ASSESSMENT REPORT ON THE 2011 FUGRO HELITEM SURVEY

RAINY RIVER GOLD PROJECT

Richardson Township

UTM Zone 15 - NAD 83 Projection
438300mE, 5419600mN

PREPARED BY:

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SUMMARY

This report presents and discusses the results of a 988 km helicopter electromagnetic survey conducted by Fugro Airborne Surveys for Rainy River Resources (RRR) over the Rainy River Greenstone hosting the Rainy River Gold Project (RRGP) in Richardson Township. This portion of surveying took place over a portion of the duration between April 12th and May 5th, 2011. The RRGP is located 50 kilometres Northwest of the nearest large population centre at Fort Francis, Ontario.

The purpose of the program was to collect high resolution magnetic and electromagnetic date to assist in the understanding the RRGP geological setting and to produce additional exploration targets.

This program was integral in furthering our understanding of regional geological features. It has allowed us to analyze where our resource is located and target other similar magnetic features for potential future exploration. Future exploration programs will likely involve prospecting and soils to follow up on electromagnetic targets.

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INTRODUCTION

This report presents and summarizes the results of a portion of an helicopter borne magnetic and electromagnetic (EM) survey conducted for Rainy River Resources (RRR) over its RRGP in the Richardson and Tait Townships located northwest of Fort Francis, Ontario (Figure 1).

The survey program was conducted between April 12th and May 5th, 2011. Andrew Tims P.Geo of Thunder Bay designed the survey.

LOCATION, ACCESS AND PHYSIOGRAPHY

The Richardson Property is located in Northwestern Ontario and is centred on NAD83 UTM Zone 15 coordinates 425500mE and 5410000mN on NTS map sheet 52 D/16 (Figure 1). The unpatented claims are located in Richardson Township, Northwestern Ontario, and fall within the Ministry of Natural Resources Administrative District of Rainy River and the Ministry of Northern Development and Mines, Kenora Mining Division. The town of Fort Francis is located 50 kilometres to the southwest of the property. The villages of Emo and Nestor Falls are about 25 km to the south and north respectively. The property holdings are displayed on the Ontario Mining Tenure Map Plan M-2115 (Richardson) and G 3826 (Potts).

The property is approximately 400 kilometres by road from Thunder Bay, Ontario. Thunder Bay has a population of over 110,000 and is a full service community. Thunder Bay's population includes skilled tradesmen and experienced underground miners. All necessary supplies are available locally or in Thunder Bay and/or Winnipeg.

Access to the property in Richardson Township is attained via numerous all-weather, secondary provincial highways (gravel) and township roads, which lead off of paved provincial highways 11 and 71. These routes traverse the region and provide excellent ingress to the property.

There are no known environmental liabilities or public hazards associated with the property, and work permits are not required in Ontario to perform the work prescribed in this report.

Temperatures range from highs of 35^{o} C in summer to lows of –30^{o} C in winter, with snow cover between November and May. The best season for exploration is between June and October, although in lake covered or swampy areas exploration activities such as geophysical surveys and diamond drilling might best be conducted after winter freeze up.

The Rainy River region is located within the Severn Upland of the Canadian Shield. Generally the Precambrian surface and the overlying Paleozoic and Mesozoic strata to the west, dip at a very low angle to the southwest into the Williston Basin. Physiographically the Rainy River claim groups are situated in typical Precambrian highland and are onlysparsely covered by glacial drift. he Pinewood Lake claim block is 5 km to the south of Off Lake in the vicinity of the northwest-southeast trending Rainy Lake -Lake of the Woods Moraine and has subsequently less outcrop. Overall this area has been subjected to only one of the most recent glacial advances (the Whiteshell -from the northeast) because of the elevated topography which prevented the advance of other glacial lobes from the west. Glacial drift attains significant thickness only in very local areas. It displays few signs of intense weathering. Relief is controlled by bedrock geology with the supracrustal sequences displaying positive relief relative to the batholithic complexes; relief can attain 90 meter. The area has been subdivided by Bajc (1991b) into two regions. Region 2a contains 10-40% outcrop by area, and may attain significant relief which is related to bedrock topography; areas separating outcrops are sites of extensive drift accumulation. In region 2b southwest of the Rainy Lake -Lake of the Woods Moraine outcrop density is less than 5% of the surface area, topography is low and undulating, drainage is poor, and peat land is common.

Hudson Bay
Manitoba
James Bay
Off Lake Property
Red Lake
Pickle Lake
ONTARIO
Kenora
Quebec
Geraldton
Rainy River
Thunder Bay
Timmins
Kirkland Lake
Lake Superior
Sault Ste. Marie
Sudbury
Ottawa
Lake Michigan
Lake Huron
Toronto
Lake Ontario
Windsor
Lake Erie

