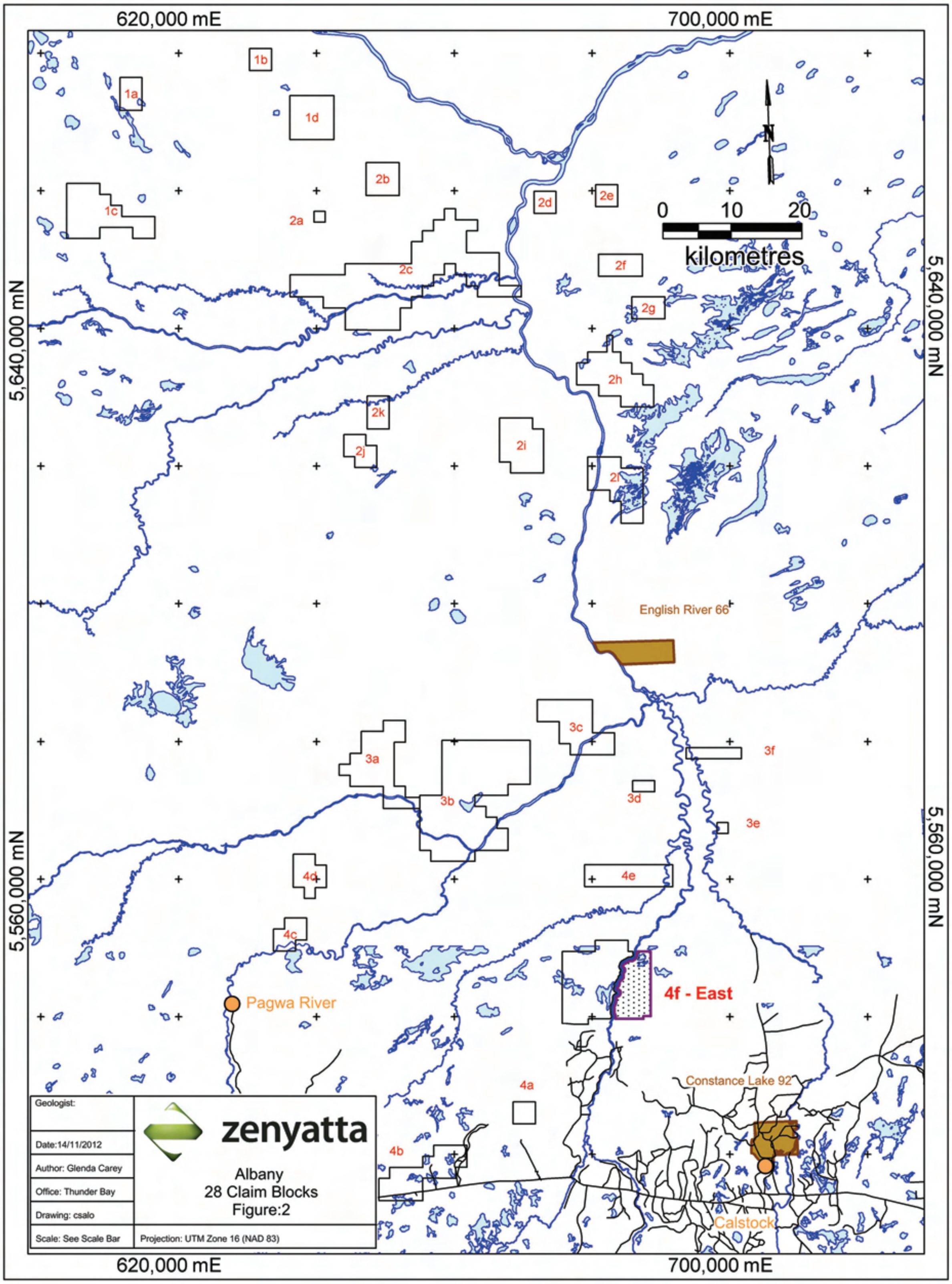
Geologist:	zenyatta
Date:14/11/2012	ALBANY PROJECT LOCATION MAP
Author: Glenda Carey	
Office: Thunder Bay	
Drawing: csalo	FIGURE: 1
Scale: N.T.S.	Projection: Longitude/Latitude

2.0 Introduction

In the winter of 2010, Zenyatta Ventures Limited contracted Geotech Limited of Aurora, Ontario to conduct an airborne electromagnetic (VTEM) and aeromagnetic geophysical survey. The entire survey was flown from March 17th to May 19th, 2010 in the Hearst area of Northern Ontario. The survey was flown in a north-south direction. Traverse lines were flown with 150 metre spacing and tie lines were flown in an east-west direction with spacing's of 1500/700/1550 metres. Several targets were outlined in the Albany claim blocks based on the results of this survey and all results were sent to Mira Geoscience in Vancouver, British Columbia for further interpretation of the electromagnetic data.

Both the Geotech (July, 2010) and the Mira (August, 2010) reports have been inserted at the end of this assessment report (Appendices A and B). For the purposes of this report, the accompanying Geotech Limited and Mira Geoscience reports only include results for the ***4F-East claims***. A percentage of the total costs (Geotech & Mira reports, etc.) that was calculated for Block 4F-East section will be used to assign credits to the following claims: 4257732, 4257733, 4257738, 4257739, 4257740 and 3002473.

Figure 2: Albany Project – 28 Claim Blocks



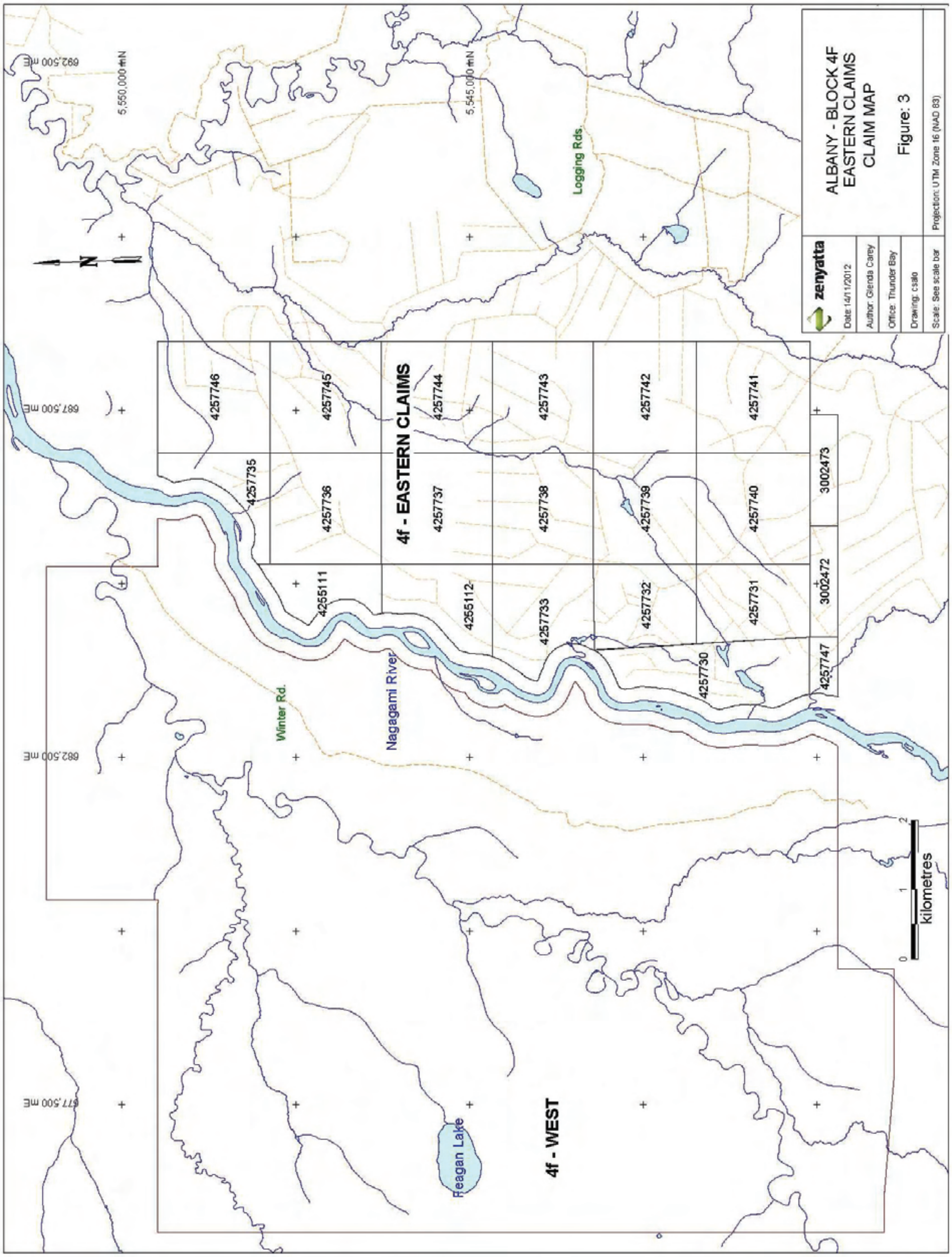
3.0 Property Description

The Albany Project claim group **Block 4F** is located north of Lake Superior and west of James Bay in northwestern Ontario, Canada. Zenyatta's Block 4F is part of a larger group of claims (*see Figure #2*) that make up the Albany Project and include 28 groups of claims totaling 495 claims, 7757 claim units, and 124,112 hectares. The majority of the entire Albany Project claims were staked during the late summer and fall of 2009, followed by additional staking in the winter and spring of 2010.

The Block **4F-East** claims, located on the eastern side of the Nagagami River are in the Pitopiko River Township and situated within NTS blocks 42K/01 and 42F/16. The claims were staked during the months of February and April of 2010. The Block 4F eastern claims (*Figure #3*) total ***21 claims, 277 claim units,*** and make up ***4432 hectares***. The yearly work required costs to keep the total claims in good standing amounts to ***$110,800***. Table #1 lists the Block 4F claims located on the eastern side of the Nagagami River. During the airborne survey in 2010 the claims were 100% owned by Cliffs Natural Resources Exploration Canada Inc. (CNRECI). Presently the claims are 100% owned by Zenyatta Ventures Limited.

Table #1: Albany Block 4F-East Claims Summary

Claim #	Units	Hectares	Due Date	Work Required	Ownership
4255111	16	256	Feb 28/2013	$6,400	Zenyatta
4255112	16	256	Feb 28/2013	$6,400	Zenyatta
4257730	14	224	Feb 28/2013	$5,600	Zenyatta
4257731	12	192	Feb 28/2013	$4,800	Zenyatta
4257732	12	192	Feb 28/2013	$4,800	Zenyatta
4257733	14	224	Feb 28/2013	$5,600	Zenyatta
4257735	7	112	Feb 28/2013	$2,800	Zenyatta
4257736	16	256	Feb 28/2013	$6,400	Zenyatta
4257737	16	256	Feb 28/2013	$6,400	Zenyatta
4257738	16	256	Feb 28/2013	$6,400	Zenyatta
4257739	16	256	Feb 28/2013	$6,400	Zenyatta
4257740	16	256	Feb 28/2013	$6,400	Zenyatta
4257741	16	256	Feb 28/2013	$6,400	Zenyatta
4257742	16	256	Feb 28/2013	$6,400	Zenyatta
4257743	16	256	Feb 28/2013	$6,400	Zenyatta
4257744	16	256	Feb 28/2013	$6,400	Zenyatta
4257745	16	256	Feb 28/2013	$6,400	Zenyatta
4257746	16	256	Feb 28/2013	$6,400	Zenyatta
4257747	2	32	Feb 28/2013	$800	Zenyatta
3002472	4	64	Feb 28/2013	$1,600	Zenyatta
3002473	4	64	Feb 28/2013	$1,600	Zenyatta
21 Claims	***277***	***4432***		***$110,800***	


ALBANY - BLOCK 4F
EASTERN CLAIMS
CLAIM MAP
Figure: 3
Projection: UTM Zone 16 (NAD 83)
zenyatta
Date 14/11/2012
Author: Glenda Carey
Office: Thunder Bay
Drawing: csalo
Scale: See scale bar
4f - EASTERN CLAIMS
4f - WEST
4257746
4257745
4257744
4257743
4257742
4257741
4257735
4257736
4257737
4257738
4257739
4257740
3002473
4255111
4255112
4257733
4257732
4257731
3002472
4257730
4257747
Nagagami River
Winter Rd.
Logging Rds.
Reagan Lake
5,550,000 mN
5,545,000 mN
692,500 mE
687,500 mE
682,500 mE
677,500 mE
kilometres
0
1
2

4.0 Location, Access and Topography

Zenyatta's Albany Project - Block 4F is situated within the Porcupine Mining District of northern Ontario, Canada. The claims are located approximately 50 kilometres northwest of Highway 11 and the small town of Hearst, population of 5825. The eastern claims of Block 4F are located in the Township of Pitopiko River, and within NTS blocks 42K/01 and 42F/16.

Access to most of the 4F claim block can be gained using helicopter, but boat or canoe access can be used along the Nagagami River. Old forestry logging roads reach the south-east boundary of the claim block, leading to several old quad trails through previously harvested forests just east of the Nagagami River. The small town of Hearst, located approximately 50 kilometres to the southeast of Block 4F, has many facilities to keep an exploration camp well supplied. These include hotels, restaurants, a hospital, hardware stores, gas stations, mining supply store, and an airport. Float plane and helicopter services are available in Hearst.

The claims are situated within the Hudson Bay-James Bay Lowlands area where the topography is essentially flat, low-lying and swampy. Overburden is thick, approximately 35 metres in the Block 4F area with little or no outcrop exposure. There are many creeks flowing between peat bogs throughout the area. Vegetation is dominated by wetlands with some areas of spruce and alder trees, and cedar swamps. Spruce and alder trees are also abundant along the banks of the Nagagami River and other smaller rivers.

The claims are situated in northern Ontario where there are various climates and weather extremes. Most of the region has a continental climate with warm to hot summers (June, July and August; 25 to 35 degrees Celsius) and cold winters (December to March, 10 to -30 degrees Celsius). Spring and autumn tend to be short seasons and have some of the weather of winter and summer. Generally, precipitation ranges from 600 millimeters to around 900 millimeters. Surface exploration work can be carried out during the months of May to November, possibly later if there is no snow accumulation. Airborne or ground geophysical surveys and diamond drill programs can be conducted year round.

5.0 Historical Work

Historical company exploration work has been limited in this area of the James Bay Lowlands and mostly consists of geophysical surveys. The following is a brief summary of the reported historical exploration work carried out in the ***Albany Project, Block 4F-East*** area:

> **1961**: ***Algoma Ore Properties Limited*** flew an aeromagnetic survey in the Nagagami River and Pitopiko Townships area. The survey outlined a horseshoe-shaped anomaly which was confirmed on the ground in the same year. This led to further exploration in 1963.
>
> **1963**: ***Algoma Ore Properties Limited*** flew an airborne magnetometer survey in the Nagagami River area, located forty miles north-west of Hearst, Ontario. The survey was flown by Hunting Survey Corporation. The survey results indicated two large low intensity circular shaped anomalies (Anomalies #1 and #2), underlying the Paleozoic limestones. Interpretation of the anomalies inferred that they were caused by a complex syenitic to gabbroic intrusion. It was reported that Anomaly #1 could be associated with a basic intrusive, hosting magnetite, and thought to be mildly interesting for iron ore, niobium, and sulphides. Anomaly #2 was interpreted to be associated with an alkaline and carbonatite complex and could contain columbium and other rare earth elements (REEs). Algoma recommended follow-up work to include a ground magnetometer survey over the anomalies and a diamond drill program (Venn, V.R., 1964).
>
> **1993: *McKinnon Prospecting*** reported on a ground geophysical survey (magnetometer, horizontal loop EM, and IP) that was contracted to Rayan Exploration Ltd. and covered only the most southern claims in the Block 4F-East area.
>
> **1999**: The ***Ontario Geological Survey*** (OGS) released aeromagnetic geophysical maps for the Hudson Bay and James Bay Lowlands areas, *Geophysical Data Set 1036*. (*see Figure 5 for Block 4F area*)
>
> **2008:** The ***Ontario Geological Survey*** (OGS) Precambrian Geology Map P.3599 was published: *Hudson Bay and James Bay Lowlands Region Interpreted from Aeromagnetic Data*, G.M. Stott, 2007–2008. (*see Figure 6 for Block 4F area*)

6.0 Geological Setting

The following are excerpts from Stott's (2007-2008) "Marginal Notes", Map P3599, describing the interpreted Precambrian Geology of the Hudson Bay and James Bay Lowlands Region:

The relatively flat-lying Hudson Bay and James Bay Lowlands, consist mostly of carbonates of Paleozoic to Mesozoic age. These sediments cover a significant portion of the Precambrian rocks of Northern Ontario and therefore, have impeded the understanding of the Precambrian geology and the tectonic framework across this region of Ontario. The regions Precambrian geology is based mainly on available reprocessed aeromagnetic data and limited drill hole information. The results provide a general framework of interpreted supracrustal belts, plutonic subdivisions, major faults and Proterozoic mafic dikes (see Figure 4).

In the James Bay Lowland area, the most significant feature is the aeromagnetic expression of the Uchi domain greenstone belts, along the southern flank of the Sachigo superterrane trending northeast under the James Bay Lowland and wrapping around the eastern end of the Island Lake domain, a portion of the Sachigo superterrane. This greenstone trend merges with the Oxford–Stull domain near the western margin of the James Bay Lowland just east of the McFaulds Lake massive sulphide deposits. This combined array of Neoarchean greenstone belts continues east, narrowing under the James Bay Lowland, towards the Eastmain greenstone–granite domain in Quebec.

According to Stott's (2007) regional tectonic subdivisions map, Zenyatta's **Block 4F** covers parts of the ***Marmion Terrane*** and the ***Quetico Basins*** of the Superior Province of the Canadian Shield:

> ***The Quetico Subprovince:*** *The Quetico Subprovince is an east-northeast trending, 10 to 100 km wide by 1200 km long belt of variably metamorphosed and deformed clastic metasedimentary rocks and granitoids located in the west-central part of the Superior Province. The metamorphic grade varies from greenschist to amphibolite to local granulite facies. The metasedimentary rocks were deposited before 2696 Ma. The Quetico intrusions near Atikokan are typically small ($<1km^2$) and form spills, plugs, and small stocks composed of a variety of lithologies, mainly wehrlites, clinopyroxenites, hornblendites, monzodiorites, syenites, foidites and silicocarbonatites. They are locally enriched in Ni-Cu and PGEs (Vaillancourt, C., et. al.).*
>
> ***Marmion Terrane/Subprovince:*** *This terrane consists predominately of metamorphosed felsic intrusive rocks. The 3.0 to 2.7 billion year old rocks are interpreted as an assemblage of continental fragments. These rocks were once also interpreted as part of the Western Wabigoon and Winnipeg River terranes (MNDM, Government of Ontario).*

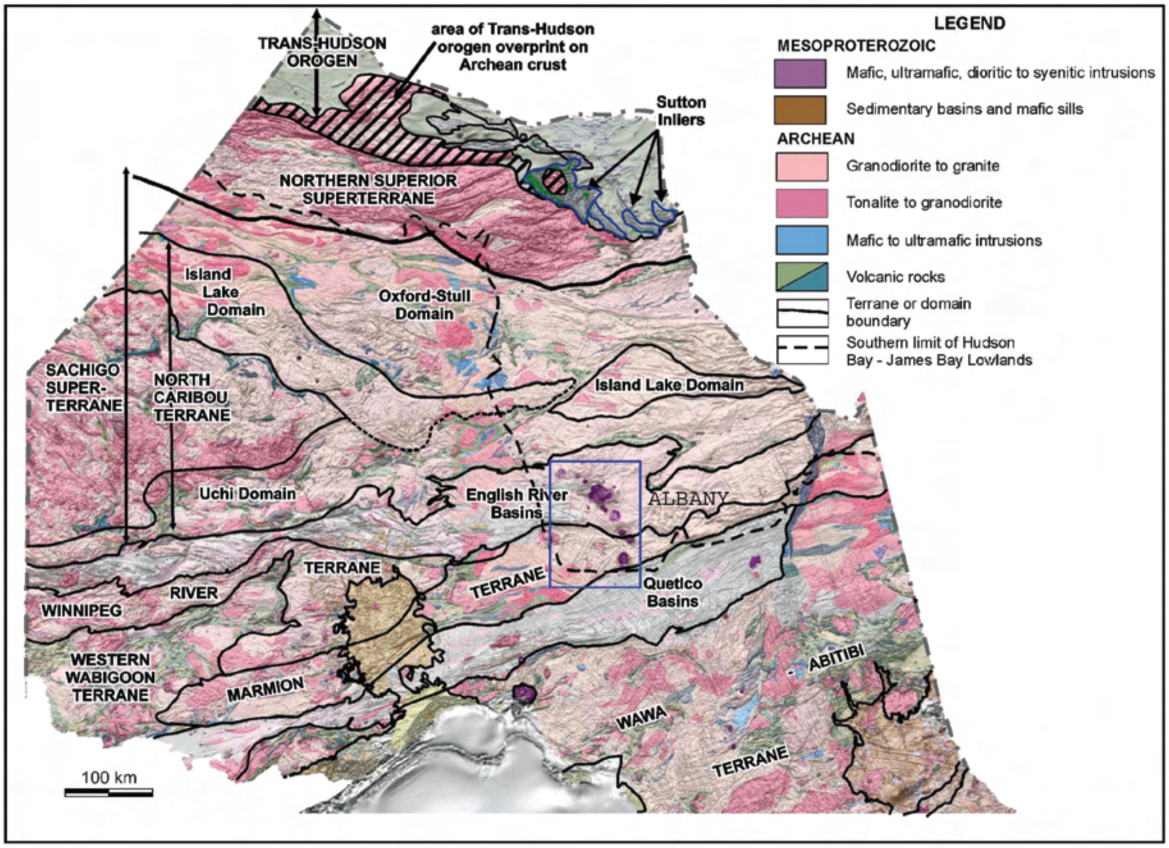


Figure 4. Regional tectonic subdivisions of northern Ontario (*after* Stott et al. 2007).

7.0 Conclusions

The preliminary exploration program on the Albany claims, carried out by Zenyatta Ventures in the winter and spring of 2010, consisted of a Geotech helicopter-borne geophysical ***VTEM and Aeromagnetic Survey.***

Results of the Geotech survey were used to identify high priority EM and magnetic targets for diamond drilling. For the Block 4F-East area, Geotech identified eleven EM anomalies (3 may be affected by cultural activity); these are listed in the inserted 2010 Geotech Report (Appendix A), at the end of the report. The EM anomalies are of weak conductance and at this time, are not considered high priority targets by Zenyatta Ventures. The Mira Geosciences' interpretation of the airborne results (in this eastern region of Block 4F) did not outline any significant geophysical anomalies.

Zenyatta Ventures is not proposing any follow-up exploration at this time, on the Block 4F-East claims located in the Hearst area of Northern Ontario.

8.0 References

Algoma Steel Corporation (1963-1966): MNDM Assessment Report File T-4267, Nagagami River File – Alkaline Ring Complexes, Hearst Area.

Jagodits, F. & Paterson, N. (1964): Hunting Survey Corporation Limited for Algoma Ore Properties Limited, Airborne Magnetic Survey, MNDM Assessment Report File T-343, Nagagami River Area.

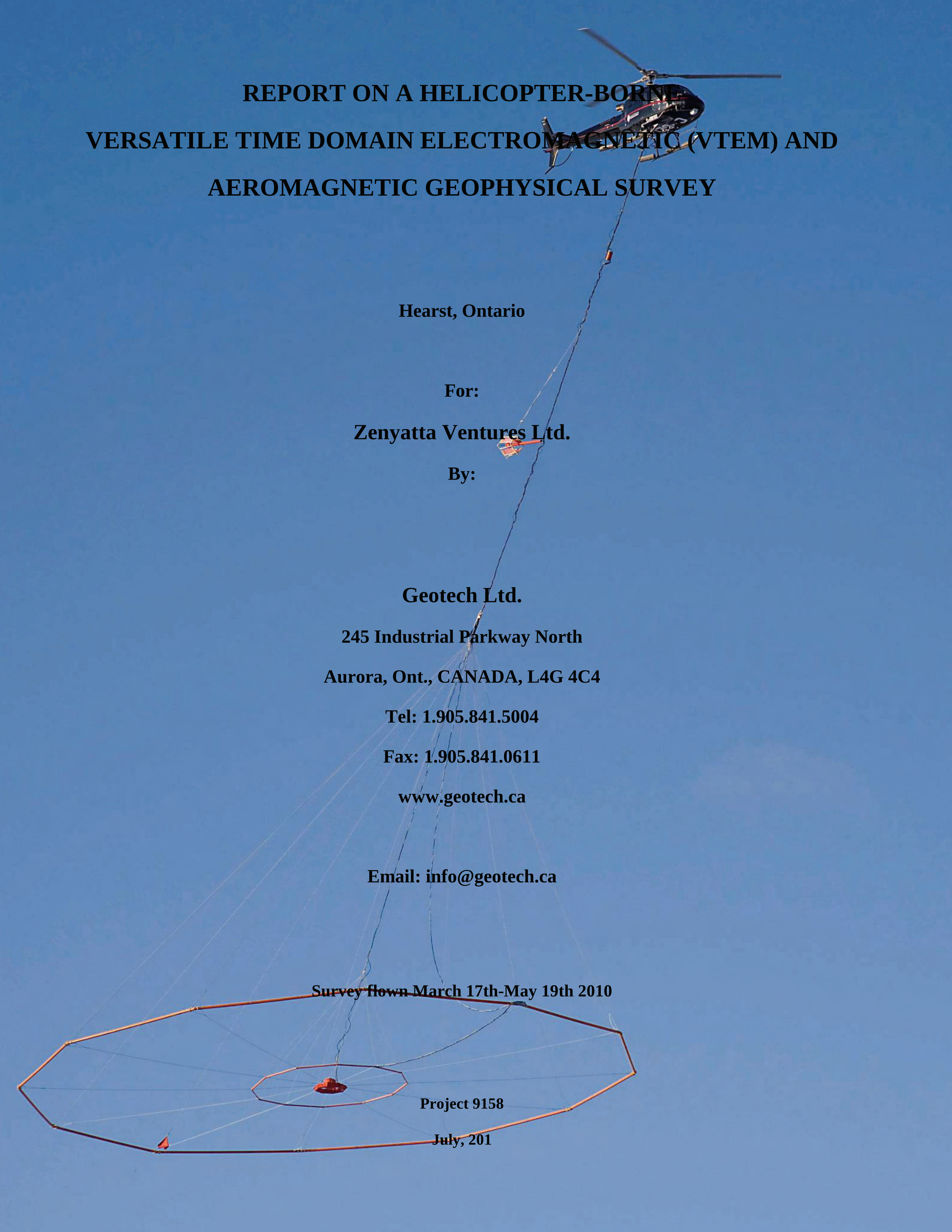
Ontario Geological Survey (1999): Aeromagnetic Geophysics, Geophysical Data Set 1036.

Stott, G.M. (2007-2008): Ontario Geological Survey Map P3599, Hudson Bay and James Bay Lowlands Region Interpreted From Aeromagnetic Data, South Sheet.

Venn, V.R. (1964-65): Algoma Ore Properties Division, MNDM Assessment Report File T-338; Report on the Nagagami River Alkaline Ring Complexes, Hearst Area.

APPENDIX A

2010 GEOTECH AIRBORNE GEOPHYSICS



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

Hearst, Ontario

For:

Zenyatta Ventures Ltd.

By:

Geotech Ltd.

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Survey flown March 17th-May 19th 2010

Project 9158

July, 201

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VERSATILE TIME DOMAIN ELECTROMAGNETIC (VTEM) and
AEROMAGNETIC SURVEY

1(A-D), 2(A-L), 3(A-F), 4(A-F)
Hearst, Ontario

Executive Summary

During March 17th 2010 to May 19th 2010 Geotech Ltd. carried out a helicopter-born geophysical survey over the 1(A-D), 2(A-L), 3(A-F), **4**(A-**F**) blocks situated near Hearst, Ontario, Canada.

Principal geophysical sensors included a versatile time domain electromagnetic (VTEM) system, and a caesium magnetometer. Ancillary equipment included a GPS navigation system and a radar altimeter.

The survey operations were based out of the town of Hearst located in the province of Ontario. 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 electromagnetic stacked profiles of the B-field Z Component and dB/dt X and Z Components, Calculated Vertical Gradient (CVG), Second Vertical Gradient (2VG) and Total Magnetic Intensity (TMI).

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

The survey report describes the procedures for data acquisition, processing, final image presentation and the specifications for the digital data set. The survey results are supported by EM anomaly picking, EM time-constant (Tau) and magnetic derivative analyses that were performed.

1. INTRODUCTION

1.1 General Considerations

Geotech Ltd. performed a helicopter-borne geophysical survey over the 1(A-D), 2(A-L), 3(A-F), 4(A-F) block located near Hearst, Ontario, Canada (Figure 1).

Aubrey Eveleigh acted on behalf of ZENYATTA Ventures Ltd. 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 and X component measurements and aeromagnetics using a caesium magnetometer. A total of 10006.18 line-km of geophysical data were acquired during the survey. The entire survey area is shown in Figure 2.

The crew was based out of Hearst, Ontario for the acquisition phase of the survey. Survey flying started on March 17th and completed on May 19th 2010.

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 June, 2010.

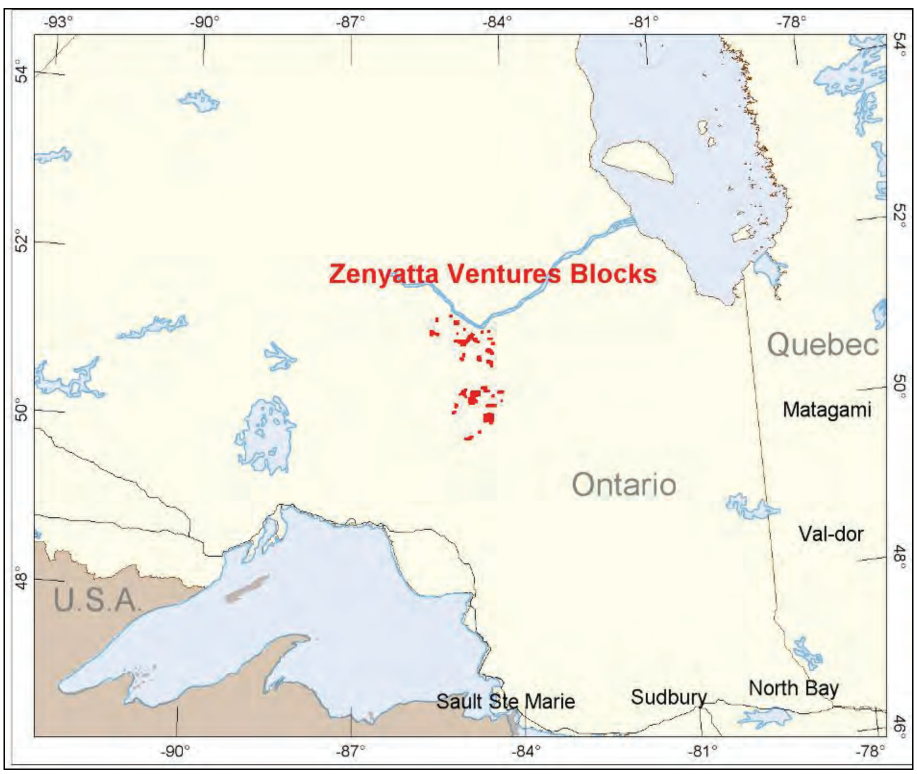


Figure 1 – ZENYATTA Ventures blocks

1.2 Survey and System Specifications

The ZENYATTA Ventures blocks are located approximately 60 kilometres north west of Hearst, Ontario (Figure 2).

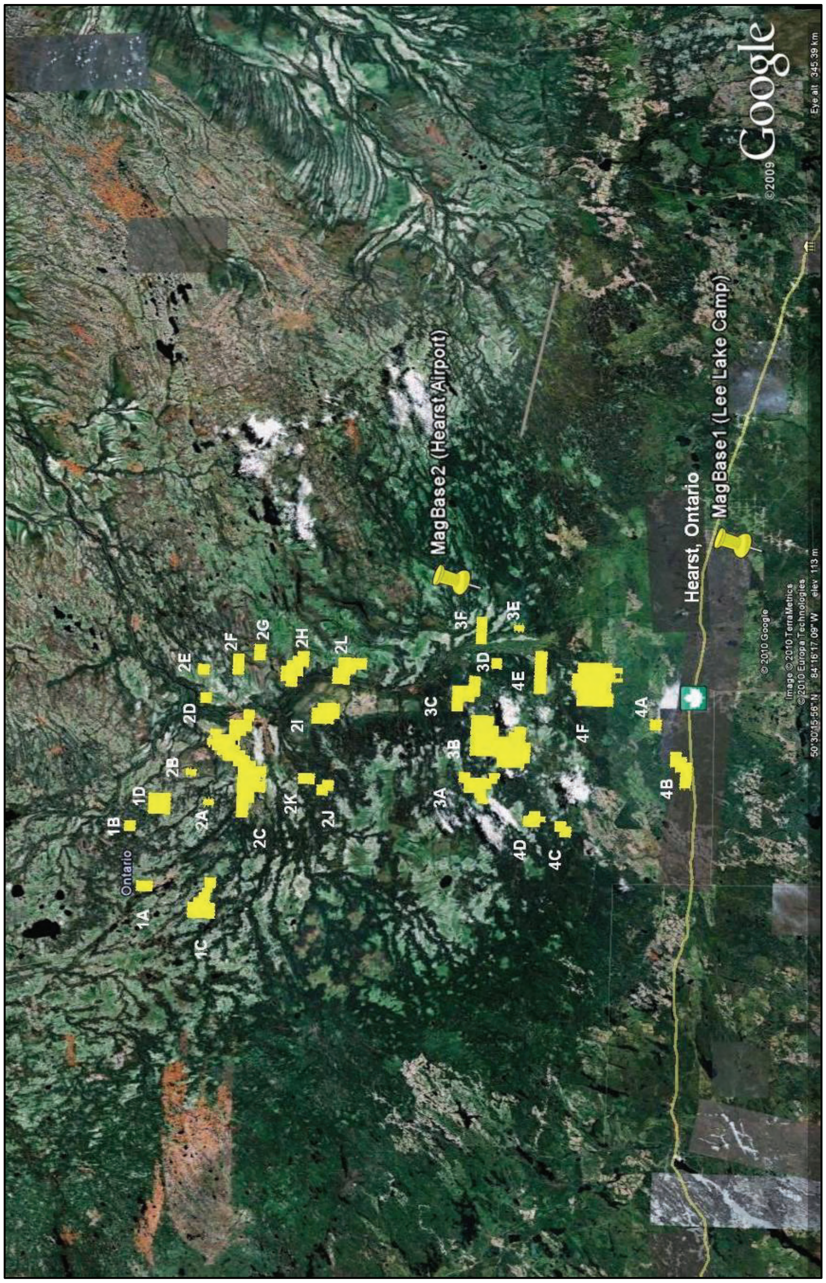


Figure 2 – All Zenyatta Ventures blocks, showing the magnetic base station locations on Google Earth.

The ZENYATTA Ventures blocks were flown in a North to South (N 0° E / N 180° E) direction with a traverse line spacing of 150 metres as depicted in Figure 6. Tie lines were flown perpendicular to the traverse lines at a spacing of 1500/700/1550 metres (N 90° E / N 270° E) direction.

1.3 Topographic Relief and Cultural Features

Topographically, the blocks exhibit a moderate relief with an elevation ranging from 120 to 360 metres above sea level over an area of approximately 2485.4 square kilometres. There are numerous rivers running through the survey area connecting various lakes and wetlands. The most notable river system flows beginning with Albany River and continues south from there. There are limited signs of culture throughout the block such as, roads, trails and mining areas. Special care is recommended in identifying these few roads, trails and mine locations, along with any other potential cultural features from other sources that might be recorded in the data. The blocks are 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. 042N, 042K & 042F.

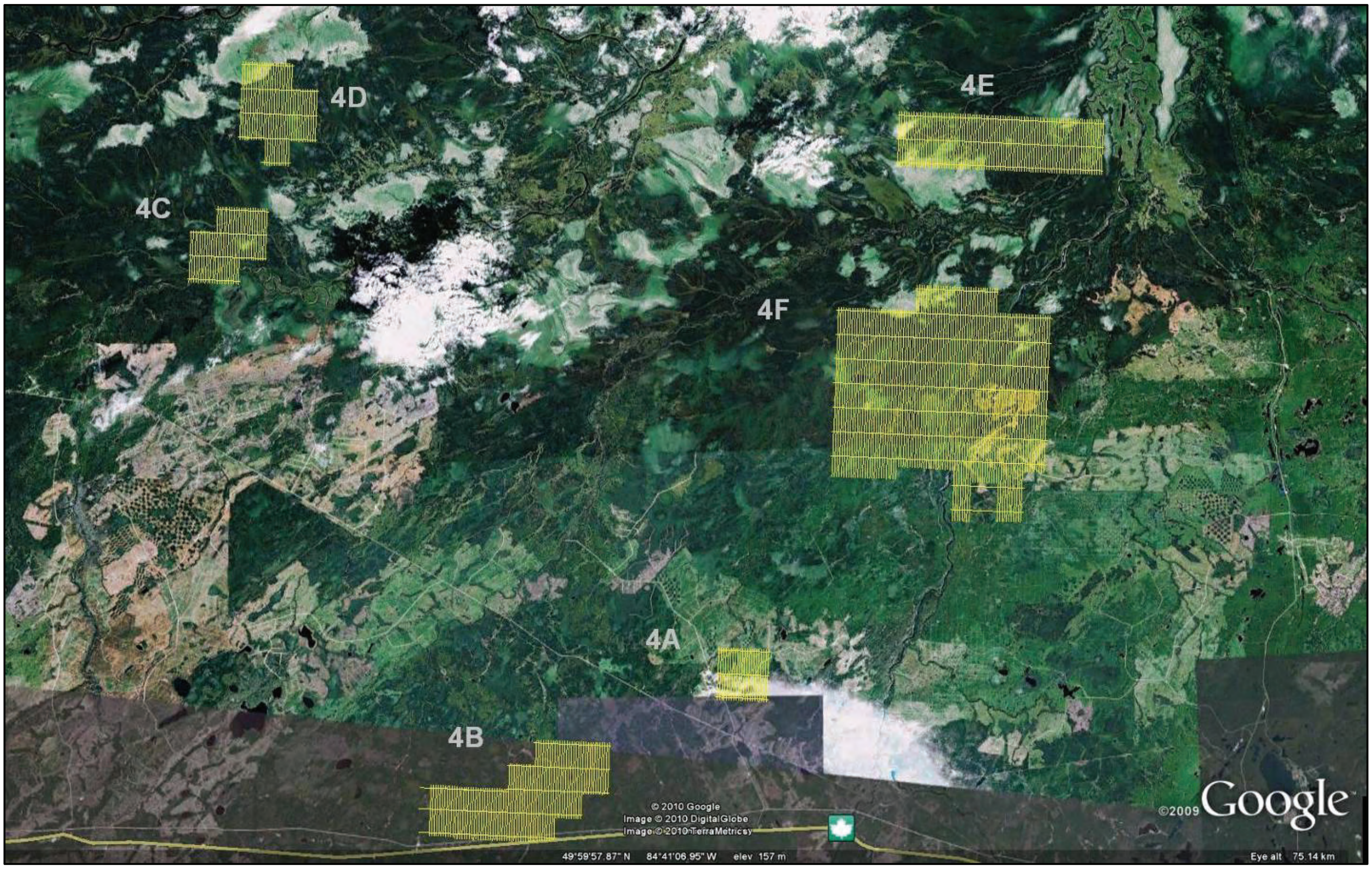


Figure 6 – ZENYATTA Ventures **4 (A-F)** flight paths over a Google Earth Image.

2. DATA ACQUISITION

2.1 Survey Area

The survey block (see Figure 6) and general flight specifications are as follows:

Table 1 - Survey Specifications

Survey block	Traverse Line spacing (m)	Area (Km²)	Planned[1] Line-km	Actual Line-km	Flight direction	Line numbers
4F	Traverse: 150	206.1	1081.8	1081.8	N 0° E / N 180° E	L26000 – L26910
	Tie: 1500		99.1	99.1	N 90° E / N 270° E	T26900 – T29120

[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.

2.2 Survey Operations

Survey operations were based out of the Companion Motel in the town of Hearst, Ontario from March 17th to March 30th 2010 & April 11th to May 11. They were also based out of Lee Lake Camp in the town of Hearst, Ontario from March 31st to April 10th & May 12th to May 19th. The following table shows the timing of the flying.

Table 2 - Survey schedule

Date	Flight #	Flown km	Crew location	Comments
3-17-2010			Hearst ON	test flights
3-18-2010			Hearst ON	No Production due to weather
3-19-2010			Hearst ON	No Production due to weather
3-20-2010	1,2	64.3	Hearst ON	Limited Production due to weather
3-21-2010	3	59.3	Hearst ON	Limited Production due to weather
3-22-2010	4,5,6	245.6	Hearst ON	Production
3-23-2010	7,8,9	297.0	Hearst ON	Production
3-24-2010	10,11,12,13	339.2	Hearst ON	Production
3-25-2010			Hearst ON	No Production due to weather
3-26-2010	14,15,16,	210.6	Hearst ON	Production
3-27-2010			Hearst ON	No Production due to weather
3-28-2010	17,18	170.0	Hearst ON	Production
3-29-2010	19	48	Hearst ON	Limited Production due to weather
3-30-2010	20,21,22,23	311.7	Hearst ON	Production
3-31-2010	24,25	123.4	Hearst ON	Production
4-01-2010	26,27,28	297.2	Hearst ON	Production
4-02-2010	29,30,31,32	318.3	Hearst ON	Production
4-03-2010	33	78.6	Hearst ON	Production
4-04-2010	34,35	298.9	Hearst ON	Production
4-05-2010	37,38	207.0	Hearst ON	Production
4-06-2010	39,40,41,42	331.1	Hearst ON	Production
4-07-2010	43,44,45	383.6	Hearst ON	Production
4-08-2010	46,47,48	307	Hearst ON	Production
4-09-2010			Hearst ON	No Production due to weather
4-10-2010	49,50	171.0	Hearst ON	Production
4-11-2010			Hearst ON	Lee camp to Hearst
4-12-2010	51,52,53	345.0	Hearst ON	Production
4-13-2010	54,55	281.7	Hearst ON	Production
4-14-2010	56,57	213.2	Hearst ON	Production
4-15-2010			Hearst ON	No Production due to weather
4-16-2010			Hearst ON	No Production due to weather

4-17-2010			Hearst ON	No Production due to weather
4-18-2010	58,59	171.2	Hearst ON	Production
4-19-2010	60,61,62	264.0	Hearst ON	Production
4-20-2010			Hearst ON	No Production due to weather
4-21-2010	63	119.9	Hearst ON	Production
4-22-2010	64	56	Hearst ON	Limited Production due to weather
4-23-2010	65,66,67	272.3	Hearst ON	Production
4-24-2010	68,69,70	274.3	Hearst ON	Production
4-25-2010	71,72,73	154.2	Hearst ON	Production
4-26-2010			Hearst ON	No Production due to weather
4-27-2010	74,75	122.5	Hearst ON	Production
4-28-2010	76,77	184.5	Hearst ON	Production
4-29-2010			Hearst ON	No Production due to technical issues
4-30-2010			Hearst ON	No Production due to technical issues to May 9th
5-09-2010	78,79,80	333.6	Hearst ON	Production
5-10-2010	81,82,83	392.7	Hearst ON	Production
5-11-2010			Hearst ON	Building landing pad May 11- May12
5-13-2010	84,85,86	585.5	Hearst ON	Production
5-14-2010			Hearst ON	No Production due to weather
5-15-2010	87,88,89	331.4	Hearst ON	Production
5-16-2010	90,91,92	399.8	Hearst ON	Production
5-17-2010	93,94	315.4	Hearst ON	Production
5-18-2010	95,96,97	387.6	Hearst ON	Production
5-19-2010			Hearst ON	Job Complete

2.3 Flight Specifications

During the survey of the ZENYATTA Ventures blocks the helicopter was maintained at a mean height of 88 metres above the ground with a nominal survey speed of 80 km/hour. This allowed for a nominal EM sensor terrain clearance of 53 metres and a magnetic sensor clearance of 75 metres.