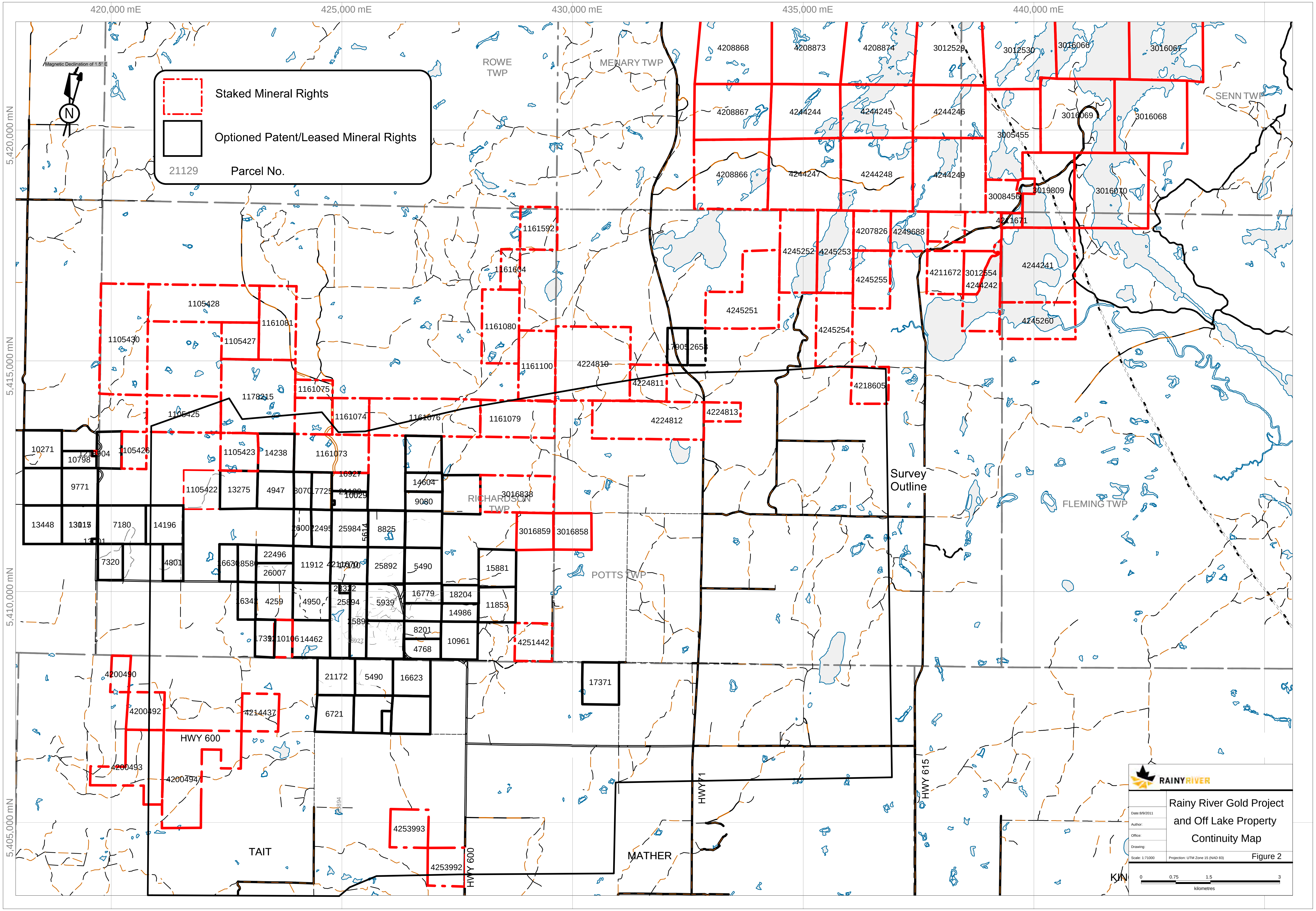
CLAIMS AND OWNERSHIP

The property, as partially outlined in Figure 2, has 168 mineral claim units in 23 claims which lie within the Kenora Mining Division. The property also includes a variety of optioned and purchased freehold patented lands that do not have an assessment obligations but require maintaining land taxes with the Chapple Municipality (formerly Township offices). The unpatented claims are contiguous to the patented lands of which the two pertinent freehold patents are listed below.

Table 1
Rainy River Resources Claims List

Township/Area	Claim Number/Parcel Number	G Number	Recording Date	Claim Due Date	Work Required	Total Applied	Total Reserve
POTTS	4218605		2007-Apr-19	2012-Apr-19	$1,600	$4,800	$0
POTTS	4224810		2008-May-06	2013-May-06	$6,400	$19,200	$0
POTTS	4224811		2008-May-06	2013-May-06	$1,600	$4,800	$0
POTTS	4224812		2008-May-06	2013-May-06	$4,800	$14,400	$0
POTTS	4224813		2008-May-15	2013-May-15	$800	$2,400	$0
RICHARDSON	1105422		1992-Oct-09	2011-Oct-09	$1,600	$27,200	$864
RICHARDSON	1105423		1992-Oct-09	2011-Oct-09	$1,600	$27,200	$0
RICHARDSON	1105425		1992-Oct-09	2011-Oct-09	$3,200	$54,400	$0
RICHARDSON	1161073		1991-Dec-19	2011-Dec-19	$3,200	$57,600	$0
RICHARDSON	1161076		1991-Dec-19	2011-Dec-19	$4,800	$86,400	$0
RICHARDSON	1161079		1991-Dec-19	2011-Dec-19	$3,200	$57,600	$0
RICHARDSON	1178215		1995-Feb-24	2013-Feb-24	$6,400	$102,400	$0
RICHARDSON	1210106		1996-May-27	2015-May-27	$800	$13,600	$78
RICHARDSON	4251442		2010-Jun-02	2012-Jun-02	$1,600	$0	$0
TAIT	4253992		2011-Jan-11	2013-Jan-11	$2,000	$0	$0
TAIT	4253993		2011-Jan-11	2013-Jan-11	$1,600	$0	$0
TAIT	4200492		2006-Oct-27	2012-Oct-27	$1,600	$6,400	$78,368
TAIT	4200493		2006-Oct-27	2012-Oct-27	$3,600	$14,400	$81,833
TAIT	4200494		2006-Oct-27	2012-Oct-27	$5,200	$20,800	$76,062
TAIT	4214437		2010-Mar-03	2012-Mar-03	$1,600	$0	$0
Mather	17371		Patent	100% MR			
RICHARDSON	4259		Patent	100% MR			
RICHARDSON	4768		Patent	100% MR			
RICHARDSON	4801		Patent	100% MR			
RICHARDSON	4947		Patent	100% MR			
RICHARDSON	4950		Patent	100% MR			
RICHARDSON	5490		Patent	100% MR			
RICHARDSON	5614		Patent	100% MR			

Township/Area	Claim Number/Parcel Number	G Number	Recording Date	Claim Due Date	Work Required	Total Applied	Total Reserve
RICHARDSON	8070		Patent	100% MR			
RICHARDSON	8201		Patent	100% MR			
RICHARDSON	8825	10100135	Patent	100% MR			$2,441
RICHARDSON	10029		Patent	100% MR			
RICHARDSON	10961		Patent	100% MR			
RICHARDSON	11912		Patent	100% MR			
RICHARDSON	13275		Patent	100% MR			
RICHARDSON	14196		Patent	100% MR			
RICHARDSON	14238		Patent	100% MR			
RICHARDSON	14462		Patent	100% MR			
RICHARDSON	14986		Patent	100% MR			
RICHARDSON	16342		Patent	100% MR			
RICHARDSON	16630		Patent	100% MR			
RICHARDSON	16779		Patent	100% MR			
RICHARDSON	16927		Patent	100% MR			
RICHARDSON	17110	1000145	Patent	100% MR			$38,793
RICHARDSON	17392		Patent	100% MR			
RICHARDSON	17725		Patent	100% MR			
RICHARDSON	18580		Patent	100% MR			
RICHARDSON	21129	10100145	Patent	100% MR			$46,496
RICHARDSON	22495		Patent	100% MR			
RICHARDSON	22496		Patent	100% MR			
RICHARDSON	25891		Patent	100% MR			
RICHARDSON	25982	10100136	Patent	100% MR			$5,919
RICHARDSON	25984	10100133	Patent	100% MR			$610,033
RICHARDSON	25894	1000143	Patent	100% MR			$205,464
RICHARDSON	26007		Patent	100% MR			
RICHARDSON	26007		Patent	100% MR			
TAIT	5490		Patent	100% MR			
TAIT	6721		Patent	100% MR			
TAIT	16623		Patent	100% MR			
TAIT	21172		Patent	100% MR			