The data recording rates of the data acquisition was 0.1 second for electromagnetics, magnetometer and 0.2 second for altimeter and GPS. This translates to a geophysical reading about every 2 metres along flight track. Navigation was assisted by a CDGPS receiver and data acquisition system, which reports GPS co-ordinates as latitude/longitude and directs the pilot over a pre-programmed survey grid.

The operator was responsible for monitoring of 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 qualified personnel, operating remotely.

2.4 Aircraft and Equipment

2.4.1 Survey Aircraft

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

2.4.2 Electromagnetic System

The electromagnetic system was a Geotech Time Domain EM (VTEM) system. The configuration is as indicated in Figure 7 below.

The standard VTEM Receiver and transmitter coils are concentric-coplanar and Z-direction oriented. The receiver system for the project also included a coincident-coaxial X-direction sensor to measure the in-line dB/dt and calculate B-Field responses. All loops were towed at a mean distance of 35 metres below the aircraft as shown in Figures 7 and 9. The receiver decay recording scheme is shown diagrammatically in Figure 8.

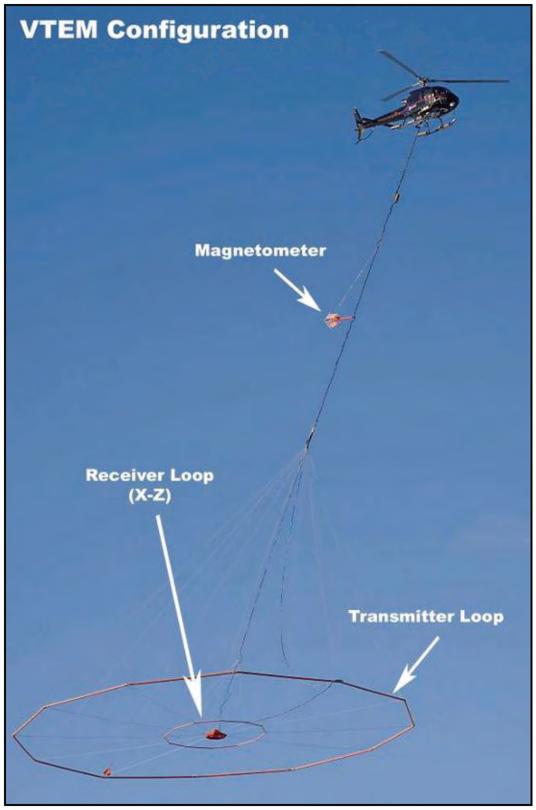


Figure 7 - VTEM Configuration, with magnetometer.

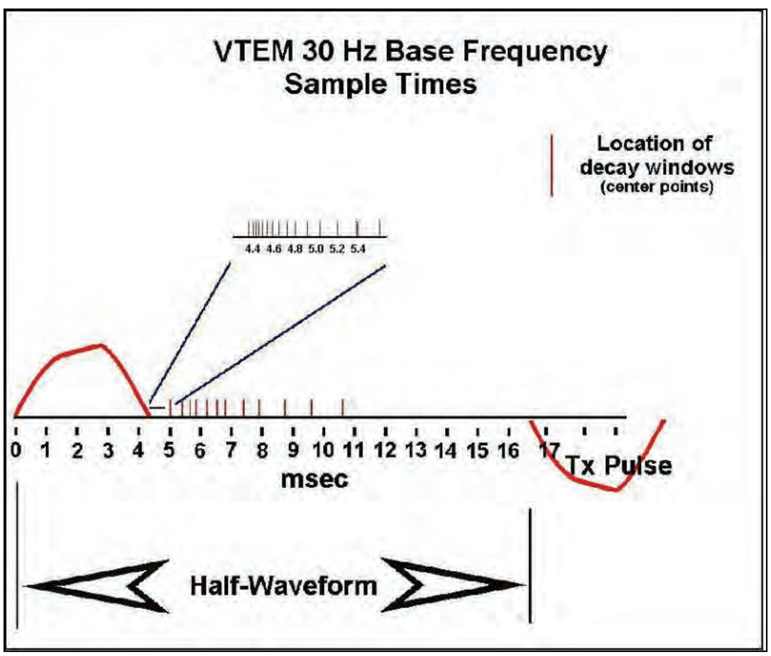


Figure 8 - VTEM Waveform & Sample Times

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 96 to 7036 µ sec, as shown in Table 5.

Table 3 - Decay Sampling Scheme[2]

VTEM Decay Sampling Scheme				
Index	**Middle**	**Start**	**End**	**Window**
	Microseconds			
0	0	-3	3	6
1	5	3	8	5
2	10	8	13	5
3	16	13	18	5
4	21	18	23	5
5	26	23	29	5
6	31	29	34	5
7	36	34	39	5
8	42	39	45	6
9	48	45	51	7
10	55	51	59	8
11	63	59	68	9
12	73	68	78	10
13	83	78	90	12
14	96	90	103	13
15	110	103	118	15
16	126	118	136	18
17	145	136	156	20
18	167	156	179	23
19	192	179	206	27
20	220	206	236	30
21	253	236	271	35
22	290	271	312	40
23	333	312	358	46
24	383	358	411	53
25	440	411	472	61
26	505	472	543	70
27	580	543	623	81
28	667	623	716	93
29	766	716	823	107
30	880	823	945	122
31	1,010	945	1,086	141
32	1,161	1,086	1,247	161
33	1,333	1,247	1,432	185
34	1,531	1,432	1,646	214
35	1,760	1,646	1,891	245
36	2,021	1,891	2,172	281
37	2,323	2,172	2,495	323
38	2,667	2,495	2,865	370
39	3,063	2,865	3,292	427
40	3,521	3,292	3,781	490
41	4,042	3,781	4,341	560
42	4,641	4,341	4,987	646
43	5,333	4,987	5,729	742
44	6,125	5,729	6,581	852
45	7,036	6,581	7,560	979
46	8,083	7,560	8,685	1,125
47	9,286	8,685	9,977	1,292
48	10,667	9,977	11,458	1,482
49	12,250	11,458	13,161	1,703

[2] Note: Measurement times-delays are referenced to time-zero marking the end of the transmitter current turn-off, as illustrated in Figure 5 and Appendix C.

VTEM system parameters:

<u>Transmitter Section</u>

- Transmitter coil diameter: 35 m
- Number of turns: 4
- Transmitter base frequency: 30 Hz
- Peak current: 218 A
- Pulse width: 5.5 ms
- Duty cycle: 33 %
- Wave form shape: trapezoid
- Peak dipole moment: 837,457 nIA
- Nominal terrain clearance:53 metres
- Effective coil area: 508 m^2

<u>Receiver Section</u>

<u>X-Coil</u>

- X Coil diameter: 0.32 m
- Number of turns: 245
- Effective coil area: 19.69 m^2

<u>Z-Coil</u>

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

<u>Magnetometer</u>

- Nominal terrain clearance: 75 metres

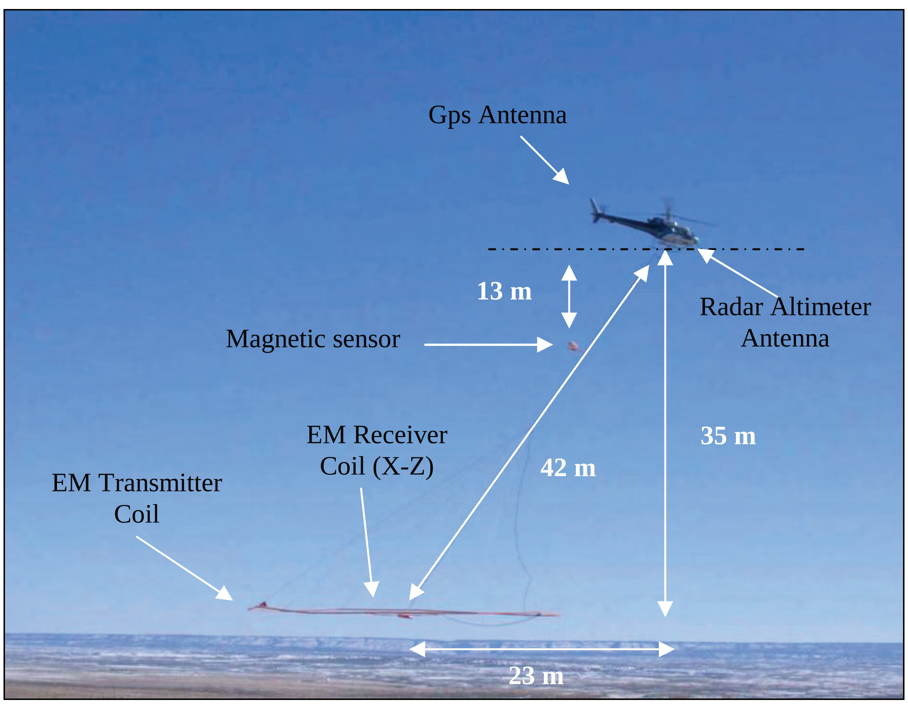


Figure 9 - VTEM System Configuration

2.4.3 Airborne magnetometer

The magnetic sensor utilized for the survey was a Geometrics optically pumped caesium vapour magnetic field sensor, mounted on the EM bird, 13 metres below the helicopter, as shown in Figure 9. The sensitivity of the magnetic sensor is 0.02 nanoTesla (nT) at a sampling interval of 0.1 seconds. The magnetometer sends the measured magnetic field strength as nanoTesla to the data acquisition system via the RS-232 port.

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 9).

2.4.5 GPS Navigation System

The navigation system used was a Geotech PC104 based navigation system utilizing a NovAtel's CDGPS (Canada-Wide Differential Global Positioning System Correction Service) 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 9). As many as 11 GPS and two CDGPS satellites may be monitored at any one time. The positional accuracy or circular error probability (CEP) is 1.8 m, with CDGPS 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 Caesium 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 in the forest behind the camp (50° 51'90.25 N, 84° 24'24.03 W); also was installed at the Hearst Airport (49° 42'44.76 N, 83° 41'68.40 W) at away from electric transmission lines and moving ferrous objects such as motor vehicles (see Figure 2). 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 QA/QC:	Nick Venter (office)
Crew chief:	Les Moschuk
System Operators:	Paul Taylor

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

Pilot:	Blair Elliott
Mechanical Engineer:	Marc Belodeau

Office:

Preliminary Data Processing:	
Final Data Processing:	
Interpretation:	
Final Data QA/QC:	Gord Smith
Reporting/Mapping:	Corrie Laver

Data acquisition phase was carried out under the supervision of Andrei Bagrianski, P. Geo, Surveys Manager. Processing phase was carried out under the supervision of Gord Smith, Manager of Data Processing. . Interpretation phase was 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 NAD83 Datum, UTM Zone 16 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 filter used was a 4 point non-linear filter.

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 and X components. B-field Z component time channel recorded at 0.440 milliseconds after the termination of the impulse is also presented as contour color image.

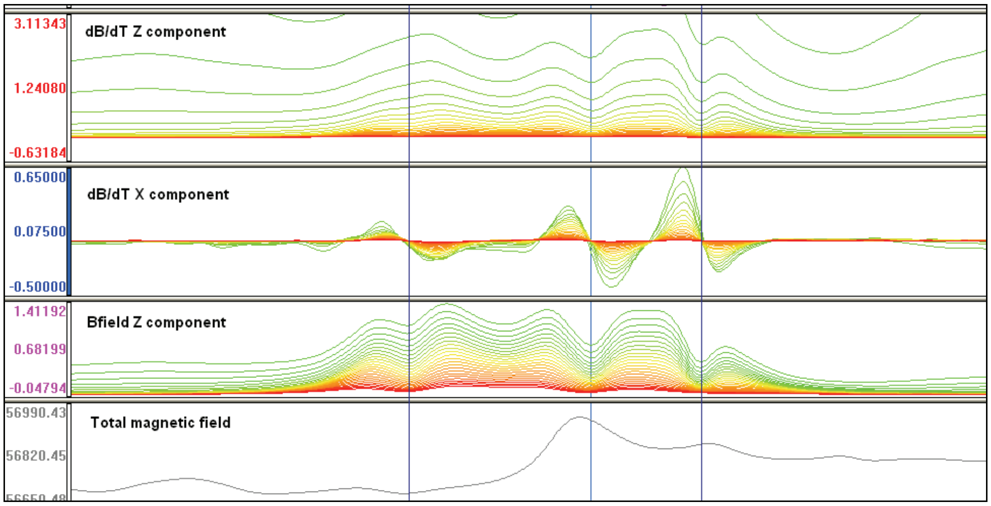


Figure 10 - VTEM Z and X Component data.

Generalized modeling results of VTEM data, are shown in Appendix E.

Graphical representations of the VTEM transmitter input current and the output voltage of the receiver coil are shown in Appendix C.

4.2.1 VTEM X Component Polarity

VTEM X component data do not exhibit maxima or minima above conductors; in fact they produce cross-over type anomalies (Figure 10). The crossover polarity sign convention for VTEM X component polarity is according to the right hand rule for multi-component transient electromagnetic methods.

For the North-South lines of the ZENYATTA Ventures blocks, the sign convention for the X in-line component crossover is positive-negative pointing south to north for vertical conductor's perpendicular to the profile (Figure 11). Similarly, for the West to East tie lines, the X Component polarity is positive to negative pointing West to East. For plan plotting of profiles, the X component data for alternating/opposite flight directions have been reversed (multiplied by negative one) in the final database (SFx_Rev and BFx_Rev channels) to account for this polarity convention.

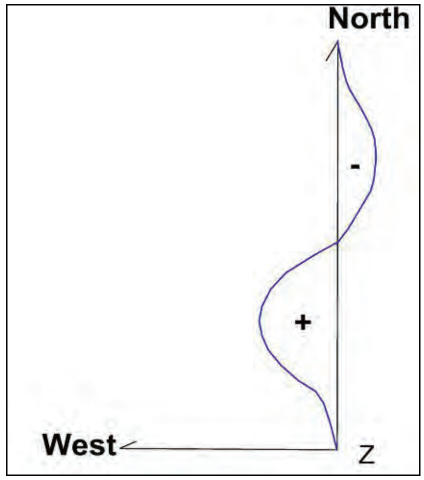


Figure 11 - VTEM X Component Polarity Convention for 9158 – (Blocks 1A - 4F)

Electromagnetic Anomaly selection

The EM data were subjected to an anomaly recognition process using all time domain geophysical channels and using both the B-Field and dB/dt profiles.

Each individual conductor pick is represented by an anomaly symbol classified according to calculated conductance[3]. Identified anomalies were classified into one of six categories (Figure 1). The anomaly symbol is accompanied by postings denoting the calculated dB/dt conductance, calculated dB/dt decay constant (Tau)[4], and the dip direction for all dipping thin-plates[5]. Each symbol is also given an identification letter label, unique to each flight line. The anomaly symbol legends are given below.

---

[3] Note: Conductance values were obtained from the dB/dt EM time constant (Tau) whose relationship was calculated using Maxwell forward modeling algorithm (EMIT Technology Ltd. Pty. Midland, WA, AU). The conductance model utilized was for a vertical tabular plate, with horizontal dimensions of 10 x 100 metres by 1000 metres vertical (N. Bournas, Geotech Ltd., pers. comm.., 09/2008).

[4] Note: An explanation of the EM time constant (Tau) approach to VTEM data is provided in Appendix F.

[5] Note: For vertically dipping thin plates (i.e., producing symmetric double peak anomalies – see Appendix E) and prism-like (single peak anomaly), a dip direction was assigned.

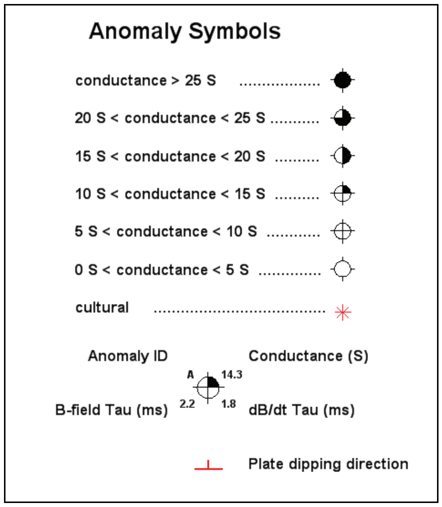


Figure 12 -VTEM anomaly symbols; classification on conductance left) up to 25 Siemens, right) up to 50 Siemens

EM anomaly symbols are presented in all final maps, i.e. VTEM profiles and grids, including total magnetic intensity grid. The anomalous responses have been picked on each line, reviewed and edited by the interpreter on a line by line basis to discriminate between bedrock, overburden and culture response. The VTEM anomalies and calculated parameters have been tabulated in XYZ format as per Table 6. The identified time domain electromagnetic VTEM anomalies are listed in Appendix G.

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 25 metres at the mapping scale. The Minimum Curvature algorithm was used to interpolate values onto a rectangular regular spaced grid.

DELIVERABLES

4.4 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.

4.5 Maps

Most final maps were produced at a scale of 1:10,000; however some larger blocks were produced at a scale of 1:20,000 for best representation of the survey size and line spacing. The coordinate/projection system used was NAD 83 Datum, UTM Zone 16 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 B-field Z Component profiles, Time Gates 0.220 – 7.036 ms in linear - logarithmic scale over Total Magnetic Intensity color grid.
- VTEM dB/dt profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
- VTEM dB/dt profiles X Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
- Calculated Vertical Gradient with EM anomalies. (CVG)
- Second Vertical Gradient with EM anomalies (2VG)
- Total magnetic intensity (TMI) color image and contours.

4.6 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	NAD83 / UTM Zone 16 North
Y:	metres	NAD83 / UTM Zone 16 North
Longitude:	Decimal Degrees	WGS 84 Longitude data
Latitude:	Decimal Degrees	WGS 84 Latitude data
Z:	metres	GPS antenna elevation (Geoid)
Radar:	metres	helicopter terrain clearance from radar altimeter
Radarb:	metres	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
SFx[20]:	$pV/(A*m^4)$	X dB/dt 220 microsecond time channel
SFx[21]:	$pV/(A*m^4)$	X dB/dt 253 microsecond time channel
SFx[22]:	$pV/(A*m^4)$	X dB/dt 290 microsecond time channel
SFx[23]:	$pV/(A*m^4)$	X dB/dt 333 microsecond time channel

Channel name	Units	Description
SFx[24]:	pV/(A*m^4)	X dB/dt 383 microsecond time channel
SFx[25]:	pV/(A*m^4)	X dB/dt 440 microsecond time channel
SFx[26]:	pV/(A*m^4)	X dB/dt 505 microsecond time channel
SFx[27]:	pV/(A*m^4)	X dB/dt 580 microsecond time channel
SFx[28]:	pV/(A*m^4)	X dB/dt 667 microsecond time channel
SFx[29]:	pV/(A*m^4)	X dB/dt 766 microsecond time channel
SFx[30]:	pV/(A*m^4)	X dB/dt 880 microsecond time channel
SFx[31]:	pV/(A*m^4)	X dB/dt 1010 microsecond time channel
SFx[32]:	pV/(A*m^4)	X dB/dt 1161 microsecond time channel
SFx[33]:	pV/(A*m^4)	X dB/dt 1333 microsecond time channel
SFx[34]:	pV/(A*m^4)	X dB/dt 1531 microsecond time channel
SFx[35]:	pV/(A*m^4)	X dB/dt 1760 microsecond time channel
SFx[36]:	pV/(A*m^4)	X dB/dt 2021 microsecond time channel
SFx[37]:	pV/(A*m^4)	X dB/dt 2323 microsecond time channel
SFx[38]:	pV/(A*m^4)	X dB/dt 2667 microsecond time channel
SFx[39]:	pV/(A*m^4)	X dB/dt 3063 microsecond time channel
SFx[40]:	pV/(A*m^4)	X dB/dt 3521 microsecond time channel
SFx[41]:	pV/(A*m^4)	X dB/dt 4042 microsecond time channel
SFx[42]:	pV/(A*m^4)	X dB/dt 4641 microsecond time channel
SFx[43]:	pV/(A*m^4)	X dB/dt 5333 microsecond time channel
SFx[44]:	pV/(A*m^4)	X dB/dt 6125 microsecond time channel
SFx[45]:	pV/(A*m^4)	X dB/dt 7036 microsecond time channel
BFz	(pV*ms)/(A*m^4)	Z B-Field data for time channels 14 to 45
BFx	(pV*ms)/(A*m^4)	X B-Field data for time channels 20 to 45
SFx_Rev	pV/(A*m^4)	X dB/dt reversed data for time channels 20 to 45
BFx_Rev	(pV*ms)/(A*m^4)	X B-Field reversed data for time channels 20 to 45
PLM:		60 Hz power line monitor

Electromagnetic B-field and dB/dt Z Component data is found in array channel format between indexes 14 – 45, and X Component data between indexes 20-45, as described above.

- Databases of selected anomalies in Geosoft GDB format, contains the channels described in Table 6.