420,000 mE
425,000 mE
430,000 mE
435,000 mE
440,000 mE
5,420,000 mN
5,415,000 mN
5,410,000 mN
5,405,000 mN
Magnetic Declination of 1.5° E
N
Staked Mineral Rights
Optioned Patent/Leased Mineral Rights
21129
Parcel No.
ROWE TWP
MENARY TWP
SENN TWP
RICHARDSON TWP
FLEMING TWP
POTTS TWP
TAIT
MATHER
Survey Outline
HWY 600
HWY 71
HWY 615
RAINY RIVER
Rainy River Gold Project
and Off Lake Property
Continuity Map
Figure 2
Projection: UTM Zone 15 (NAD 83)
kilometres

PREVIOUS WORK

The exploration history compiled below has been sourced from the report by Mackie et al. (2003), an in-house Nuinsco report on the 2003-2004 diamond drill program, a search of the Ministry of Northern Development and Mines ERMES website, and assessment files from the Kenora Resident Geologist's office. The claim boundaries relating to this information are not presently the same as the property has been consolidated over the years

Although exploration activity in the area by individual prospectors dates back to the 1930s, the documented exploration in the Ministry of Northern and Development and Mines assessment files housed in Kenora Resident Geologist Office begins in 1967. It has been reported by local landowners that exploration has been undertaken on private lands, for which there is no record of filed assessment work.

In 1967 copper was recorded from a water well hole on the western shore of Off Lake. Subsequently *Noranda Exploration Company* registered claims around the original discovery and performed mapping, geophysics, and diamond drilling. This activity met with limited success and the claims were allowed to lapse.

In 1971 *International Nickel Company of Canada Limited* conducted airborne and follow-up ground geophysics across a large portion of the greenstone belt. Although there is no record of this work, Inco did file a report on two diamond drill holes in Richardson Township in 1973. Results are unknown.

In 1972 *Hudson's Bay Exploration and Development,* (HBED) carried out airborne geophysical surveys followed by claim staking and ground geophysics. In 1973, HBED drilled 54 diamond drill holes to test 42 E.M. conductors for base metals.

Considerable interest was generated in the area west of Finland following the release of the Ontario Geological Survey (OGS) map *No. P 3140, "Gold Grains in Rotosonic Drill Core and Surface Samples (1987-1988)"*. Based on the results of this survey *Mingold Resources Inc.* staked 85 claims in 1989 and optioned patented lands from 12 local landowners in three separate blocks in Richardson, Tait, Pattullo, and Sifton townships. Between mid-1989 and late-1990 *Mingold* conducted a sampling program of the glacial drift by hand, backhoe trenching and reverse circulation drilling. Geological mapping and ground geophysics accompanied this work and three holes were drilled in Pattullo Township. As the results of this drilling were inconclusive, the highly anomalous values obtained in the tills were left unexplained.

Nuinsco began assembling the Rainy River Project land position in 1991 centered on the Richardson Township OGS rotasonic drill results and on the Menary Township gold occurrences of *Western Troy Resources*. In 1993, the land position was expanded to include Crown Land in several townships extending west to the USA international boundary. Fieldwork began in June 1993 and to the present *Nuinsco* has completed numerous surveys. This work is summarised in Table 2.

Nuinsco exploration from 1993 to the present was directed, primarily, to defining anomalous gold in Richardson Township discovered by reverse circulation drilling. This work resulted in the discovery of the #17 Zone, and subsequently, the #34 Zone in 1995. Extensive diamond drilling followed and continued through mid-1997.

Additional reverse circulation drilling was carried out between the winters of 1995 through to 1997. This work led to the discovery of the 433 (gold) Zone that is located approximately 500m north of the #17 Zone. During 1999 additional drilling targeted the #34 Zone, and a magnetic-EM anomaly in Tait Township. From 2000 to 2001 an audio magneto-telluric (MT) geophysical survey was carried out in several areas. Anomalies were interpreted to be present in the vicinity of the #34 Zone, at Marr Rd., Dearlock, Brown Rd., south of the Pinewood River, and in Shenston Twp. Follow up diamond drilling did not result in discovery of any economic mineralization. Massive graphite was intersected at Dearlock, heavy disseminated sulphide at Kereliuk, and narrow massive but barren sulphide bands were intersected at Marr Rd.

In 2003, Nuinsco commissioned a NI 43-101 compliant report on the Rainy River Project titled: Exploration Summary & Mineral Resource Estimate For The #17 Gold Zone. The report was completed by Bruce Mackie, M.Sc., P.Geo, Eugene Puritch and Paul Jones, P.Geo. The independent resource estimate for the #17 Gold Zone was determined using various parameters. At a cut-off of 0.70 g/t gold the indicated resource was calculated to be

1,736,000 tonnes grading 1.56 g/t (87,100 contained ounces) and an inferred resource of 11,025,000 tonnes grading 1.33 g/t gold (471,400 ounces). The details of the estimate are presented in the Mineral Resource section of this report.

Subsequent to the Mackie report in 2003-2004, Nuinsco completed an 8 hole (1549.7metre) diamond drill program on the #34 zone (Wagg 2004). No additional drill testing of the #17 zone was completed following the Mackie report. The drill pattern was designed demonstrate the continuity of the #34 Zone by obtaining additional intersections on intermediate gridlines between previous intercepts, so as to have pierced the mineralized body on 50m and in some cases 25m centres. In an effort to determine an accurate measure of the width (downdip extent) and overall shape of the mineralization, several holes were collared so as to pass close to a previous intersection of the zone. All diamond drill holes were started vertically with the deepest hole being 227 metres.

Rainy River Resources Ltd. completed a major diamond drill program and numerous additional exploration activities between 2005 and 2011 on their Rainy River property located in Richardson Township.

REGIONAL GEOLOGY

REGIONAL GEOLOGY, MINERALIZATION and DEPOSIT TYPES

Adapted from Mackie et al. 2003

The property lies within the Rainy River Greenstone Belt. This belt is one component of the western part of the Archean Wabigoon Subprovince of the Canadian Shield, a 900 km long, east-west trending metavolcanic-metasedimentary domain bordered and intruded by granitoid intrusions of up to batholithic dimensions. The Wabigoon Subprovince is composed of several tectonically bounded assemblages consisting of komatiitic to calc-alkalic metavolcanics overlain by clastic and minor chemical sediments. Intrusion of the granitoid domes has imparted a synformal structural character to the supracrustal rocks, and the central axial zones of many of these synformal belts may be characterised by long sinuous shear/fault zones. The larger, crustal-scale Quetico Fault (in part) forms the southern boundary of the Wabigoon Subprovince and crosscuts both supracrustal and plutonic assemblages of the western Wabigoon region.

Due to the paucity of outcrop data and thick overburden much of the geological framework of the Rainy River greenstone belt has been based on interpretation of aeromagnetic maps. The most recent mapping was carried out by Johns, Ontario Geological Survey in 1988 in conjunction with an OGS rotasonic drilling program. The regional-scale, east-west trending Quetico Fault is interpreted to trend south-westward through the Rainy River Greenstone Belt following a concordant magnetic low. However, the fault is regionally discordant and could equally well be extended due west through the Richardson area where considerable magnetic disruption is evident.

Although the bedrock geology of the project area is poorly understood, the Quaternary geology has been interpreted by the 1986-88 OGS surficial mapping and rotasonic drilling programs (Bajc,1991) and from similar programs in adjoining areas of Minnesota and Manitoba. In Late Wisconsian time when most and perhaps all of the Quaternary sediments were deposited the area lay on the suture zone between Labradorean and Keewatin ice domes. This juxtaposition resulted in deposition of a basal till layer of northeastern provenance, which is in direct contact with bedrock and useful for sampling, overlain by at least one horizon of till of western provenance.

Quaternary Geology

The surficial and subsurface Quaternary geology of the Rainy River area has been thoroughly summarised by Bajc (1991 a, b). Quaternary sediments intersected in Nuinsco's reverse circulation drill holes from 1994 to 1998 comprised till and lacustrine sediments from glacial Lake Agassiz from both the Labradorean and Keewatin events. Labradorean till rests on bedrock in > 90 percent of the drill holes and was the principal sampling horizon. Its thickness ranges from < 1 to > 20 metres and it is sympathetic to bedrock topography with thin till on bedrock highs and thicker till containing interlayers of ice contact glaciofluvial sand/gravel and embryonic Lake Agassiz clay-silt-sand in bedrock depressions. Striae measurements indicate an ice flow azimuth of 210 ± 10° for the Labradorean ice.

Bedrock Geology

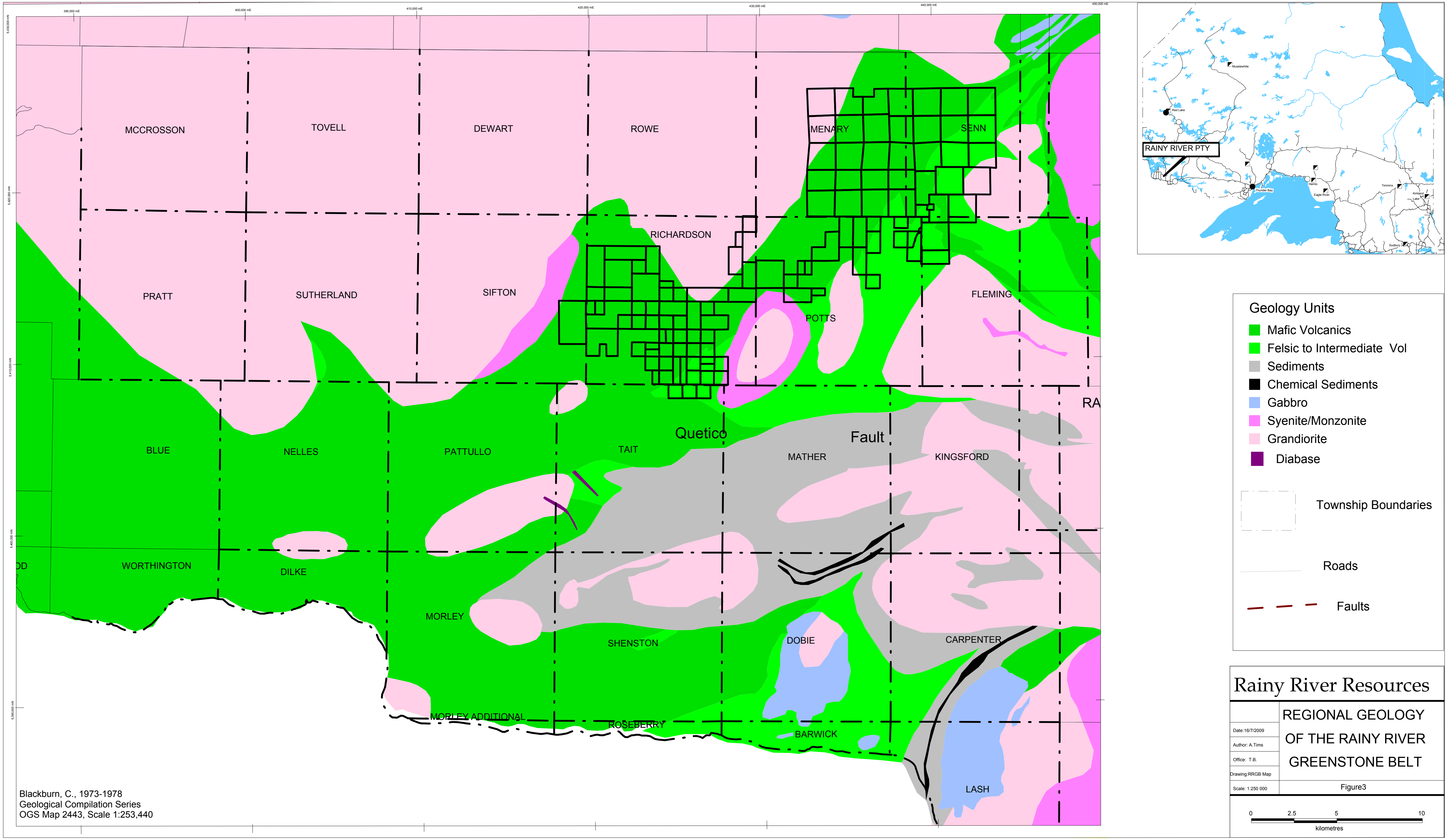
As noted above, the bedrock geology of the Rainy River Greenstone Belt is poorly understood because of limited outcrop exposure and lack of past mineral exploration. In general, the belt is bounded by the Sabaskong Batholith in the north and the Rainy Lake Batholithic Complex in the east. It extends south into Minnesota where the Long Point Intrusive Rocks, the Baudette Intrusive Rocks (both granitoid), and the Rainy Lake - Seine River Fault, the Vermillion Fault and the Four Towns Fault constrain the belt, and others farther to the west. A thin septum of supracrustal rocks separates the batholiths and connects the Rainy River belt with the Kakagi-Rowan Lakes Greenstone Belt to the north. To the west the greenstone terrain is overlain by unmetamorphosed Paleozoic to Mesozoic sedimentary rocks of the Western Sedimentary Basin.

Regional metamorphic grade is regarded as being generally of greenschist to lower-middle amphibolite facies but adjacent to the late-post tectonic stocks may attain upper amphibolite facies, with possible local partial remelting.

Structurally, the region is complex although very little structural detail is available for study. The strongest and earliest deformation event produced a well-defined penetrative fabric commonly observed on a regional scale and is probably the result of deformation and intrusion of late or post-tectonic intrusions. Subsequently, major faults, such as the Quetico Fault and the Rainy Lake-Seine River Fault, were established during an episode of northwest-southeast oriented, dextral, transgressive, ductile shear (Klein, et al, 1997). The deformation zones formed during this event are now schist, phyllonite, and mylonite zones of up to one-kilometre widths. The southern part of the region encompassing the Rainy River Project is transected by the Quetico Fault, although the surface trace of the fault is only conjectured.