Table 6 - Geosoft database for selected EM anomalies

Channel name	Units	Description
Line		Line number
AnomID:		Letter indicating the Anomaly ID
Anom_type:		Anomaly type
X:	metres	NAD83 / UTM zone 16N
Y:	metres	NAD83 / UTM zone 16N
Z:	metres	GPS antenna elevation (ASL)
Radarb:	metres	EM bird terrain clearance from radar altimeter
CondSFz:	Siemens	Estimated conductance calculated from dB/dt data
CondBFz:	Siemens	Estimated conductance calculated from B-Field data
TauSFz:	milliseconds	Time constant, calculated from dB/dt data
TauBFz:	milliseconds	Time constant, calculated from B-Field data
Dipping:		Dip direction
Cultural		Cultural effect

- Database of the VTEM Waveform "9158_waveform_final.gdb" in Geosoft GDB format, containing the following channels:

Time:	Sampling rate interval, 5.2082 microseconds
Rx_Volt:	Output voltage of the receiver coil (Volt)
Tx_Current:	Output current of the transmitter (Amp)

- Grids in Geosoft GRD format, as follows:

Bb_CVG:	Calculated Vertical Gradient (nT/m)
Bb_2VG:	Second Vertical Gradient (2VG)
Bb_TauBF:	B-Field Z Component Calculated Time Constant (ms)
Bb_TauSF:	dB/dt Z Component Calculated Time Constant (ms)
Bb_TMI:	Total magnetic intensity (nT)
Bb_AS:	Analytic Signal
Bb_HGrad:	
Bb_RTE:	
Bb_RTP:	
SFz1010:	Z-component dB/dt Channel 31 (Time Gate 1.010 ms) For 2A, 2D, 2E, 2F, 2G, 2H, 2J, 2K blocks For 4A, 4E, 4F blocks

Where bb represents the block name (ie: 1A_TMI.grd)

A Geosoft .GRD file has a .GI metadata file associated with it, containing grid projection information. A grid cell size of 25 metres was used.

- Maps at 1:10,000 in Geosoft MAP format, as follows:

9158_10K_Bfield_BB:	B-field Z Component profiles, Time Gates 0.220 – 7.036 ms in linear- logarithmic scale over Total Magnetic Intensity color grid.
9158_10K_dBdt_BB:	dB/dt profiles Z Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale.
9158_10K_XCoil_BB:	dB/dt profiles X Component, Time Gates 0.220 – 7.036 ms in linear – logarithmic scale
9158_10K_CVG_BB:	Calculated Vertical Gradient (nT/m) color image
9158_10K_TMI_BB:	Total magnetic intensity (TMI) color image and contours.
9158_10K_2VG_BB:	Second Vertical Gradient (2VG) color image
9158_10k_SFz**tg**+anom_**bb**:	Z-component dB/dt image of specified time gate with VTEM anomaly symbols. Where, **tg**: time gate

Where bb represents the block name (ie: 1A_TMI.map)

Maps are also presented in PDF format.

1:250,000 topographic vectors were taken from the NRCAN Geogratis database at; http://geogratis.gc.ca/geogratis/en/index.html.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

A helicopter-borne versatile time domain electromagnetic (VTEM) geophysical survey has been completed over the ZENYATTA Ventures blocks near Hearst, Ontario.

The total area coverage is 2485.4 km^2. Total survey line coverage is 10006.18 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 1:10,000 & 1:20,000. The survey results are supported by the EM anomaly picking, EM time-constant (Tau) and magnetic derivative analyses that were performed.

5.2 Recommendations

Based on the geophysical results obtained, a number of interesting EM anomalies that were identified across the property. The magnetic results may also contain worthwhile information in support of exploration targets of interest. We therefore recommend a detailed interpretation of the available geophysical data, in conjunction with the geology. It should include 2D - 3D inversion modeling analyses and magnetic derivative analysis prior to ground follow up and drill testing.

Respectfully submitted[6],

Marta Orta
Geotech Ltd.

Jean Legault, P. Geo, P. Eng
Geotech Ltd.

Neil Fiset
Geotech Ltd.

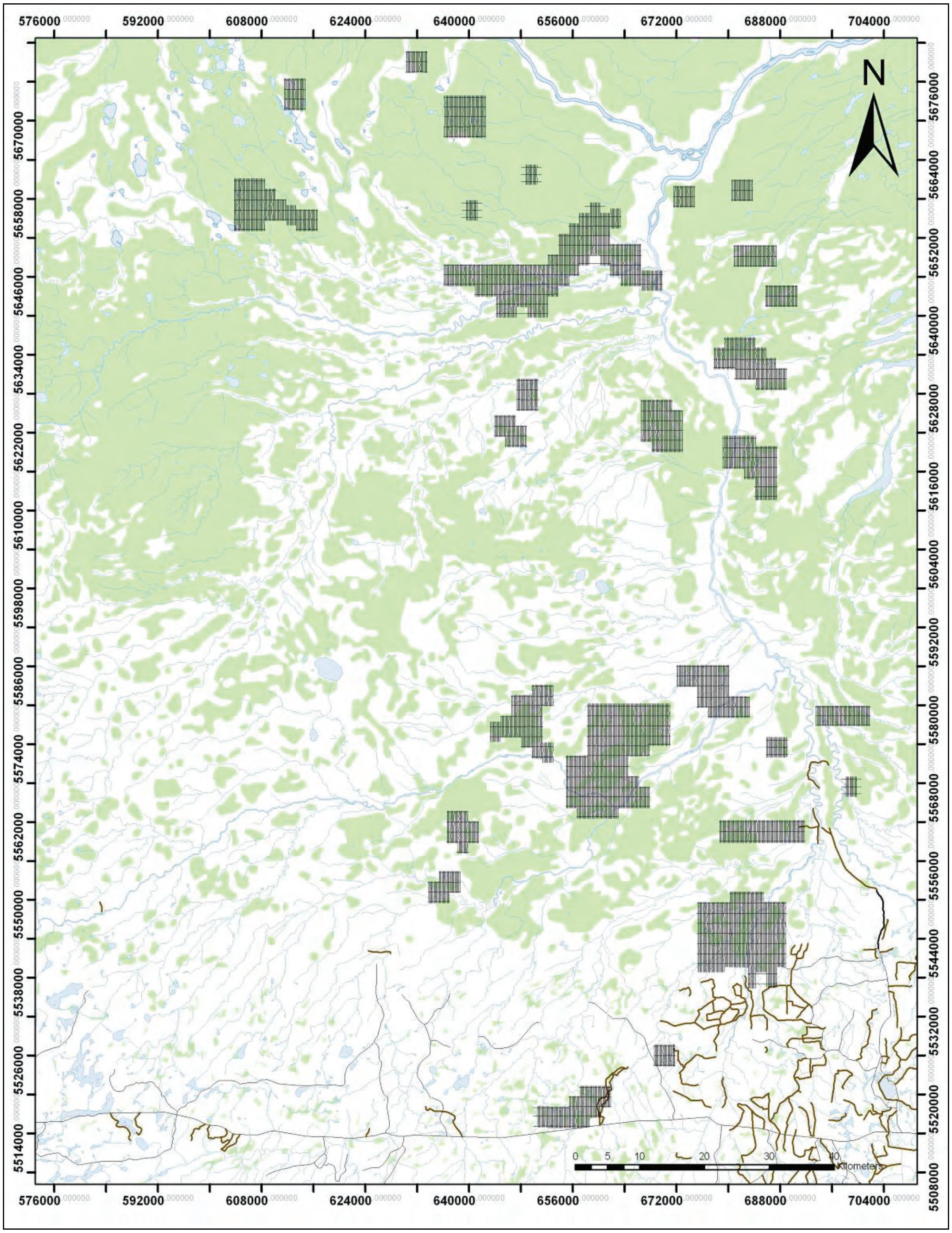
Gord Smith
Geotech Ltd.

July 2010

[6]Final data processing of the EM and magnetic data were carried out by Marta Orta, Interpretation was carried out by Alex Prikhodko, from the office of Geotech Ltd. in Aurora, Ontario, under the supervision of Gord Smith, Manager of Data Processing and Jean Legault, P. Geo, P. Eng, Chief Geophysicist (Interpretation) (OGQ#1147)

APPENDIX A

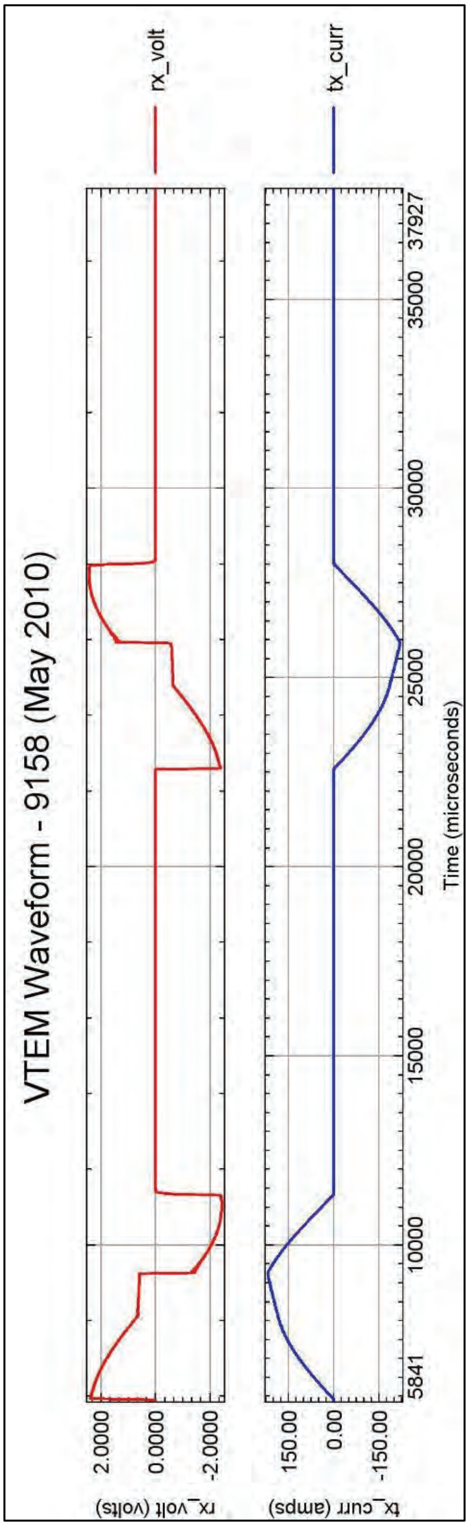
SURVEY BLOCK LOCATION MAP



Survey Overview of the Blocks

APPENDIX C

VTEM WAVEFORM



APPENDIX E

GENERALIZED MODELING RESULTS OF THE VTEM SYSTEM

The VTEM system is based on a concentric or central loop design, whereby, the receiver is positioned at the centre of a 35 metres diameter transmitter loop that produces a dipole moment up to 837,457 nIA at peak current. The wave form is a bi-polar, modified square wave with a turn-on and turn-off at each end. With a base frequency of 30 Hz, the duration of each pulse is approximately 5.5 milliseconds followed by an off time where no primary field is present.

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.

Measurements are made during the off-time, when only the secondary field (representing the conductive targets encountered in the ground) is present.

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 E1 to E15). The Maxwell ^{TM} 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.

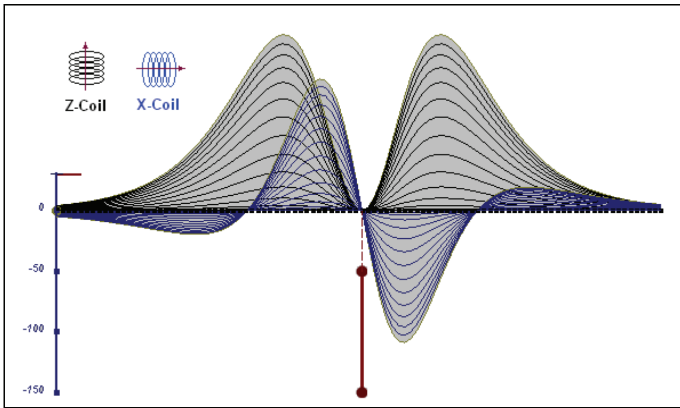


Fig E-1: vertical thin plate

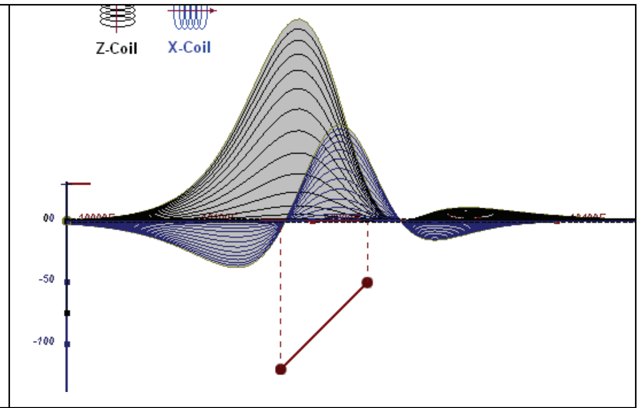


Fig E-2: inclined thin plate

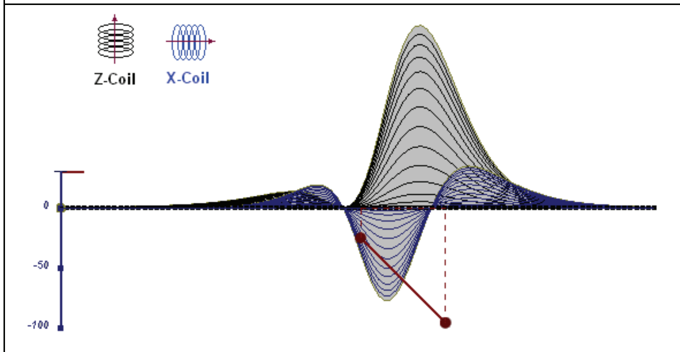


Fig E-3: inclined thin plate

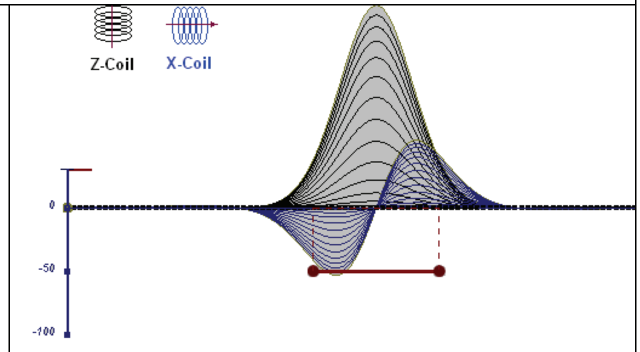


Fig E-4: horizontal thin plate

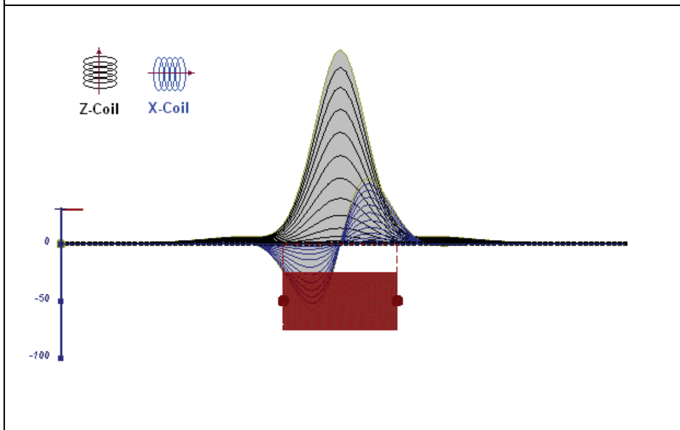


Figure E-5: horizontal thick plate (linear scale of the response)

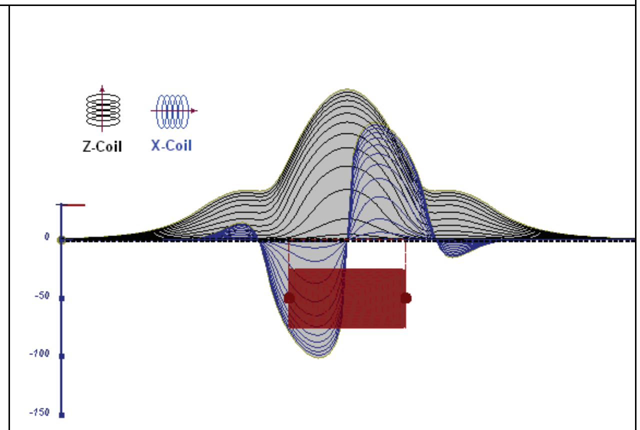


Figure E-6: horizontal thick plate (log scale of the response)

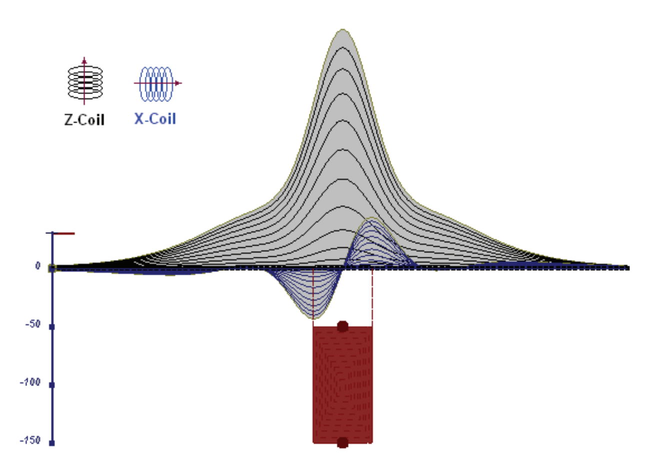


Figure E-7: vertical thick plate (linear scale of the response). 50 m depth

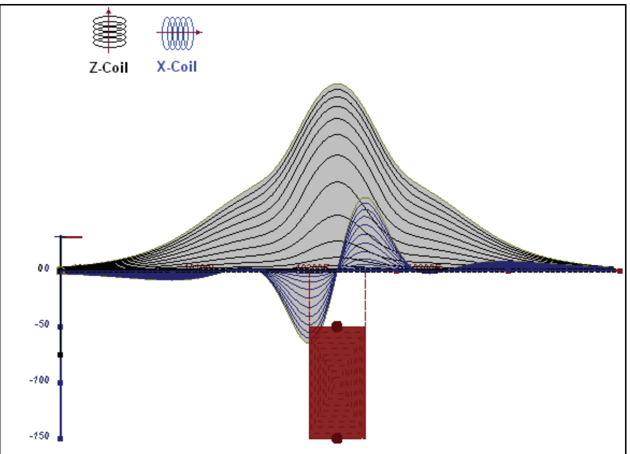


Figure E-8: vertical thick plate (log scale of the response). 50 m depth

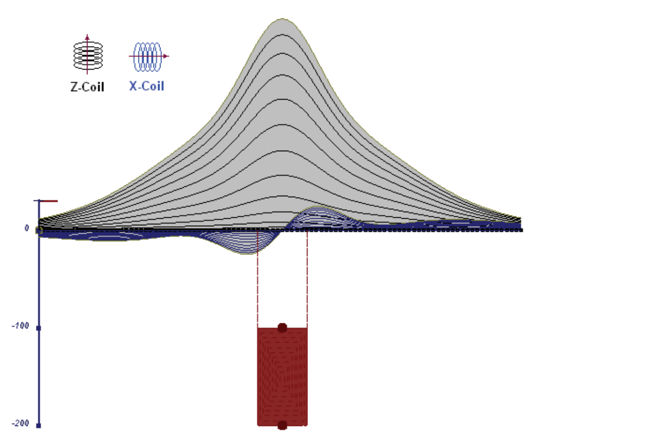


Fig E-9: vertical thick plate (linear scale of the response). 100 m depth

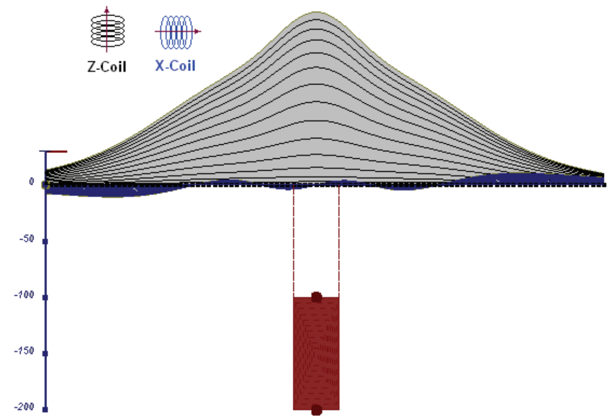


Fig E-10: vertical thick plate (linear scale of the response). Depth/hor.thickness=2.5

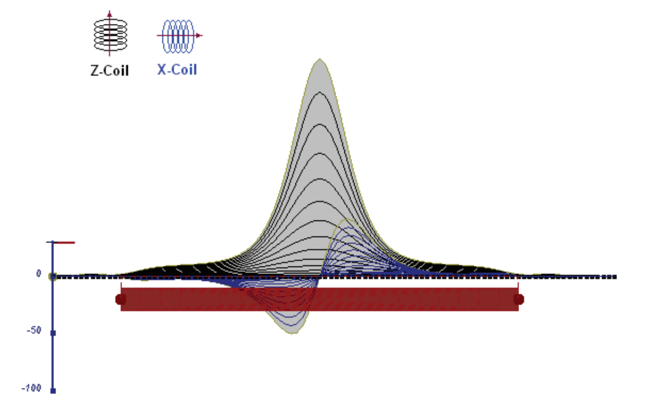


Fig E-10: horizontal thick plate (linear scale of the response)

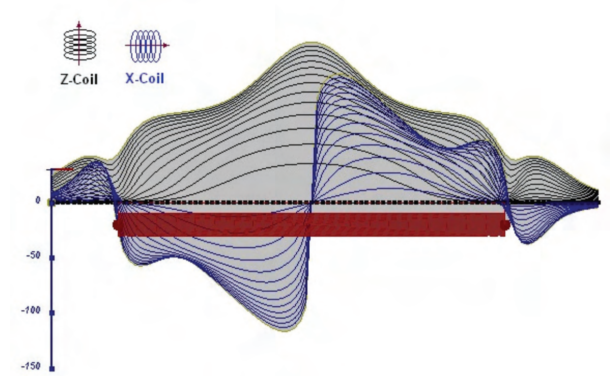
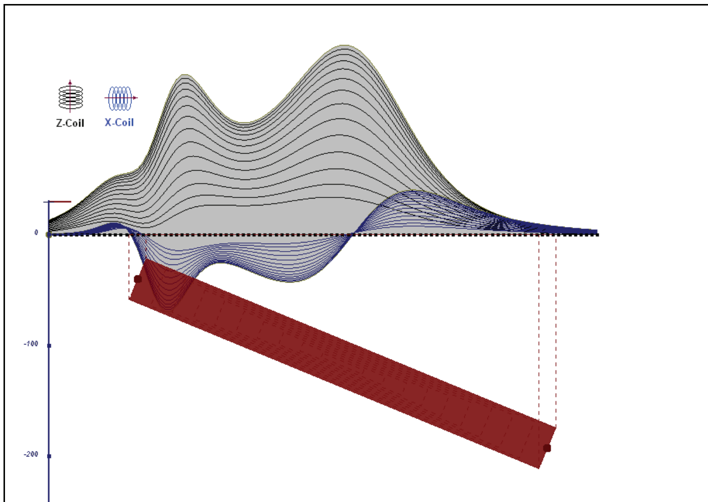