The final episode of regional deformation occurred during the Early Proterozoic. It caused reactivation along the major regional faults, and the establishment of northwest oriented faults, which, are in part, filled by the diabase dykes of the Kenora - Fort Frances Dyke Swarm.

Middle Cretaceous, non-marine, fossiliferous, clastic sediments were encountered in an O.G.S. borehole, which was drilled 7.5 km northwest of Rainy River. Composed primarily of white to buff coloured, moderately sorted, silica sand and gravel, this occurrence is located in a protected hollow, down-ice from prominent bedrock highlands. Similar occurrences have been noted in a few of the Nuinsco reverse circulation drill holes.



MCCROSSON
TOVELL
DEWART
ROWE
MENARY
SENN
RICHARDSON
PRATT
SUTHERLAND
SIFTON
POTTS
FLEMING
RA
BLUE
NELLES
PATTULLO
TAIT
Quetico
Fault
MATHER
KINGSFORD
WORTHINGTON
DILKE
MORLEY
SHENSTON
DOBIE
CARPENTER
MORLEY ADDITIONAL
ROSEBERRY
BARWICK
LASH
Blackburn, C., 1973-1978
Geological Compilation Series
OGS Map 2443, Scale 1:253,440
RAINY RIVER PTY
Geology Units
Mafic Volcanics
Felsic to Intermediate Vol
Sediments
Chemical Sediments
Gabbro
Syenite/Monzonite
Grandiorite
Diabase
Township Boundaries
Roads
Faults
Rainy River Resources
REGIONAL GEOLOGY
OF THE RAINY RIVER
GREENSTONE BELT
Date:16/7/2009
Author: A.Tims
Office: T.B.
Drawing:RRGB Map
Scale: 1:250 000
Figure3
0 2.5 5 10
kilometres

WORK PROGRAM SUMMARY

The Fugro Airborne Surveys “Logistic and Processing Report” is located in Appendix 1 and summarizes the details of the survey. Of the 988 line kilometres flown by Fugro Airborne Surveys only 194 line kilometres covers the the actual RRGP property. A flight line coverage nage is included in Appendix 2.

All survey maps are also located in Appendix 2.

Flight line profiles can be found in Appendix 3.

The Geosoft database and grid files are included with this submission.

CONCLUSION AND RECOMMENDATIONS

The electromagnetic survey performed by Fugro Airborne Surveys over block 5 yielded valuable data for interpretation. The data received has been integral in broadening our understanding of sub-surficial geology of the region. By identifying certain geological features using the magnetic survey, such as fold noses, dykes, etc., and mapping these features, the area will be able to be explored surficially and through drilling much more accurately and effectively. This survey has also identified a plethora of electro-magnetic targets that are worth exploring in future. As the economical deposits in this area are associated with magnetic low zones we will be able to see where magnetic low zones intersect magnetic high zones, indicating hydrothermal fluid alteration, and design appropriate exploration programs for these areas.

Recommended future work for the area covered by the survey should entail prospecting and soil sampling. A budget of $370,500 is outlined below.

Table 2

Recommended Exploration Program Costs

Item	Days	Number of Samples	Cost Per Day	Cost Per Sample	Cost
Soil Samples		4800		$60	$288,000
Rock Samples		500		$75	$37,500
Vehicle	60		$50		$3,000
Personnel	60		$700		$42,000
Total Cost					$370,500

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STATEMENT OF QUALIFICATIONS

I, Andrew A. B. Tims, of 317 Sillesdale Cr., Thunder Bay Ontario hereby certify that:

1.) I am the author of this report.

2.) I graduated from Carleton University, in Ottawa, with a Bachelor of Science Degree in Geology (1989).

3.) I possess a valid prospector's license and have been practising my profession as a geologist involved in mineral exploration for the past 21 years.

4.) I am a practising member of the Association of Professional Geoscientist of Ontario as well as a Fellow of the Geological Association of Canada.

5.) I do not hold or expect to receive any interest in the property described in this report.

6.) I consent to the use of this report by Rainy River Resources Inc.

Thunder Bay, Ontario
February 17, 2012

Andrew Tims
Geologist
Rainy River Resources Inc.

APPENDIX 1 – Fugro Airborne Logistic Report

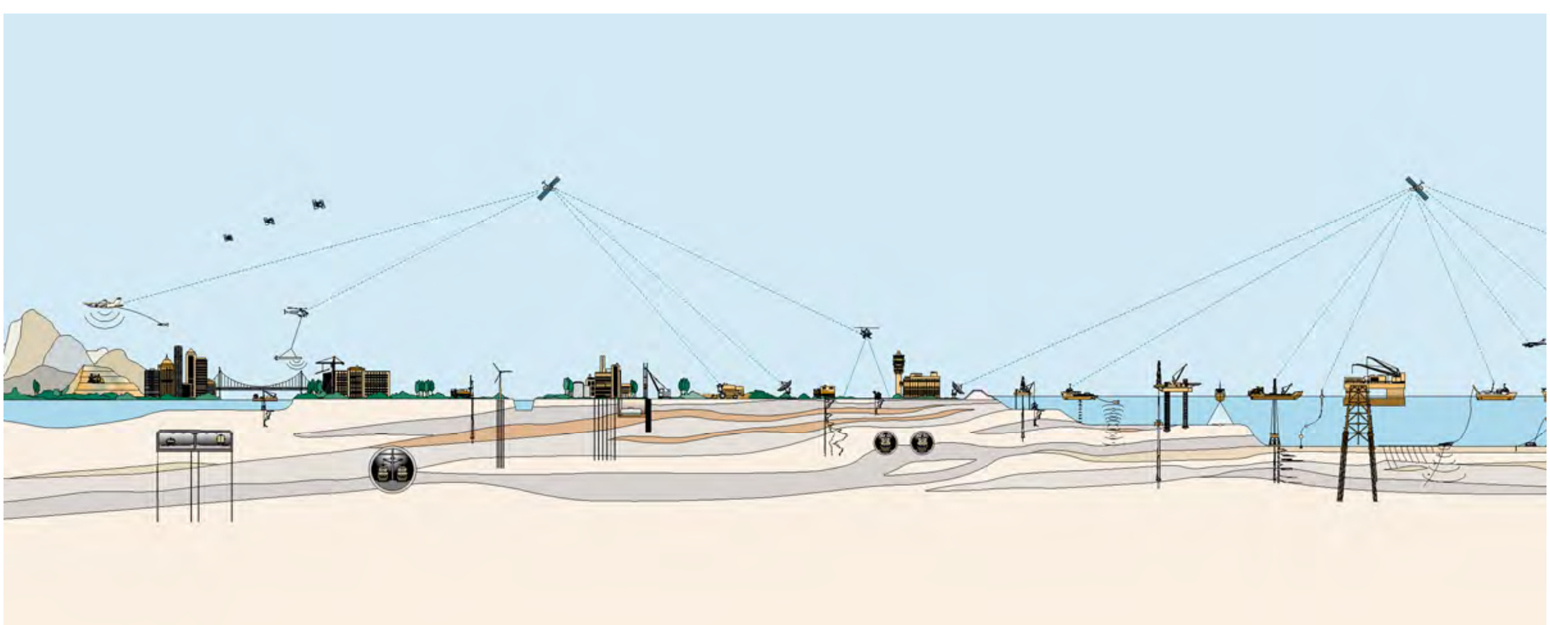
Fugro Airborne Surveys

LOGISTICS AND PROCESSING REPORT
Airborne Magnetic and HELITEM® Survey

RAINY RIVER, ONTARIO, CANADA

Job No. 11021

Rainy River Resources Ltd.