Fig E-11: horizontal thick plate (log scale of the response)



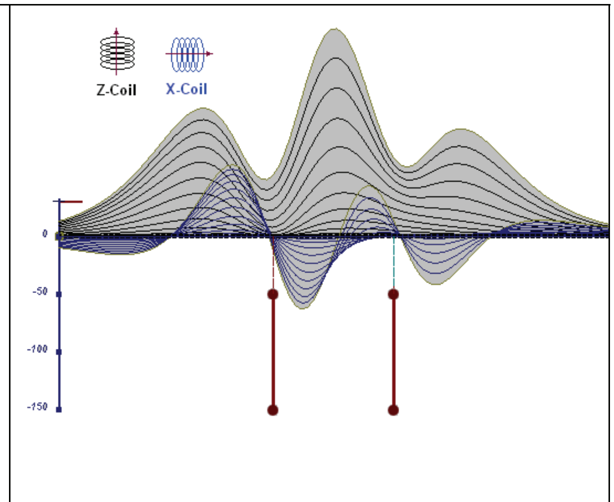
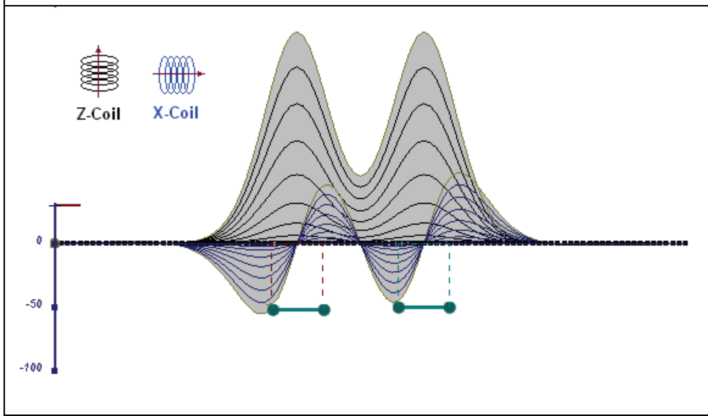


Fig E-12: inclined long thick plate

Fig E-13: two vertical thin plates



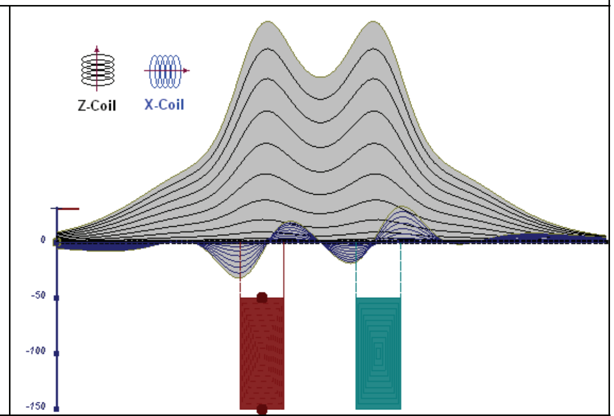


Fig E-14: two horizontal thin plates

Fig E-15: two vertical thick plates

APPENDIX F

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 decay, whose Time Constant (Tau) is a function of the conductivity and geometry of the survey 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 ($\mathbf{e_0}$) is proportional to the time rate of change of the secondary magnetic field and has the form,

$$e_0 \propto (1 / \tau)\, e^{-(t / \tau)}$$

Where,
τ = L/R is the characteristic time constant of the target
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[4].

[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 distributions in an area that is indicative of conductive overburden are shown in Figure F1.

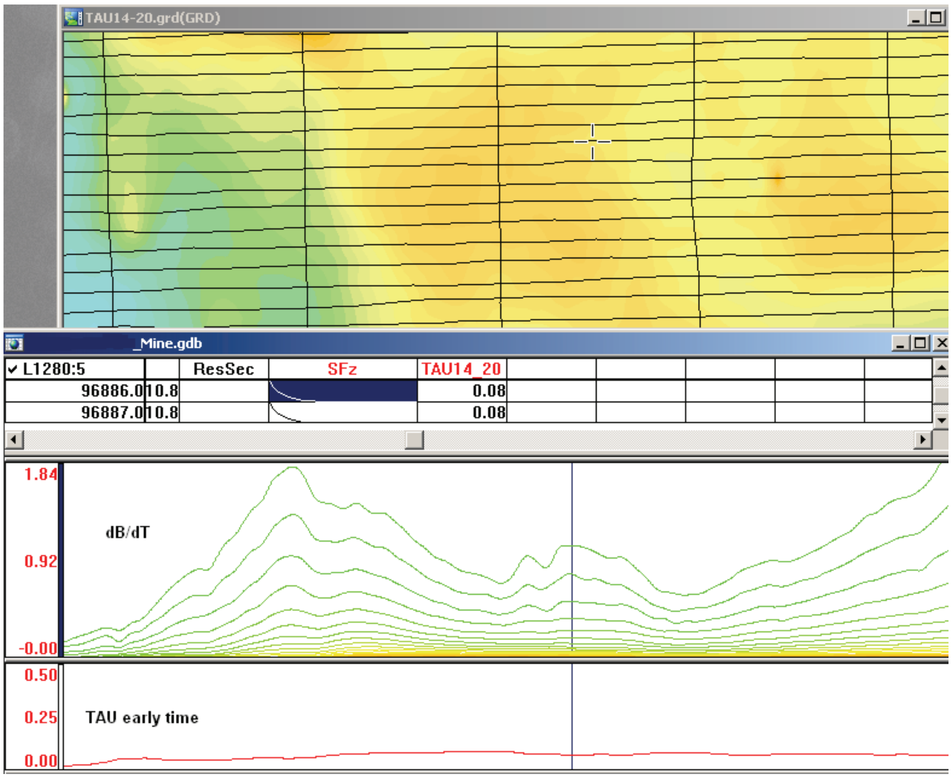


Figure F1 – Map of early times Tau. Area with overburden conductive layer and local sources.

If Tau is calculated across a wide range of time it becomes an integrated parameter and can be used to differentiate conductive sources (Figure F2).

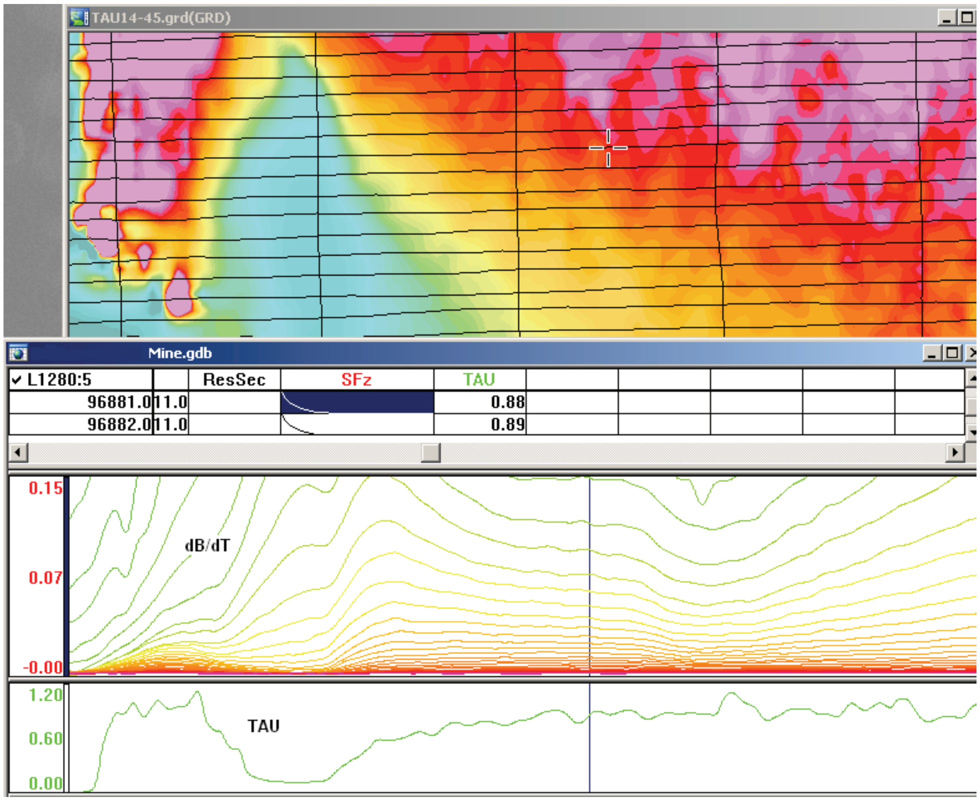


Figure F2 - Map of full time range Tau with EM anomaly picks due to deep conductive targets.

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 3, 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.

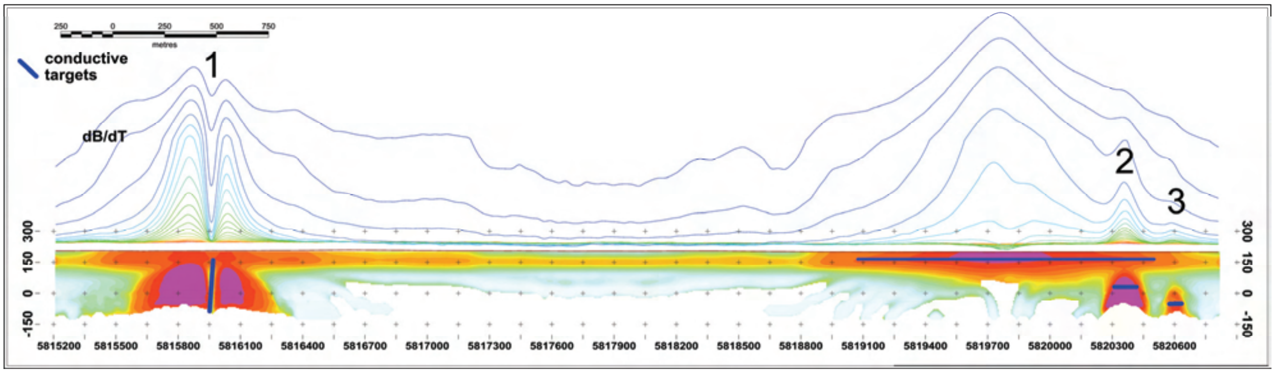


Figure F3 – dB/dt profile and RDI with different depths of targets.

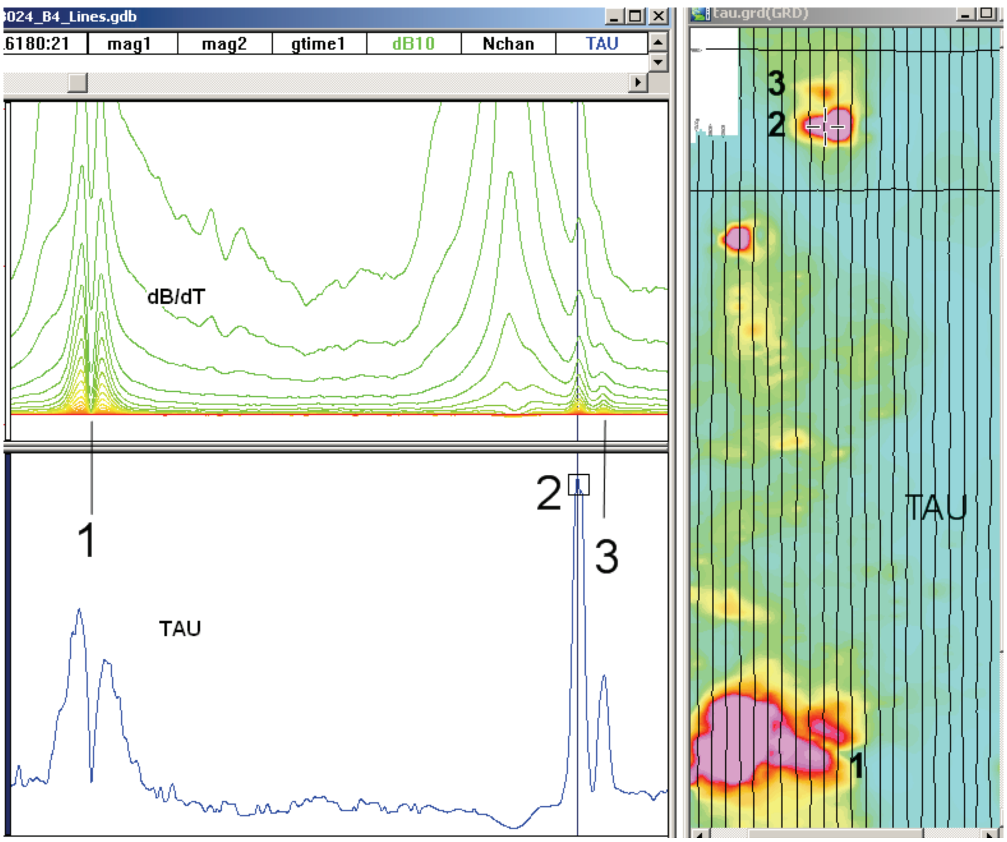


Figure F4 - Map of total TAU and dB/dt profile.

The EM Time Constants for dB/dt and B-field were calculated using the “sliding Tau” in-house program developed at Geotech. 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 30 available decay channels, starting at the latest channel (ch44). 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 F5). Threshold setting for the current project were 0.01 pV/A*m^4 for dB/dt and 0.01 (pV*ms)/(A*m^4) for B-field. 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 0.0ms by default (M. Orta, Geotech, pers. comm., 05/2010).

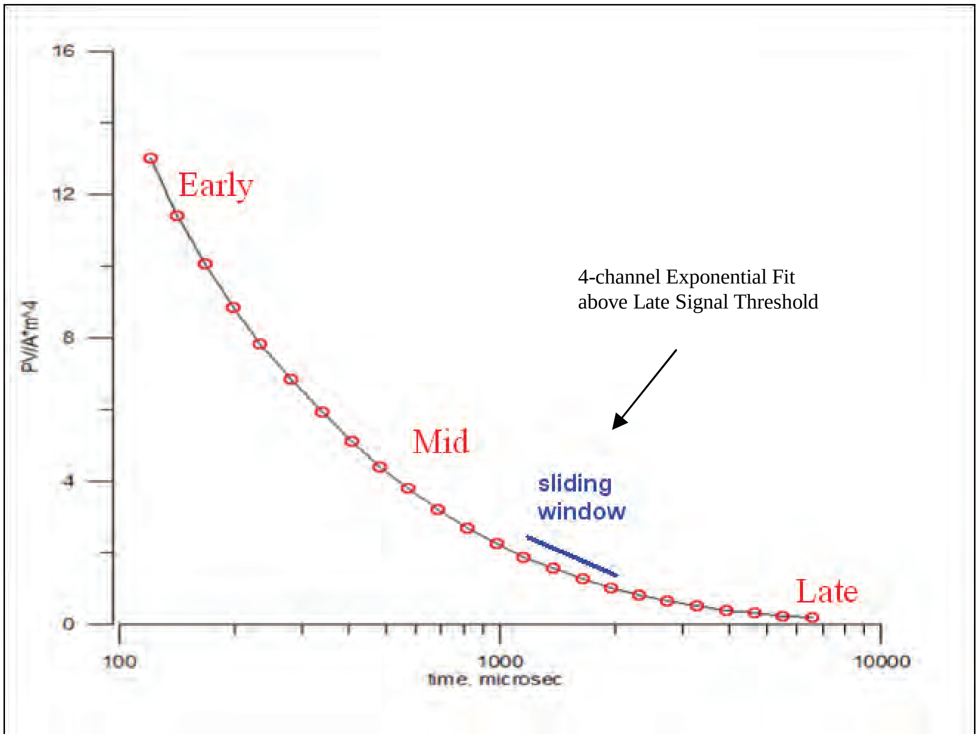


Figure F5 - Typical dB/dt decay and Sliding Tau method for VTEM data

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Geotech Ltd.

APPENDIX G

ELECTROMAGNETIC ANOMALY LISTING

4F Block - East

Line ID	Anom Type	Anom (m)	X (m)	Y (m)	Z (m)	radarb Siemens)	CondSF z (ms)	Tau_dB/dt (Siemens)	CondBFz (ms)	Tau_BF	Dipping effect	Cultural
28640	C		684898	5543529	236.1	58.6	1.94	0.12	1.17	0.08		
28650	C		685053	5543516	226.2	47.8	1.82	0.11	1.15	0.08		
28660	C		685207	5543534	229.1	50.2	1.94	0.12	1.17	0.08		
28670	C		685349	5543524	228.1	48.1	1.86	0.12	1.31	0.09		
28680	C		685507	5543532	225.7	47.8	1.96	0.13	1.33	0.09		
28690	C		685652	5543260	221.6	47.9	2.15	0.14	1.29	0.09		
28700	D		685809	5541179	227.0	43.3						Yes
28710	D		685961	5541191	226.4	44.9						Yes
28710	H		685961	5540046	237.8	50.6	1.50	0.09	0.00	0.00		
28720	H		686100	5540100	236.3	49.0	1.90	0.12	0.00	0.00		
28720	D		686111	5541224	229.7	47.4						Yes

APPENDIX B

2010 MIRA REPORT

ADVANCED GEOPHYSICAL INTERPRETATION CENTRE

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Helicopter-borne VTEM data Modelling Hearst, ON, Canada

Prepared for: Zenyatta Ventures Ltd.

Project Number: 3469

Date: 25 August 2010

Executive Summary

The Advanced Geophysical Inversion Centre (AGIC) at Mira Geoscience has completed EM modelling of helicopter-borne electromagnetic data of Hearst, Ontario for Zenyatta Ventures Ltd. This work has been conducted to aid in directing the geologic understanding of project areas and for prioritization of exploration targets.

The unconstrained inversions used the UBC-GIF EM1DTM suite of algorithms for inverting Helicopter-borne VTEM data. The results are presented as 1D conductivity distribution models and interpolated 3D conductivity models conformable with topography. These are provided for each of the 28 blocks of the survey area.

Twenty-one (21) of the 28 survey blocks provided data that inverted very well. Seven (7) survey blocks were more difficult to invert due to noisier data and result in models that do not fit the data as accurately. This could be related to different geologic background or flight conditions. Conductive overburden is present over the whole area and the modelling has been used to determine the presence of conductors in the basement below this conductive overburden.

Final conductivity models in UBC formats have been imported into a Gocad project ready for integration with geologic and other geophysical information, quantitative 3D-GIS analysis, and interpretation.

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1. Introduction

Geophysical prospecting methods used in mining exploration provide information about the physical properties of the subsurface. These properties can in turn be interpreted in terms of lithology and/or geological processes that include alteration and mineralization. Moreover, the geometric distribution of physical properties can help us delineate geological structures and may be used as an aid to determine mineralization and subsequent drilling targets.

The objective of this modelling work is to provide physical property models that can be directly employed to target prospective ground, based on selected exploration criteria. This is done using physical property-based inversion for 1D electrical conductivity distributions for the survey block located approximately 60 kilometres North West of Hearst, Ontario.

This report describes the data, methodology and results for airborne EM conductivity inversions, and subsequent targeting for the study area. Appendix 1 lists the project deliverables.

2. Scope of Work

This section describes the data used for the modelling as well as the modelling methodology.

A staged approach to modelling and targeting from the AEM data was applied and is summarized in the following workflow:

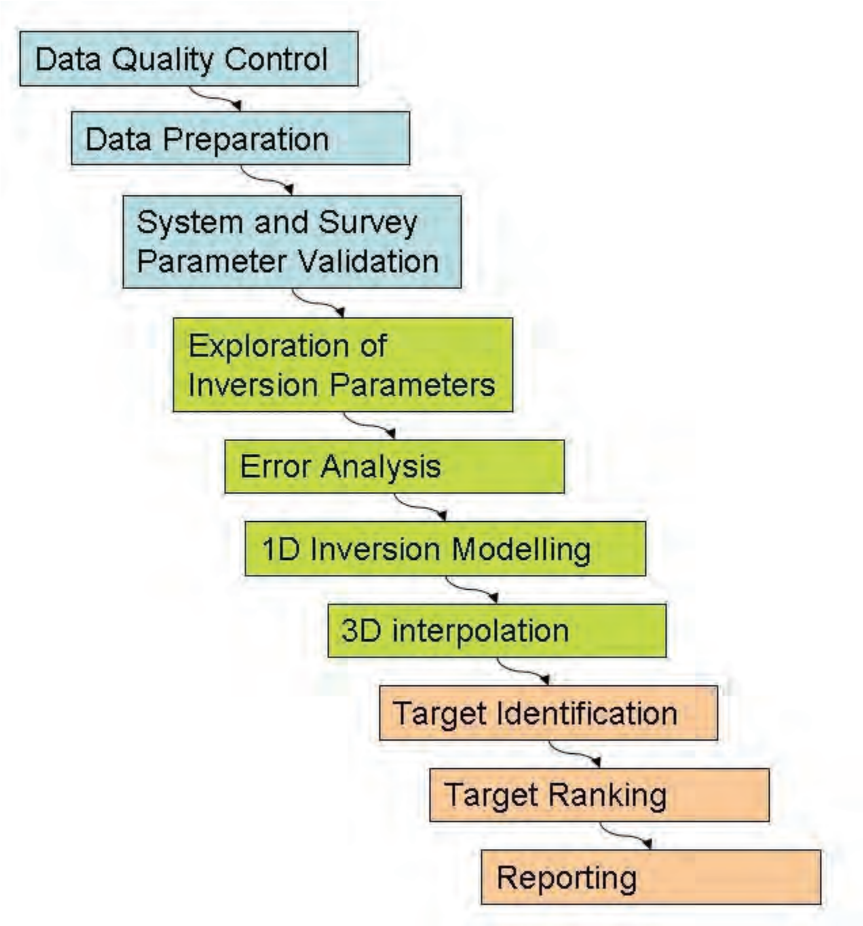


Figure 1: Airborne EM workflow for modelling and targeting of the Hearst VTEM data.

2.1. Data

Helicopter-borne EM data were provided to Mira Geoscience by Zenyatta Ventures Ltd. for the Hearst project area in the form of Geosoft databases. The modelling was carried out in the same coordinate system as that in which the data were provided (NAD 83 Zone 16 N).

Helicopter-borne VTEM data were collected by Geotech Ltd. Line spacing for the survey was flown at 150 m. Lines were flown North-South. Tie lines were flown East-West with line spacing at 1500 m.

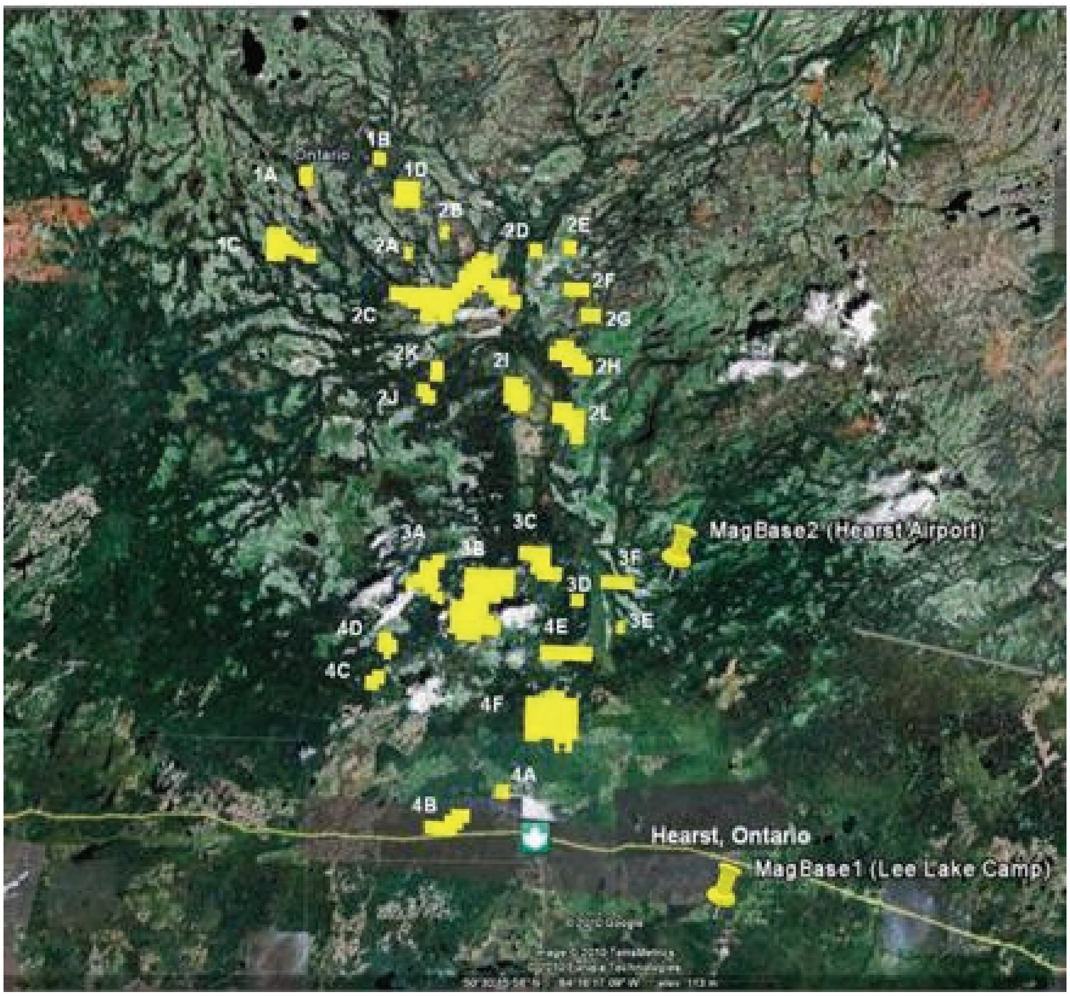


Figure 2: Zenyatta Ventures VTEM survey blocks on Google Earth

Table 1: List of 28 VTEM survey blocks

Group	**Survey Blocks**
Group 1	1A, 1B, 1C, 1D
Group 2	2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 2I, 2J, 2K, 2L
Group 3	3A, 3B, 3C, 3D, 3E, 3F
Group 4	4A, 4B, 4C, 4D, 4E, 4F

The dataset consists of Airborne Electromagnetic data, which includes EM B-field and dB/dt in z and x directions collected over the Hearst survey area from March 17th 2010 to May 19th 2010.

Table 2: Helicopter-borne VTEM data specifications

EM sensor Terrain clearance	Nominal 53 meters
Coordinates	GPS Easting and Northing, NAD 83 UTM Zone 16 North
Flight line spacing	150 meters (Nominal line direction N0 E)
Data spacing	Every 2.0 – 3.0 meters along flight lines
Number of EM channels	50

The entire dataset was imported into Gocad for quality control and modelling preparation.

2.2. Inversion Methodology

The AEM inversions were performed using the 1D electromagnetic inversion program EM1DTM, developed at the University of British Columbia – Geophysical Inversion facility (UBC-GIF). The algorithm is designed to invert for a model with many more layers than input data so that the character of the recovered model is determined by a model objective function and not solely by the goal of fitting the data.

As with any inversion method, non-uniqueness in the solution is a factor, and it should be noted that the resulting model is a selected model of an infinite number that generates a reasonable model of the earth while fitting the data to an appropriate degree. Other model solutions are possible and the range of solutions can be limited through the introduction of a priori information.

The input to the algorithm is the time-domain EM data for each channel, assigned data uncertainties, transmitter and receiver positions and altitude, transmitter waveform, system information, and model and inversion parameters (e.g. layer thicknesses, background conductivity, model structure, and level of desired data misfit). The outputs are: a finely discretized 1D conductivity model for each sounding, the predicted data, and a number of measures which can be used to evaluate the quality of the inversion results. The recovered conductivity is smoothly varying in depth while at the same time it is minimally different from the prescribed reference conductivity. It predicts the observed data to an appropriate degree that is justified by the assigned errors in the data. The algorithm is capable of producing L2 (smooth) and L1 (blocky) model results but the L2 option is most commonly used. This means that sharp boundaries will appear somewhat smoothed in the final model although increased structure can be infused by use of a layered reference model. Appendix 2 provides more detailed information on the EM inversion software.

Each sounding is inverted individually. The 1D conductivity models are presented side-by-side along line and also interpolated between lines to create approximate 3D conductivity models of the earth. The resulting 3D conductivity features should be analyzed carefully and within the context that there were generated from an under-determined inversion routine that is subject to non-uniqueness, and the inversions assumed a 1D, or layered earth. As such the true geometry of features could differ from those represented in the models.

3. Data Processing

All supplied data were imported into Gocad. They were checked for quality and consistency, processed and edited if necessary, re-sampled, and converted to a format suitable for 1D EM inversions.

Prior to inversion, we undertook quality control during which data, survey and instrument parameters are carefully checked for consistency and suspect data are removed. This includes inspection and analysis of data (e.g. analysis of positional and radar altimeter information, removal of negative EM decays, and regions of high power-line effects).

Although all EM data of the dataset from Geotech are normalized by transmitter current and effective area (NIA) and by the receiver coil area, a de-normalized process was applied on the EM data used for inversion.

Initial inversions on a test line determined that early time-channels are problematic (increase of signal by the decay time) and late-time channel data contains negative decays and significant noise and were difficult to fit with 1D model (Figure 3).

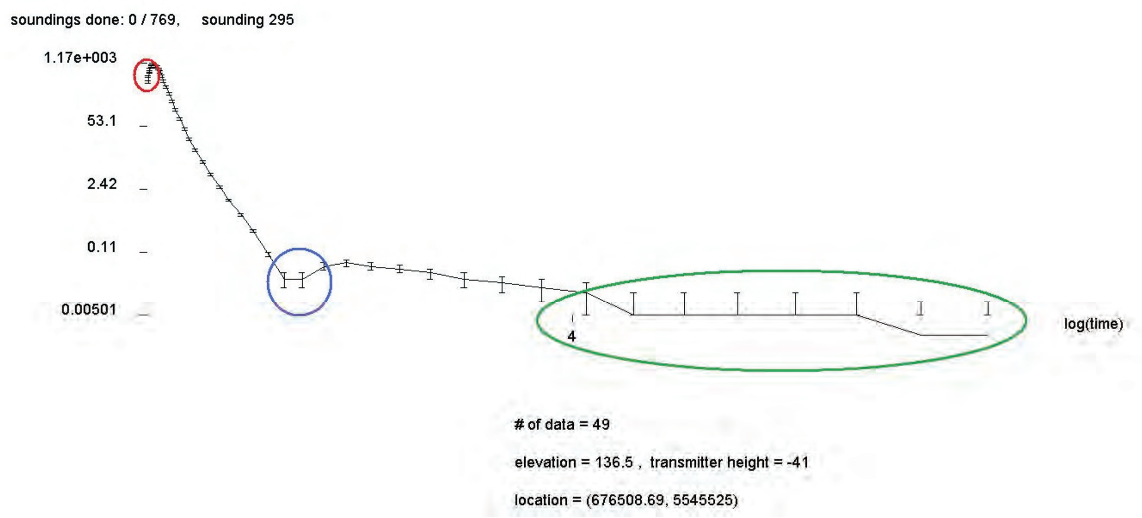


Figure 3: Raw data from one sounding shows problems of early-time channels circled in red, negative EM decays circled in blue and noisy late-time channels circled in green.

Depending on the quality of the data, after the data processing the number of channels remained for inversion ranges from 30 channels to 17 channels for first 21 blocks situated in the North of the survey area (1A through 3F) and from 20 channels to 8 channels for last 7 blocks situated in the South of the survey area (4A though 4F).

Only the z-component was used as inversion of the x-component data produced unstable results due to high noise.

Due to the high rate of spatial sampling with Helicopter-borne EM systems, the VTEM data were resampled before inversion to reduce the data spacing and achieve a suitable along-line sampling rate. In this case, the data were averaged using 5 soundings on each side of the central sounding. This leads to a variable station spacing roughly of 20 m. This achieves a spatial resolution at least half the nominal flight height (~53m) and is a value smaller than the expected size of the EM system footprint for the VTEM system. This sampling conserves all information in the data that relates to geologic structure.

Noise and errors in the data can be caused by a number of issues. The most common are equipment and system errors, operator errors, GPS location errors, and modelling errors. It is important to assign uncertainties to the data when modelling the data to account for noise and errors present in the data. We assume that the data errors are Gaussian in nature and independent and have a standard deviation equal to a percentage of the magnitude of the datum plus a floor. The percentage value is needed to account for errors on data with a large dynamic range. The floor value is needed when data are small compared to the noise. The uncertainties are assigned as standard deviations (Table).

Table 3: Data standard deviations for each channel.

Inversion channels	Assigned STD DEV (%)	Minimum Absolute Uncertainty
15-25	10	0.01
26-35	15	0.01
37-50	20	0.01

4. EM Modelling

VTEM dBz/dt data were inverted for a 1D (layered Earth) conductivity model using the UBC-GIF EM1DTM code. A 1D discretization mesh was designed using 25 layers with slowly increasing thickness from 2.7m to 50m with a total depth of 450 m. The maximum depth exceeds the depth of penetration of the survey equipment. The inversion parameters for each sounding are tabulated in Table 8 in Appendix 3.

Examples of the observed data, predicted data and the conductivity model are shown in Figure 4. The recovered conductivity model shows a high-conductivity (~0.1 S·m-1) layer near the surface.

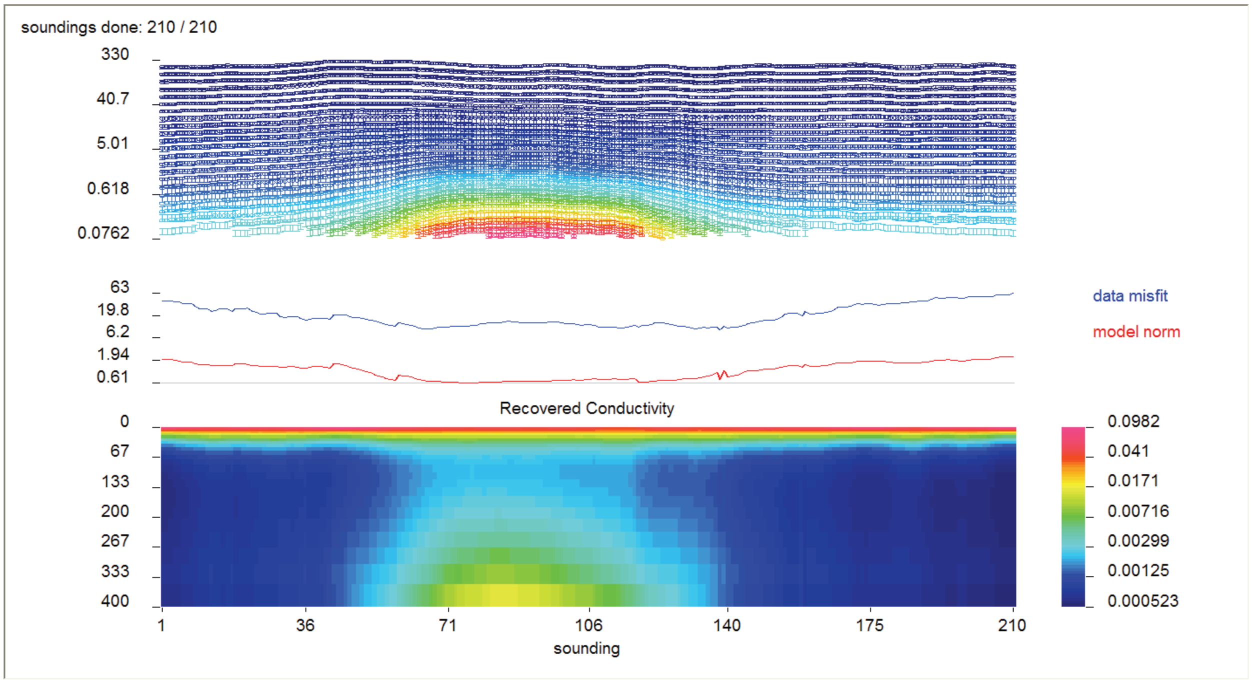


Figure 4: VTEM predicted and observed data (top) and recovered conductivity (values on Ohm-m).

The inversion revealed a high-conductivity feature with values ranging from 0.01 $S.m^{-1}$ to 0.14 $S.m^{-1}$ below a depth of 300 m.

5. EM Modelling Results

VTEM dBz/dt data were inverted for a 1D (layered earth) conductivity model. Data of each block was inverted separately for a 1D earth distribution of conductivity model. The 1D inversion model has been interpolated in 3D as a simple lateral interpolation between cells at the same depth. This produces a 3D model where the vertical axis represents depth.

All 3D models were imported into GOGAD where they are draped conformably to topography.

The data misfit (a measure of how will the data are predicted with the resulting model), is presented for each survey block in Table . It can be seen that in general data from survey blocks 4 are the hardest to fit. This reflects the increased noise in the data for these survey blocks. It should be noted that the modelling of pre-existing VTEM data of an older vintage produced lower data misfits, suggesting the newer data could be more noisy.

Table 4: Datamisfit statistics for each survey block. These values can be used to identify dat that cannot be fit well due to noise or incompatibility with a 1D earth assumpion.

Block	N. Station	Minimum:	Maximum:	25th %	75th %	Median	Std. deviation
4F	60819	12	3052	638	1171	912	403

5.1. Target Picking

Specific target locations have been selected these represent the likely core or center of anomalies that should be targeted with the most chance of intersecting the conductive feature. The targets are labelled with the first two figures corresponding to the survey block and the last two figures corresponding to the target number within that block. Several conductivity isosurfaces were generated as a way to examine the conductivity volume.

The targets have been attributed with depth, approximate lateral extent, and conductivity, for a representative iso-surface and at the picked location. Prioritization of the targets is done through a combined ranking system that incorporated conductivity, lateral extent and depth.

6. Conclusions and Recommendations

Mira Geoscience AGIC has produced 1D conductivity models for VTEM survey blocks at Hearst, ON, Canada. These models have been interpolated in 3D to provide conductivity information for interpretation and targeting.

These results should be reviewed in the context of the project geology (if available) to summarize the effectiveness of the conductivity models as an aid in exploration for the targets of interest. The inversion models should be validated through correlation with known targets and existing results from past exploration activities such as prospecting, geologic mapping, ground geophysical surveys, and drilling.

More robust targets can be produced when the results are quantitatively combined in a 3D GIS study where all information (geology, magnetic, conductivity, alteration, geochemistry, etc.) relating to defined exploration criteria can be integrated and quantified, resulting in optimal target selection.

Magnetic inversion is recommended for survey blocks where targets have been identified in order to further define the target and include susceptibility in the targeting process. In addition, any available geologic information can be included at this stage such as mapping and drilling results in order to perform constrained inversions.

Submittal:

The work in this report has been performed by Thi Ngoc Hai Nguyen of the Mira Geoscience Advanced Geophysical Interpretation Centre.

This report has been reviewed and approved by Nigel Phillips.

____

25 August 2010

References and Related Reading Material

EM1DTM Manual 2005, UBC-GIF, Earth and Ocean Sciences, UBC, Canada

Farquharson, C.G., and D.W. Oldenburg, 1993, Inversion of time-domain electromagnetic data for a horizontally layered Earth, Geophysical Journal International, **114**, 433–442.

Farquharson, C.G., D.W. Oldenburg and P.S. Routh, 2003, Simultaneous one-dimensional inversion of loop-loop electromagnetic data for magnetic susceptibility and electrical conductivity, Geophysics, **68**, 1857–1869.

Geotech Report: helicopter-borne versatile time domain electromagnetic (VTEM) and magnetic geophysical survey for Zenyatta Ventures Ltd.

Zhang Z., and Oldenburg D.W., 1999, Simultaneous reconstruction of 1D susceptibility and conductivity from EM data, Geophysics, **64**, No.1, 33-47.

Oldenburg D.W., Li Y., Farquharson C.G., Kowalczyk P., Aravanis T., King A., Zhang P., and Watts A, 1998, Applications of Geophysical Inversions in Mineral Exploration Problems, The Leading Edge, 17, 461 - 465.

Appendix 1 Project Deliverables

Table 7: Digital Deliverables

Type	File Name	Description
Report	Mira_AGIC_Report_Hearst_EM_Inversion_3469.pdf	Logistics report detailing the unconstrained AEM inversion. This report.
Gocad Project	*.gprj and *.prf folders	Gocad Projects for the survey areas
Gocad Objects	*.sg, *.ts, *.vs	3D conductivity models, 3D conductivity iso-surfaces, conductivity targets.
3DPDF	*.pdf	3D pdf views for each survey block and targets
2D Binary Grids	*.grd	2D binary conductivity grids for each survey area at different elevation.
3D DXF	*.dxf	3D conductivity iso-surfaces
Spreadsheet	Hearst AEM_targeting.xls	Targeting scores and final ranking for each target
UBC ASCII files	*.mod	UBC ASCII format

Appendix 2 EM1DTM Modelling Software

Program EM1DTM inverts time-domain electromagnetic data for one-dimensional earth models.

The observations: Off-time measurements (in the current version 1.0) are either voltage or B-field with an arbitrary current waveform flowing through a horizontal transmitter loop. Receivers can be oriented in the x-, y- or z-directions, and they can be at any position relative to the center of the transmitter loop. Transmitters are can be any height relative to the ground surface. A "sounding" refers to all the time-decay data that correspond to what is going to be the same stack of layers at a particular horizontal location in the model. Measurement uncertainties can be provided in the same units as the observations or as relative uncertainty in percent. Multiple soundings can be handled in a single run of the program.

Four possible inversion algorithms: 1) constant (user-supplied) trade-off parameter in the objective function being minimized; 2) the trade-off parameter chosen to achieve a user-supplied target misfit; 3) the trade-off parameter chosen using the GCV criterion; and 4) the trade-off parameter chosen using the L-curve criterion. Full flexibility of the L1 and the L2 measures of the model structure and data misfit is provided, adjustable balance between "flattest" and "smallest" components of conductivity model measure; inclusion of reference models; and inclusion of specialized weighting of the layers in the model.

The product: electrical conductivity models. The models are composed of (many) layers of uniform conductivity with fixed interfaces, and the value of the conductivity in each layer is sought in the inversion. For multiple soundings, a one-dimensional model will be produced for each sounding, and a composite two-dimensional model produced at the end of one run of the program.

Appendix 3 Modelling Parameters

Table 8: EM1DTM inversion input file parameters for each sounding

Root name	Block_name
Observation file	Block_name.obs
Starting conductivity model	layer.dat
Reference conductivity model	DEFAULT
Reference conductivity model (flat)	DEFAULT
Weights	None
Objective Function Parameters (hc, eps, ees, epz, eez, acs, acz)	1000 1.2 0.0001 1.2 0.0001 0.001 1
Inversion Type	Fixed beta
Trade-off parameter	50
Maximum number of iterations	20
Convergence Test	0.0001
Hankel kernel evaluations	100
Fourier kernel evaluations	100
Level of output written to file	2

Appendix 4 Modelling results for each survey block.