LOGISTICS AND PROCESSING REPORT
AIRBORNE MAGNETIC AND HELITEM® SURVEY
RAINY RIVER, ONTARIO, CANADA

JOB NO. 11021

Client: Rainy River Resources Ltd.
P.O. Box 5
Emo, Ontario
Canada P0W 1E0

Date of Report: Sept 16, 2011

FUGRO AIRBORNE SURVEYS

Fugro Airborne Surveys was formed in early 2000 through the global merger of leading airborne geophysical survey companies: Geoterrex-Dighem, High-Sense Geophysics, and Questor of Canada; World Geoscience of Australia; Geodass and AOC of South Africa. Sial Geosciences of Canada joined the Fugro Airborne group in early 2001; Spectra Exploration Geosciences followed thereafter. In mid 2001, Fugro acquired Tesla 10 and Kevron in Australia, and certain activities of Scintrex. Fugro also works with Lasa-Geomag located in Brazil, for surveys in South America. With a staff of over 400, Fugro Airborne Surveys now operates from 12 offices worldwide.

Fugro Airborne Surveys is a professional services company specializing in low altitude remote sensing technologies and collects, processes and interprets airborne geophysical data related to the subsurface of the earth and the sea bed. The data and map products produced have been an essential element of exploration programs for the mining and oil & gas industries for over 50 years. Engineers, scientists and others with a need to map the earth's subsurface geology use Fugro Airborne Surveys for environmental and engineering solutions. From mapping kimberlite pipes and oil and gas deposits to detecting water tables and unexploded ordnance, Fugro Airborne Surveys designs systems dedicated to specific targets and survey needs. State of the art geophysical systems and techniques ensure that clients receive the highest quality survey data and images.

Fugro Airborne Surveys acquires both time domain and frequency domain electromagnetic data as well as, magnetic, radiometric and gravity data from a wide range of fixed wing (airplane) and helicopter platforms. Depending on the geophysical mapping needs of the client, Fugro Airborne Surveys can field airborne systems capable of collecting one or more of these types of data concurrently. The company offers all data acquisition, processing, interpretation and final reporting services for each survey.

Fugro Airborne Surveys is a founding member of IAGSA, the International Airborne Geophysics Safety Association. Our quality management system has successfully achieved certification to the international standard *ISO 9001:2000 Quality Management Systems - Requirement*s

SUMMARY

This report describes the logistics, data acquisition, processing and presentation of results of a HELITEM® electromagnetic/magnetic survey flown from April 12, 2011 to May 5, 2011 for Rainy River Resources Ltd. over its Rainy River property in Rainy River, Ontario. The Rainy River property consists of five survey blocks. Total coverage of the survey blocks amounted to 3050.7 km.

The purpose of the survey was to facilitate target generation, evaluate bedrock and for better understanding of the subsurface geology within the survey areas. The EM data and the magnetic data were processed to produce images and profiles that are indicative of the magnetic and conductive properties of the survey areas. A GPS electronic navigation system ensured accurate positioning of the geophysical data with respect to the base maps.

The survey data were processed and compiled in the Fugro Airborne Surveys Toronto office. Data in digital format are provided with this report.

Respectfully submitted,

FUGRO AIRBORNE SURVEYS CORP.

R11021_Rainy River_Sept2011

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A HELICOPTER AIRBORNE ELECTROMAGNETIC SYSTEMS

B AIRBORNE TRANSIENT EM INTERPRETATION

C DATA ARCHIVE DESCRIPTION

D LIST OF PERSONNEL

Survey Operations

Locations of the Survey Blocks

Figure 1 shows the locations of the Rainy River survey blocks in Rainy River, Ontario. The base of operations was setup at Emo Inn, Ontario. Total coverage of the blocks amounted to 3050.7 km.

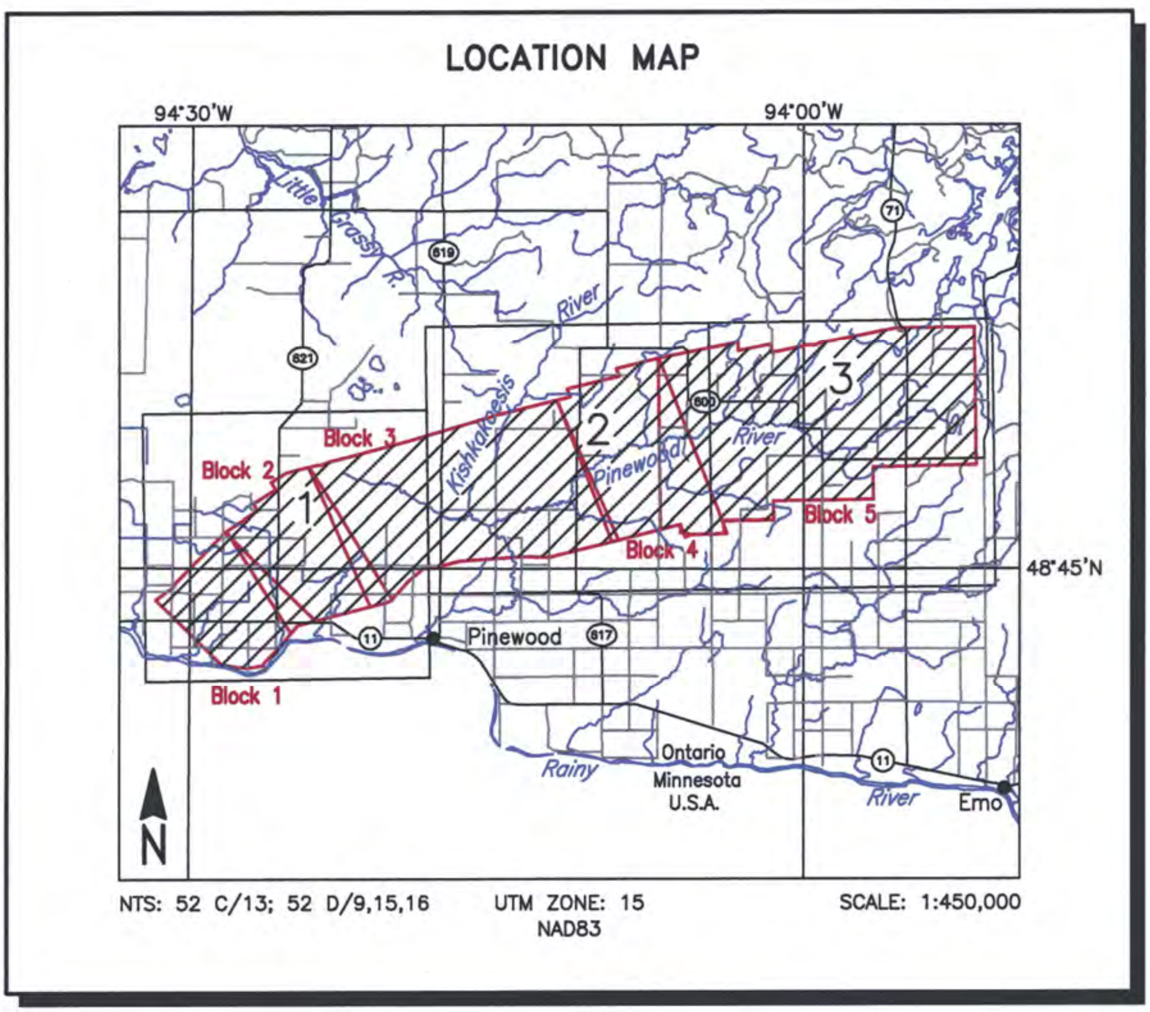


Figure 1. Survey Location.

Table 1 lists coordinates of the corner points of the survey blocks.

Block	Corners	X-UTM (E)	Y-UTM (N)
11021-1	1	391545	5394943
	2	393019	5394745
	3	394001	5394878
	4	394093	5395069
	5	394804	5395773
	6	396118	5397254
	7	397174	5397501
	8	391851	5402880
	9	388794	5399856
	10	388705	5399661
	11	387628	5398902
11021-1a	1	389825	5400875
Infills	2	391851	5402880
	3	397174	5397501
	4	396118	5397254
	5	394837	5395810
11021-2	1	395699	5396782
	2	396118	5397254
	3	400312	5398256
	4	401556	5398570
	5	401798	5398703
	6	396922	5406650
	7	395563	5406334
	8	394645	5405771
	9	394907	5405344
	10	393543	5404508
	11	393800	5404089
	12	391927	5402929
11021-2a	1	391927	5402929
Infills	2	393800	5404089
	3	393543	5404508
	4	394779	5405266
	5	399238	5398000
	6	396118	5397254
	7	395699	5396782
11021-3	1	400476	5398298

Block	Corners	X-UTM (E)	Y-UTM (N)
	2	401556	5398570
	3	401732	5398667
	4	402772	5399792
	5	403672	5400546
	6	404473	5400619
	7	405904	5400959
	8	409590	5401151
	9	411346	5401119
	10	411541	5401173
	11	415405	5402060
	12	411799	5410437
	13	408331	5409641
	14	402860	5408125
	15	399150	5407191
	16	398162	5406961
	17	397787	5406840
	18	397594	5406762
	19	397379	5406756
	20	396884	5406641
11021-3a	1	407212	5409331
Infills	2	408331	5409641
	3	411799	5410437
	4	415405	5402060
	5	411541	5401173
	6	411346	5401119
	7	410743	5401130
11021-4	1	411834	5410445
	2	412621	5410626
	3	412444	5411098
	4	415590	5411821
	5	415413	5412293
	6	417970	5412880
	7	421926	5402325
	8	419835	5402325
	9	419421	5402170
	10	419141	5402918
	11	415011	5401970
11021-4a	1	411829	5410444
Infills	2	412080	5410502

Block	Corners	X-UTM (E)	Y-UTM (N)
	3	415257	5402026
	4	415006	5401969
11021-5	1	417942	5412877
	2	422742	5413766
	3	422742	5413257
	4	424742	5413628
	5	424742	5413119
	6	426633	5413469
	7	426833	5413537
	8	427433	5413537
	9	427633	5413654
	10	430434	5414173
	11	432232	5414500
	12	436932	5414500
	13	436939	5406202
	14	430740	5406154
	15	430740	5404217
	16	424746	5404218
	17	424741	5403095
	18	421742	5403097
	19	421742	5402325
	20	419642	5402325
	21	419442	5402429
	22	419142	5402413
	23	419141	5402918
	24	417942	5402643

Table 1. Area Corners in UTM 15N, NAD83

System Information

Figure 2. HELITEM® System in Flight

Figure 2 depicts the HELITEM® system in flight. The HELITEM® system is composed of a 52 m cable to which is attached a receiver platform 20.4 m below the Helicopter, a magnetometer attached to the transmitter loop 47 m below the helicopter. The top of the cable is attached to a helicopter and when in flight it drags to form a 25 degree angle from the vertical. The real time navigation GPS antenna is on the tail boom of the helicopter, the barometric altimeter, radar altimeter, video camera and data recorder are all installed in the helicopter. One GPS antenna is attached near the centre of transmitter loop to give positional information of the loop.

Aircraft and Geophysical On-Board Equipment

Aircraft:	AS 350 B3 Helicopter
Operator:	Great Slave Helicopters Ltd.
Registration:	C-FIDA
Survey Speed:	55 knots / 65 mph / 30 m/s
Magnetometer:	Scintrex CS-2 cesium vapour, attached to transmitter loop, sensitivity = 0.01 nT, sampling rate = 0.1 s, ambient range 20,000 to 100,000 nT. The general noise envelope was kept below 0.5 nT. The nominal sensor height was ~35 m above ground.
Electromagnetic system:	HELITEM® 30 channel multicoil system
Transmitter:	Vertical axis loop slung below helicopter
	Loop area 708 m^2
	Number of turns 2
	Nominal height above ground 35 m
Receiver:	Multicoil system (X, Y and Z) with a final recording rate of 10 samples/second, for 30 channels of X, Y and Z component data. The nominal height above ground was ~62 m.
Base frequency:	30 Hz
Pulse width:	4 ms
Pulse delay:	0.049 ms
Off-time:	12.638ms
Point value:	8.14 µs
Transmitter Current:	1415 A
Dipole moment:	$2x10^6 Am^2$