Block 4F

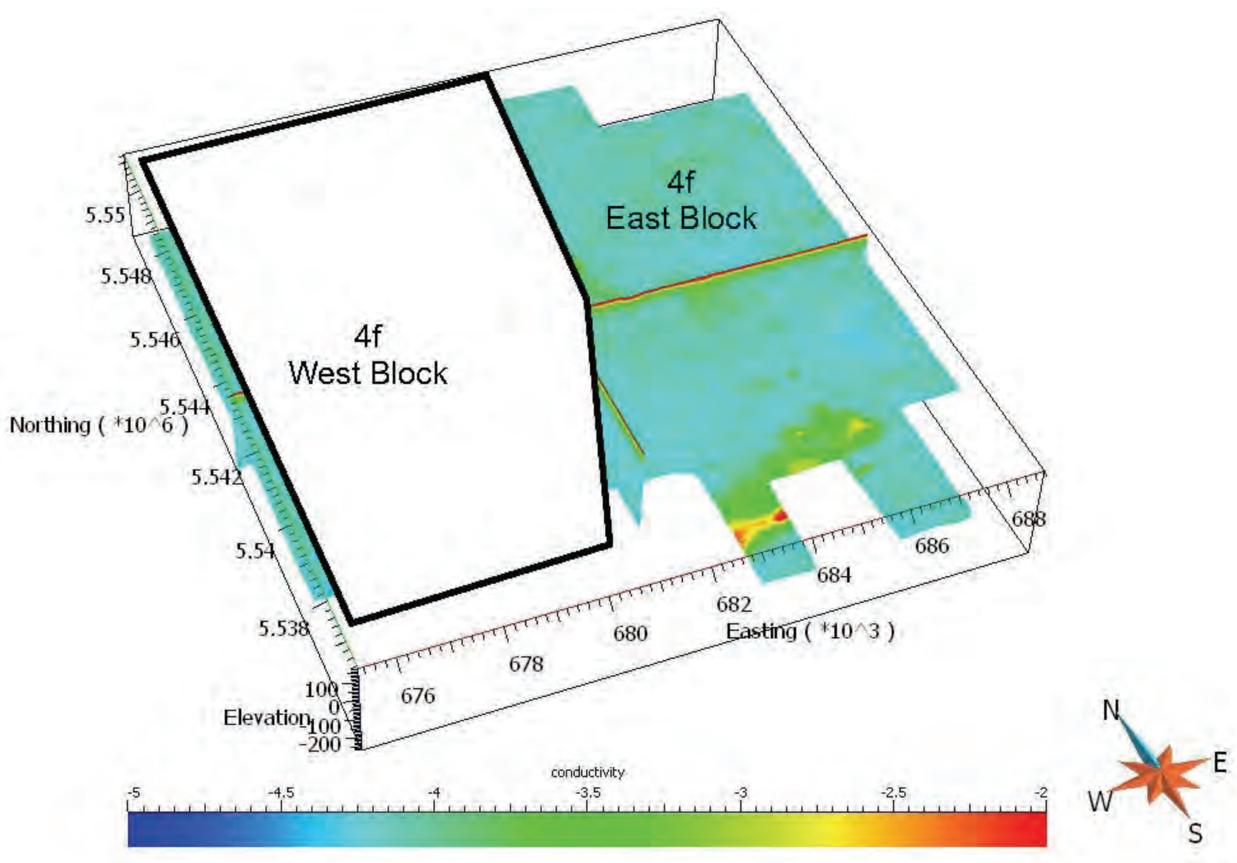


Figure 47: view from North-East of the conductivity model of the block 4F. (Vertical exaggeration; 5)

Average conductivity within the model is 0.0038 $S \cdot m^{-1}$

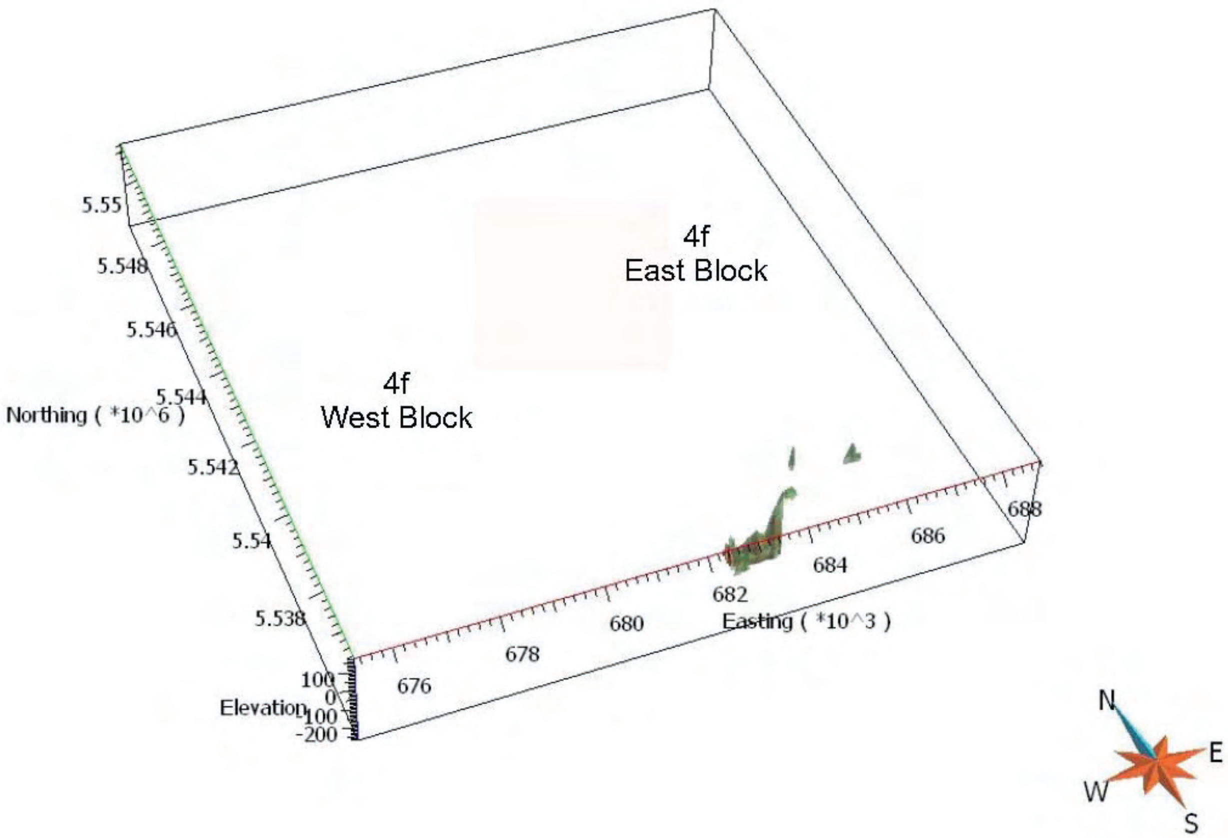
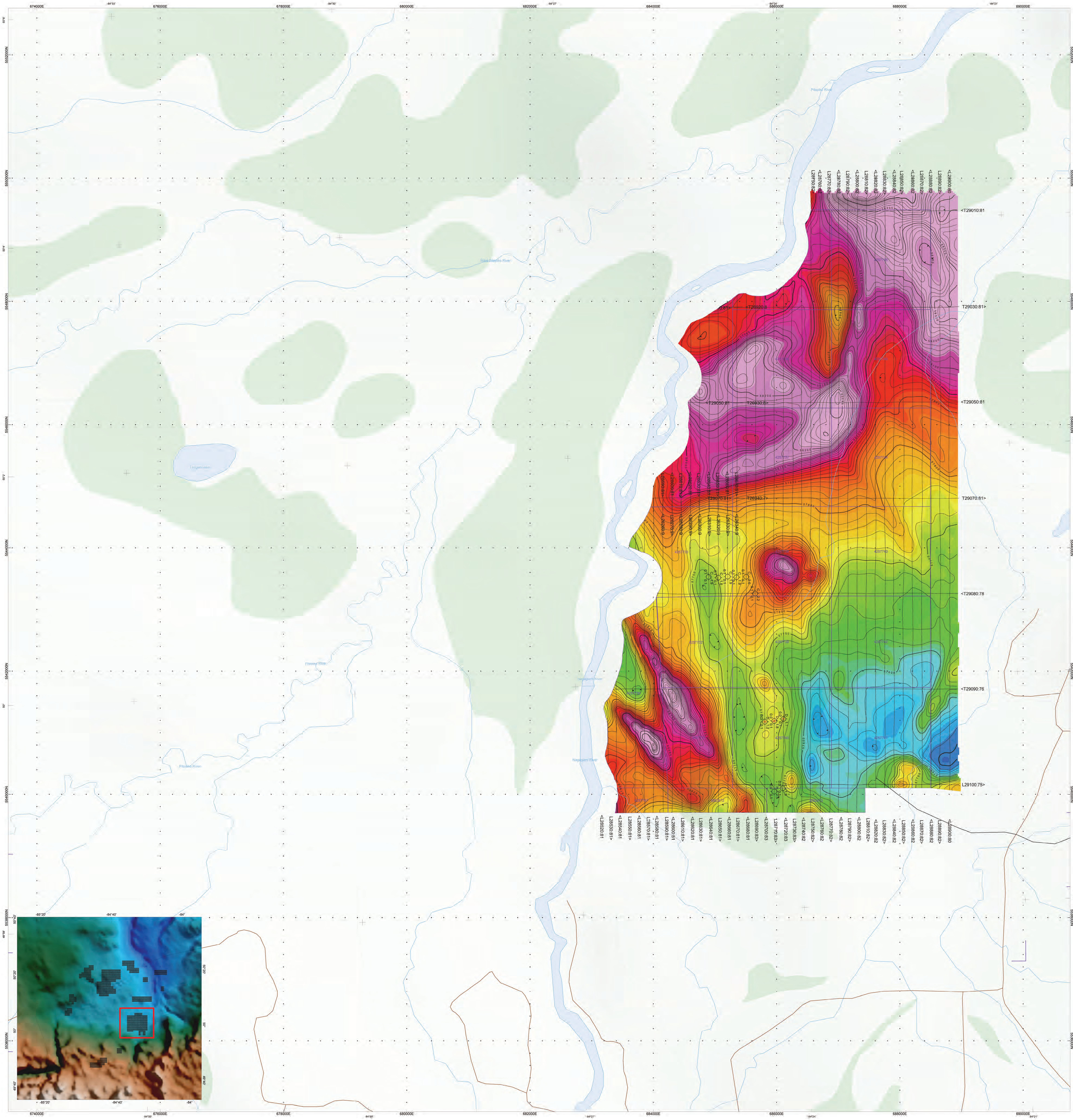
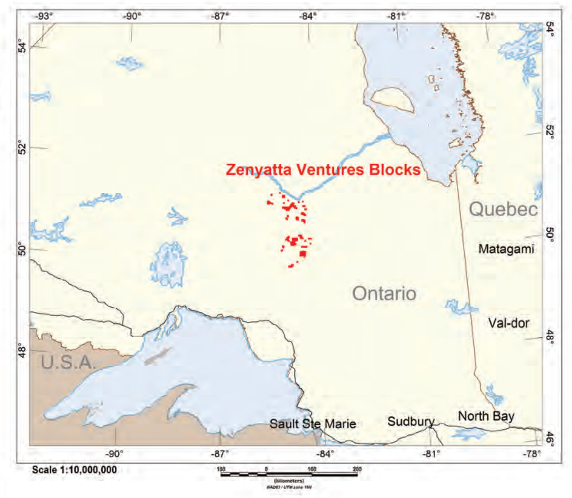


Figure 48: Iso-surfaces from 0.01 $S \cdot m^{-1}$ (green) through 0.05 $S \cdot m^{-1}$ (red) of the block 4F, (Vertical exaggeration 5)



GEOTECH LTD.

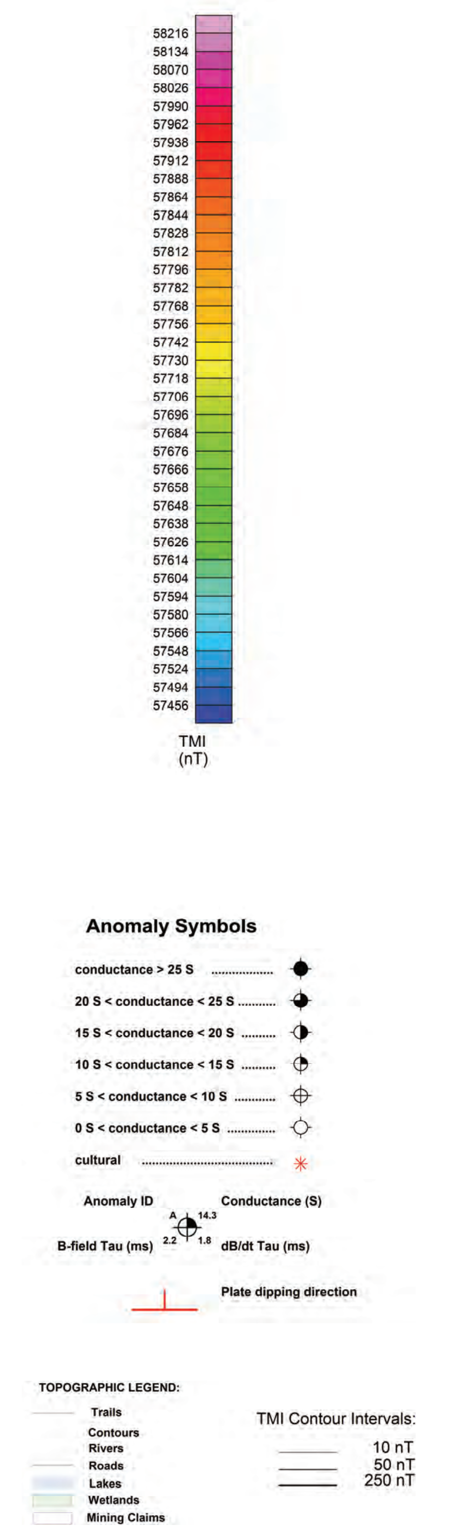


SURVEY SPECIFICATIONS:
- Survey Date: March 17th to May 19th, 2010
- Survey Base: Hearst, Ontario
- Aircraft: Aerospatiale A-Star 350 B3 C-GEOY
- Nominal Survey Line Spacing: 150 Meters
- Nominal Survey Line Direction: N 0° E / N 180° E
- Nominal Tie Line Spacing: 1500 Meters
- Nominal Tie Line Direction: N 90° E / N 270° E
- Nominal Terrain Clearance: 88 Meters
- EM Loop: Towed at a mean distance of 35 meters below the Helicopter
- Magnetic Sensor: Towed at a mean distance of 13 meters below the Helicopter

INSTRUMENTS
- Geotech Time Domain Electromagnetic System (VTEM)
- Concentric Rx/Tx Geometry
- Transmitter Loop: Diameter 25.5 Meters,Base Frequency 30 Hz
- Dipole Moment: 446,570 nIA
- Transmitter Wave Form: Trapezoid, Pulse Width 5.5 ms.
- Geometrics High Sensitivity Cesium Magnetometer
- Mag Resolution: 0.02 nT at 10 samples/sec

MAP PROJECTION
- Datum: NAD 83
- Projection: Universal Transverse Mercator
- Central Meridian: 87°W (Zone 16)
- Central Scale Factor: 0.9996
- False Easting/Northing: 500,000m/0m
- Major Axis: 6378137.000
- Eccentricity: 0.081819191

NTS: 042N06, 042N04, 042N03, 042N02, 042N01, 042K14, 042K15, 042K16, 042K10, 042K09, 042K07, 042K08, 042K03, 042K02, 042K01, 042F14, 042F16



Scale 1:20000

(meters)

NAD83 / UTM zone 16N

The topographic data base was derived from 1:250,000 NRC (Natural Resources Canada) NTDB data
Background shading is derived from NASA SRTM (Shuttle Radar Topography Mission) data
Inset data derived from Geocommunities 1:250,000 Canadian National Topographic database
Mining Claims are derived from the Ministry of Northern Development and Mines
(www.geocomm.com)(www.geogratis.ca)(http://www.mndm.gov.on.ca)

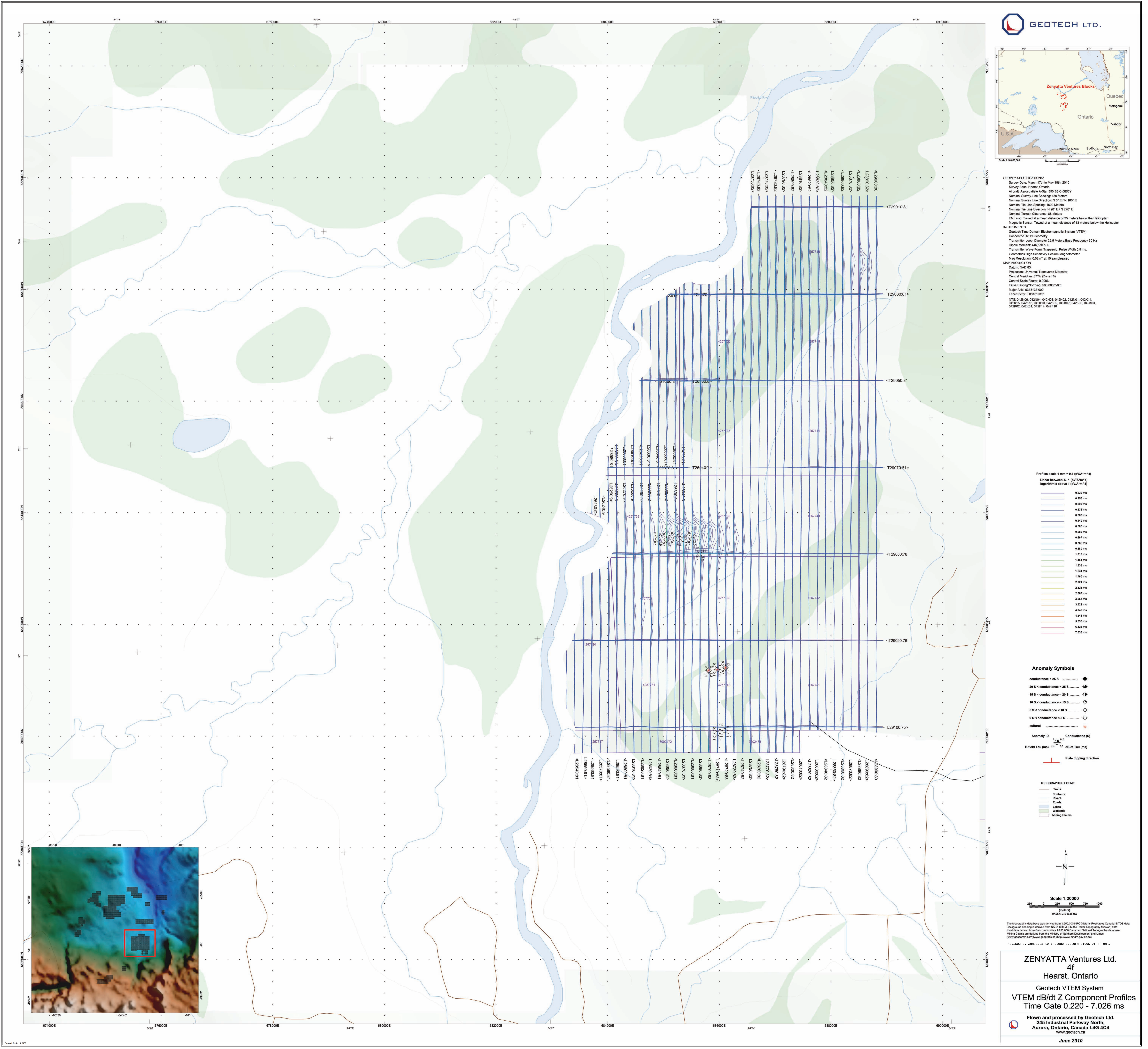
Revised by Zenyatta to include eastern block of 4f only

ZENYATTA Ventures Ltd.
4f
Hearst, Ontario

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

June 2010


GEOTECH LTD.
Zenyatta Ventures Blocks
Quebec
Matagami
Ontario
Val-dor
U.S.A.
Sault Ste Marie
Sudbury
North Bay
Scale 1:10,000,000
SURVEY SPECIFICATIONS:
Survey Date: March 17th to May 19th, 2010
Survey Base: Hearst, Ontario
Aircraft: Aerospatiale A-Star 350 B3 C-GEOY
Nominal Survey Line Spacing: 150 Meters
Nominal Survey Line Direction: N 0° E / N 180° E
Nominal Tie Line Spacing: 1500 Meters
Nominal Tie Line Direction: N 90° E / N 270° E
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Transmitter Loop: Diameter 25.5 Meters,Base Frequency 30 Hz
Dipole Moment: 446,570 nIA
Transmitter Wave Form: Trapezoid, Pulse Width 5.5 ms.
Geometrics High Sensitivity Cesium Magnetometer
Mag Resolution: 0.02 nT at 10 samples/sec
MAP PROJECTION
Datum: NAD 83
Projection: Universal Transverse Mercator
Central Meridian: 87°W (Zone 16)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m
Major Axis: 6378137.000
Eccentricity: 0.081819191
NTS: 042N06, 042N04, 042N03, 042N02, 042N01, 042K14, 042K15, 042K16, 042K10, 042K09, 042K07, 042K08, 042K03, 042K02, 042K01, 042F14, 042F16
Profiles scale 1 mm = 0.1 (pV/A*m^4)
Linear between +/- 1 (pV/A*m^4)
logarithmic above 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
1.161 ms
1.333 ms
1.531 ms
1.760 ms
2.021 ms
2.323 ms
2.667 ms
3.063 ms
3.521 ms
4.042 ms
4.641 ms
5.333 ms
6.125 ms
7.036 ms
Anomaly Symbols
conductance > 25 S
20 S < conductance < 25 S
15 S < conductance < 20 S
10 S < conductance < 15 S
5 S < conductance < 10 S
0 S < conductance < 5 S
cultural
Anomaly ID
Conductance (S)
B-field Tau (ms)
dB/dt Tau (ms)
Plate dipping direction
TOPOGRAPHIC LEGEND:
Trails
Contours
Rivers
Roads
Lakes
Wetlands
Mining Claims
Scale 1:20000
(meters)
NAD83 / UTM zone 16N
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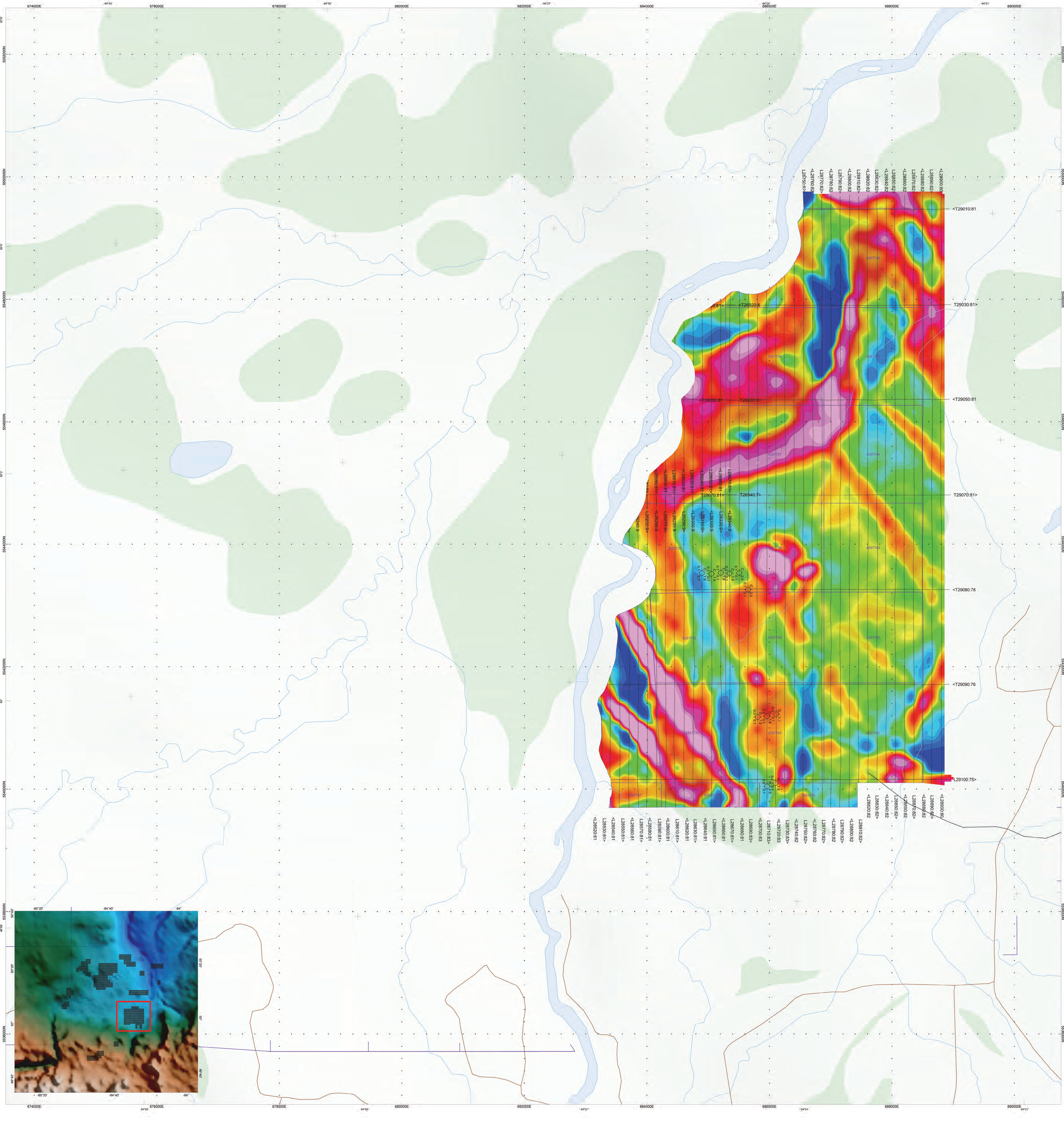
Revised by Zenyatta to include eastern block of 4f only
ZENYATTA Ventures Ltd.
4f
Hearst, Ontario
Geotech VTEM System
VTEM dB/dt Z Component Profiles
Time Gate 0.220 - 7.026 ms
Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
Aurora, Ontario, Canada L4G 4C4
www.geotech.ca
June 2010



GEOTECH LTD.

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MAP PROJECTION
- Datum: NAD 83
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- False Easting/Northing: 500,000m/0m
- Major Axis: 6378137.000
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- NTS: 042N06, 042N04, 042N03, 042N02, 042N01, 042K14, 042K15, 042K16, 042K10, 042K09, 042K07, 042K08, 042K03, 042K02, 042K01, 042F14, 042F16

Anomaly Symbols

- conductance > 25 S
- 20 S < conductance < 25 S
- 15 S < conductance < 20 S
- 10 S < conductance < 15 S
- 5 S < conductance < 10 S
- 0 S < conductance < 5 S
- cultural

Anomaly ID — Conductance (S) — B-field Tau (ms) — dB/dt Tau (ms)

Plate dipping direction

TOPOGRAPHIC LEGEND:
- Trails
- Contours
- Rivers
- Roads
- Lakes
- Wetlands
- Mining Claims

Scale 1:20000

(meters)

NAD83 / UTM zone 16N

The topographic data base was derived from 1:250,000 NRC (Natural Resources Canada) NTDB data
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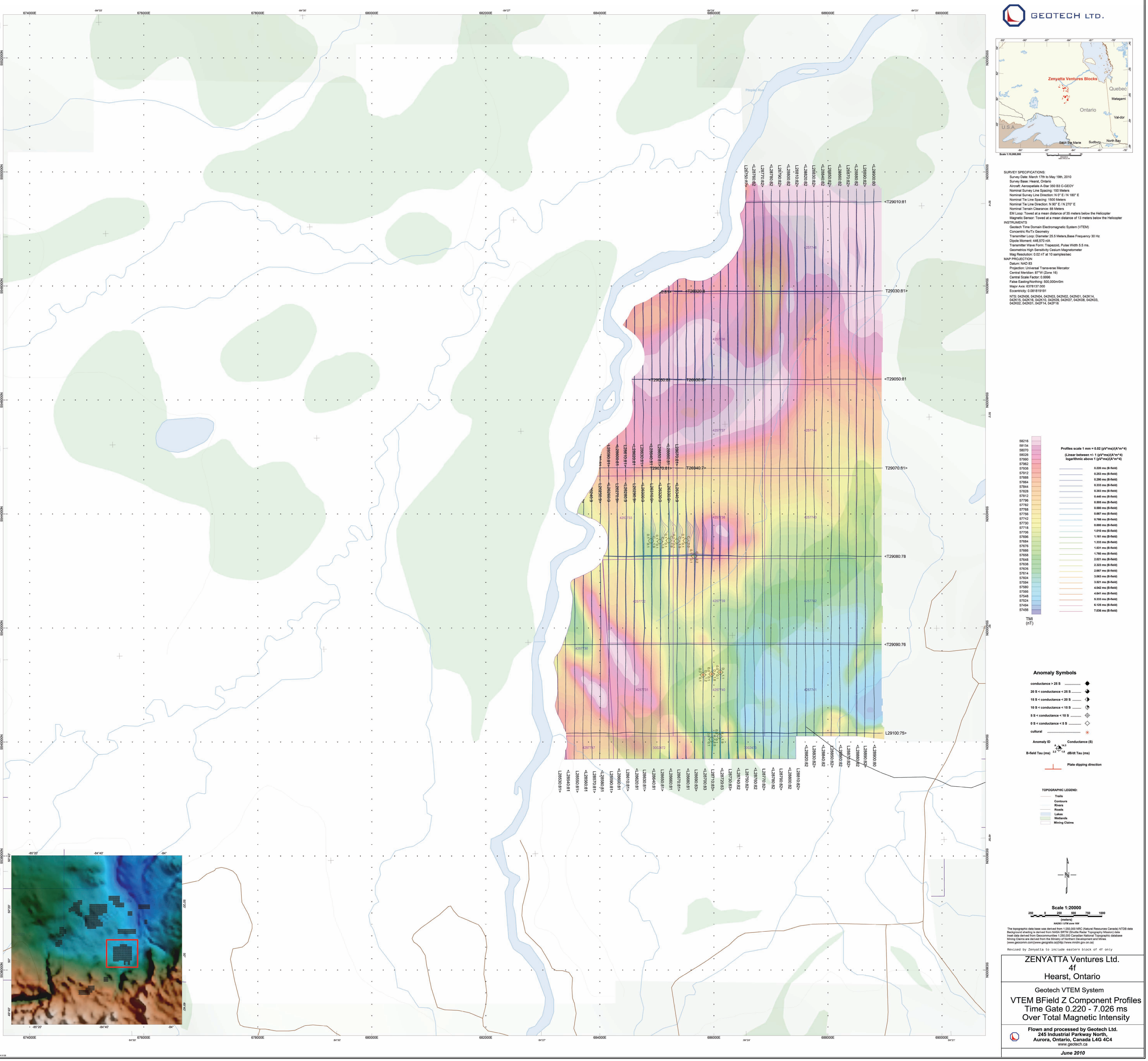
Revised by Zenyatta to include eastern block of 4f only

ZENYATTA Ventures Ltd.
4f
Hearst, Ontario

Geotech VTEM System
Calculated Magnetic Vertical Gradient
(CVG)

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

June 2010



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Revised by Zenyatta to include eastern block of 4f only

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4f
Hearst, Ontario

Geotech VTEM System

VTEM BField Z Component Profiles Time Gate 0.220 - 7.026 ms Over Total Magnetic Intensity

Flown and processed by Geotech Ltd.
245 Industrial Parkway North,
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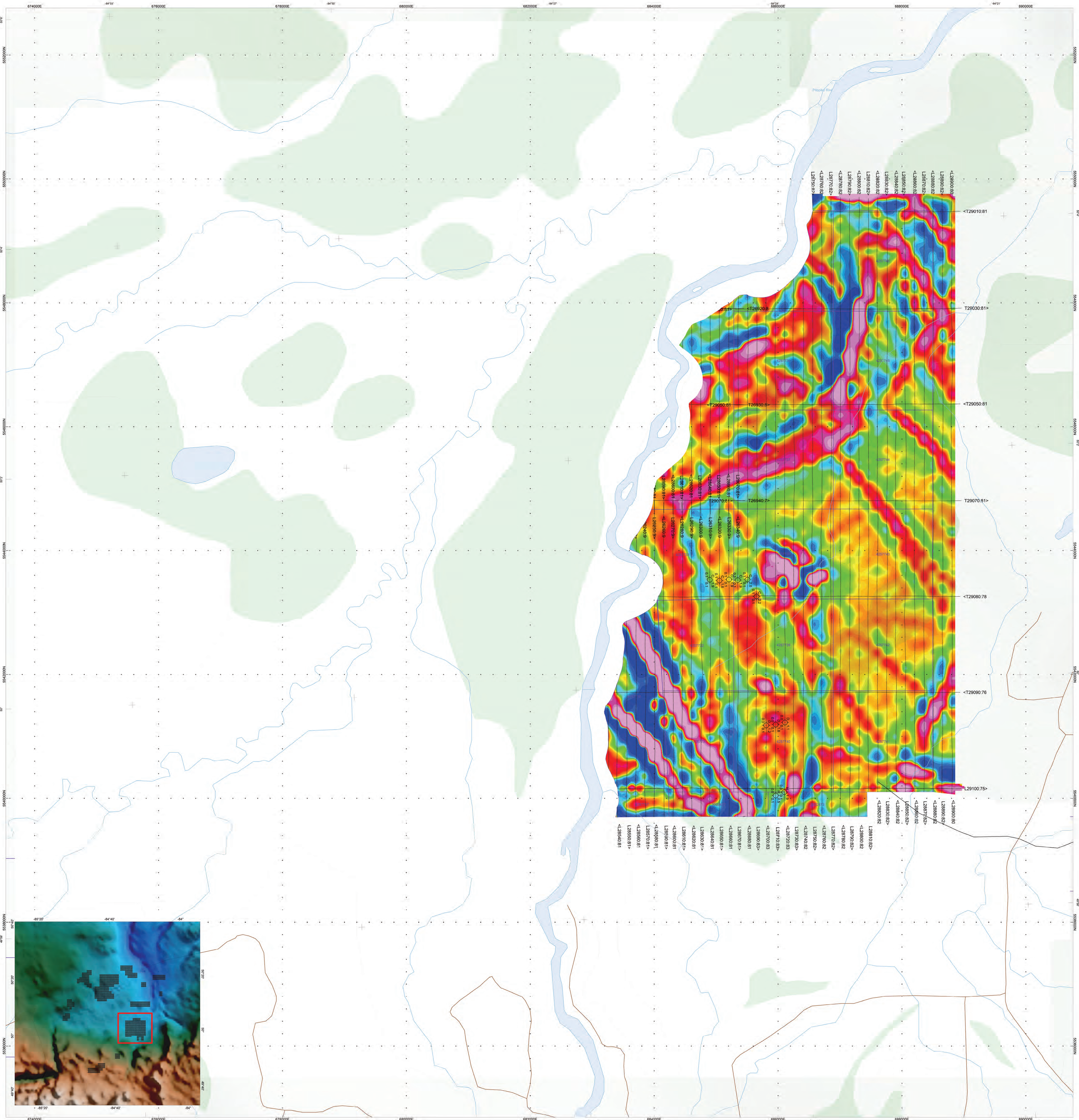
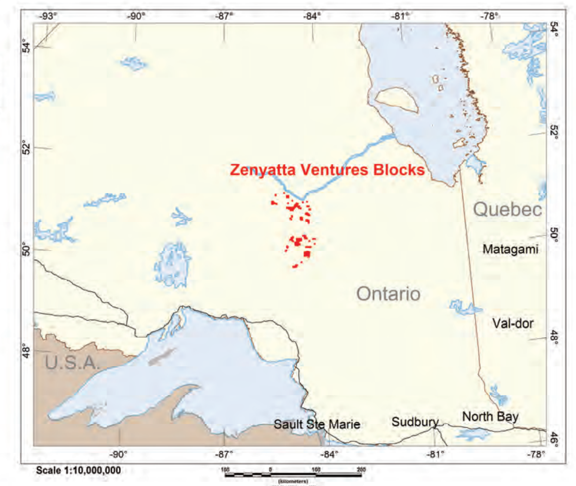
June 2010

GEOTECH LTD.





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0.00610
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0.00316
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-0.00221
-0.00258
-0.00316
-0.00438

2VG
(nT/m/m)

Anomaly Symbols

- conductance > 25 S
- 20 S < conductance < 25 S
- 15 S < conductance < 20 S
- 10 S < conductance < 15 S
- 5 S < conductance < 10 S
- 0 S < conductance < 5 S
- cultural

Anomaly ID
Conductance (S)
B-field Tau (ms)
dB/dt Tau (ms)

Plate dipping direction

TOPOGRAPHIC LEGEND:
- Trails
- Contours
- Rivers
- Roads
- Lakes
- Wetlands
- Mining Claims

Scale 1:20000

250 0 250 500 750 1000
(meters)
NAD83 / UTM zone 16N

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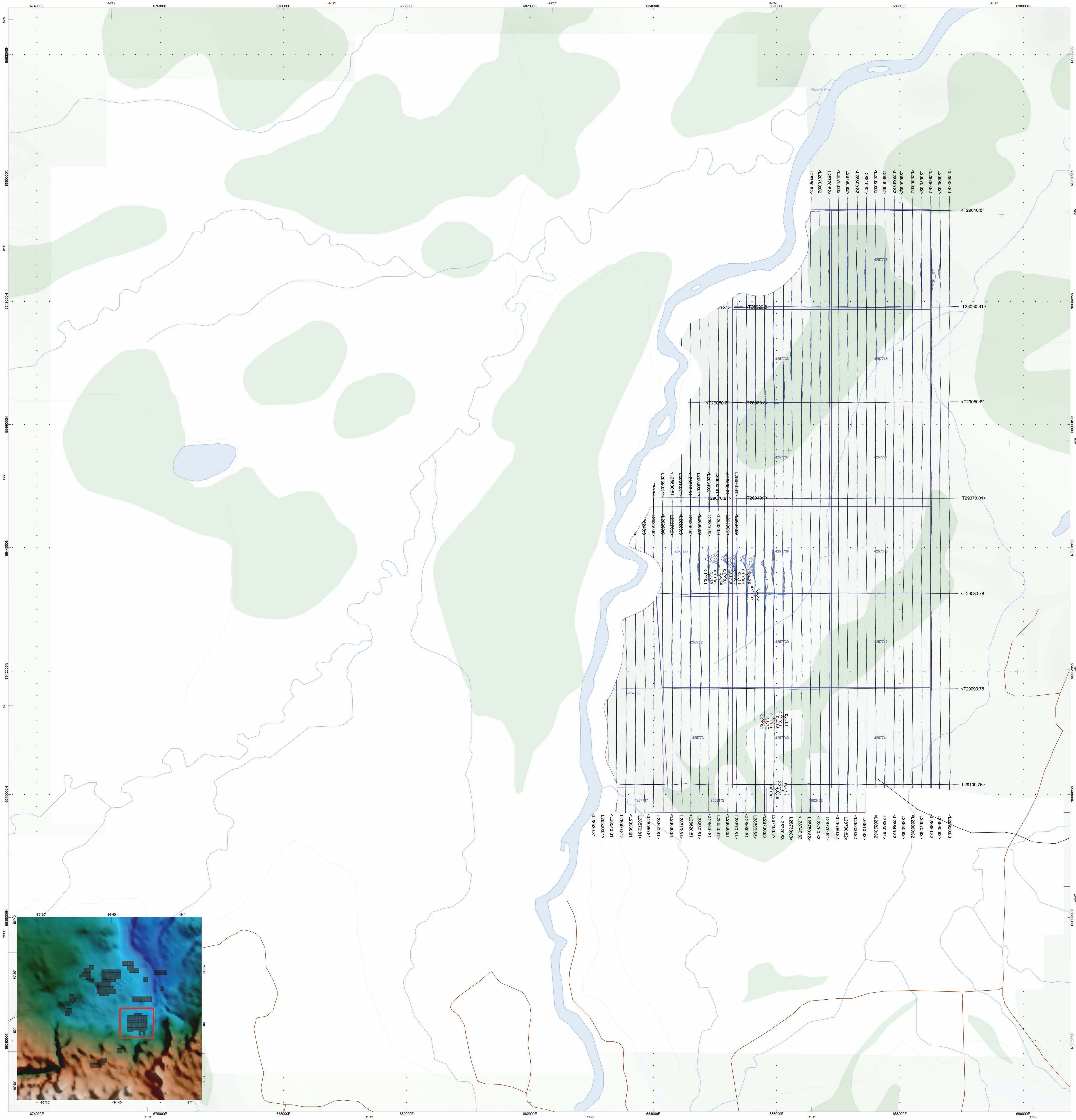
Revised by Zenyatta to include eastern block of 4f only

ZENYATTA Ventures Ltd.
4f
Hearst, Ontario

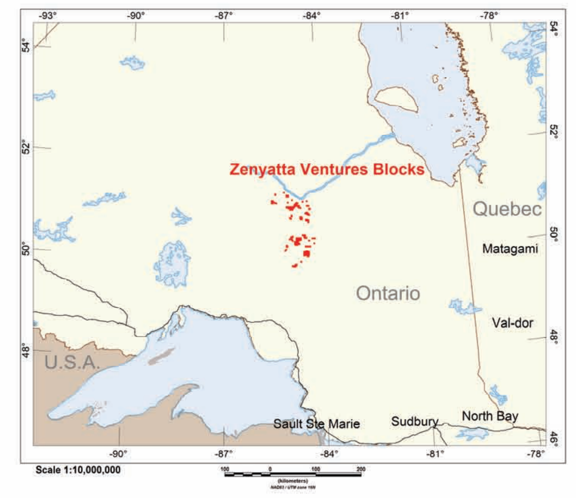
Geotech VTEM System
Second Magnetic Vertical Gradient (2VG)

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

June 2010



GEOTECH LTD.



SURVEY SPECIFICATIONS:

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Nominal Terrain Clearance: 88 Meters
EM Loop: Towed at a mean distance of 35 meters below the Helicopter
Magnetic Sensor: Towed at a mean distance of 13 meters below the Helicopter

INSTRUMENTS

Geotech Time Domain Electromagnetic System (VTEM)
Concentric Rx/Tx Geometry
Transmitter Loop: Diameter 35 Meters,Base Frequency 30 Hz
Dipole Moment: 837,457 nIA
Transmitter Wave Form: Trapezoid, Pulse Width 5.5 ms.
Geometrics High Sensitivity Cesium Magnetometer
Mag Resolution: 0.02 nT at 10 samples/sec

MAP PROJECTION

Datum: NAD 83
Projection: Universal Transverse Mercator
Central Meridian: 87°W (Zone 16N)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m
Major Axis: 6378137.000
Eccentricity: 0.081819191

NTS: 042N06, 042N04, 042N03, 042N02, 042N01, 042K14, 042K15, 042K16, 042K10, 042K09, 042K07, 042K08, 042K03, 042K02, 042K01, 042F14, 042F16

Profiles scale 1 mm = 0.05 (pV/A*m^4)

Linear between +/- 1 (pV/A*m^4)
logarithmic above 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
1.161 ms
1.333 ms
1.531 ms
1.760 ms
2.021 ms
2.323 ms
2.667 ms
3.063 ms
3.521 ms
4.042 ms
4.641 ms
5.333 ms
6.125 ms
7.036 ms

Anomaly Symbols

conductance > 25 S ....
20 S < conductance < 25 S ....
15 S < conductance < 20 S ....
10 S < conductance < 15 S ....
5 S < conductance < 10 S ....
0 S < conductance < 5 S ....
cultural ....

Anomaly ID — Conductance (S)
A 14.3
2.2 1.8
B-field Tau (ms) — dB/dt Tau (ms)

Plate dipping direction

TOPOGRAPHIC LEGEND:

Trails
Contours
Rivers
Roads
Lakes
Wetlands
Mining Claims

North
West

Scale 1:20000

250 0 250 500 750 1000
(meters)
NAD83 / UTM zone 16N

The topographic data base was derived from 1:250,000 NRC (Natural Resources Canada) NTDB data
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Revised by Zenyatta to include eastern block of 4f only

Zenyatta Ventures Ltd.
Block 4f
Hearst, Ontario

Geotech VTEM System
VTEM dB/dt X Component Profiles
Time Gate 0.220 - 7.026 ms

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June 2010