Times from start of cycle:						Times after Tx turnoff:				
Gate	Start time (ms)	End Time (ms)	Midpoint (ms)	Width (ms)			Start time (ms)	End Time (ms)	Midpoint (ms)	Width (ms)
0	0.049	0.220	0.134	0.171	Ontime					
1	0.220	1.489	0.854	1.270	Ontime					
2	1.489	2.759	2.124	1.270	Ontime					
3	2.759	4.028	3.394	1.270	Ontime					
4	4.183	4.199	4.191	0.016	Offtime	4	0.155	0.171	0.163	0.016
5	4.199	4.224	4.211	0.024	Offtime	5	0.171	0.195	0.183	0.024
6	4.224	4.256	4.240	0.033	Offtime	6	0.195	0.228	0.212	0.033
7	4.256	4.297	4.277	0.041	Offtime	7	0.228	0.269	0.248	0.041
8	4.297	4.346	4.321	0.049	Offtime	8	0.269	0.317	0.293	0.049
9	4.346	4.403	4.374	0.057	Offtime	9	0.317	0.374	0.346	0.057
10	4.403	4.468	4.435	0.065	Offtime	10	0.374	0.439	0.407	0.065
11	4.468	4.541	4.504	0.073	Offtime	11	0.439	0.513	0.476	0.073
12	4.541	4.622	4.582	0.081	Offtime	12	0.513	0.594	0.553	0.081
13	4.622	4.712	4.667	0.090	Offtime	13	0.594	0.684	0.639	0.090
14	4.712	4.810	4.761	0.098	Offtime	14	0.684	0.781	0.732	0.098
15	4.810	4.932	4.871	0.122	Offtime	15	0.781	0.903	0.842	0.122
16	4.932	5.111	5.021	0.179	Offtime	16	0.903	1.082	0.993	0.179
17	5.111	5.330	5.221	0.220	Offtime	17	1.082	1.302	1.192	0.220
18	5.330	5.591	5.461	0.260	Offtime	18	1.302	1.563	1.432	0.260
19	5.591	5.908	5.750	0.317	Offtime	19	1.563	1.880	1.721	0.317
20	5.908	6.299	6.104	0.391	Offtime	20	1.880	2.271	2.075	0.391
21	6.299	6.771	6.535	0.472	Offtime	21	2.271	2.743	2.507	0.472
22	6.771	7.340	7.056	0.570	Offtime	22	2.743	3.312	3.027	0.570
23	7.340	8.032	7.686	0.692	Offtime	23	3.312	4.004	3.658	0.692
24	8.032	8.870	8.451	0.838	Offtime	24	4.004	4.842	4.423	0.838
25	8.870	9.888	9.379	1.017	Offtime	25	4.842	5.859	5.351	1.017
26	9.888	11.125	10.506	1.237	Offtime	26	5.859	7.096	6.478	1.237
27	11.125	12.630	11.877	1.506	Offtime	27	7.096	8.602	7.849	1.506
28	12.622	14.453	13.538	1.831	Offtime	28	8.594	10.425	9.509	1.831
29	14.453	16.667	15.560	2.214	Offtime	29	10.425	12.638	11.532	2.214

Table 2. HELITEM® Gate positions

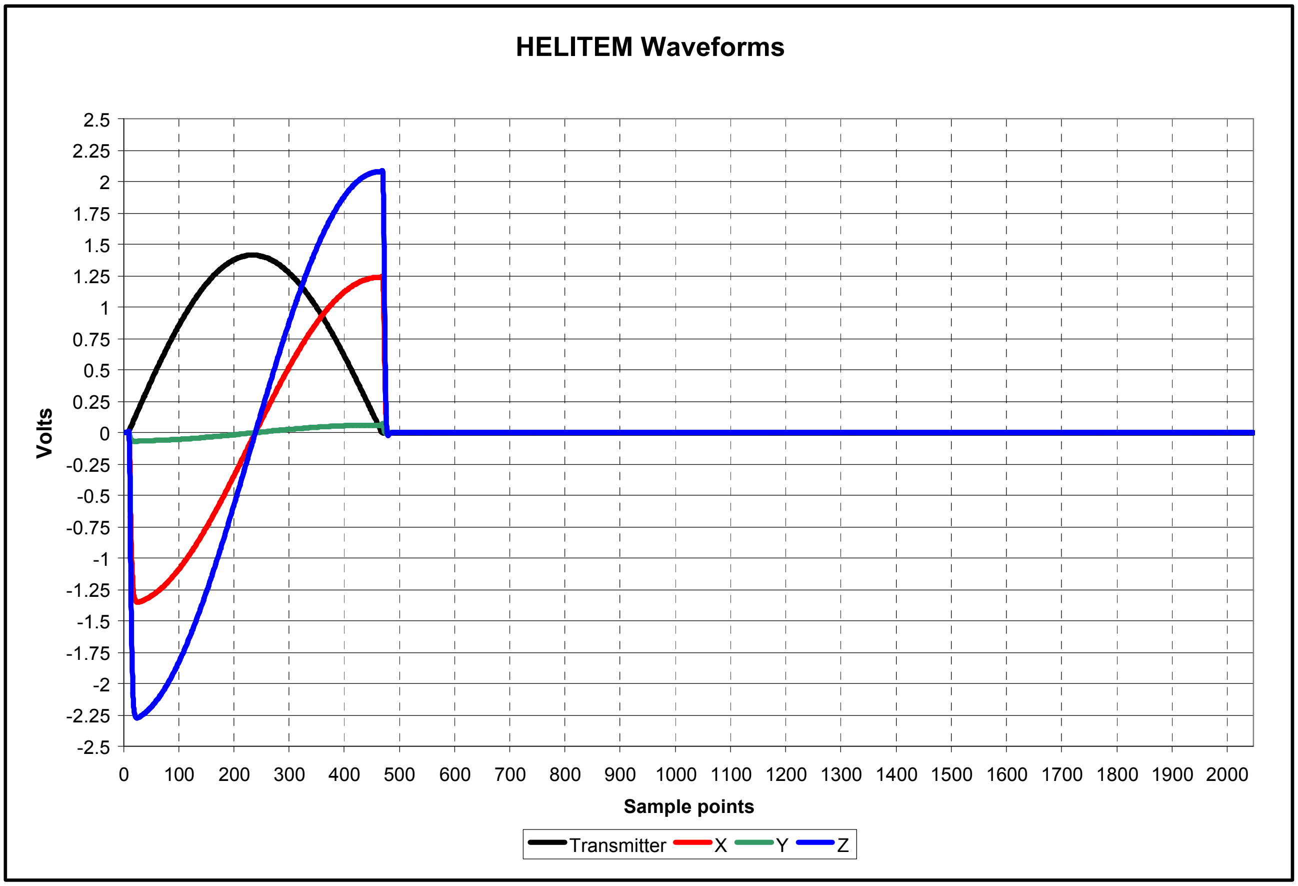


Figure 3. HELITEM® System Waveforms

The aircraft is equipped with a HELITEM® electromagnetic and magnetic survey system configured as follows:

Manufacturer	Fugro Airborne Surveys Corp.
Model	HELITEM
Base frequency	30 Hz
Pulse width	4 ms
Time gates	30 Channels
Dipole moment (approx.)	2.0 x 10^6 A·m^2 (@+1°C)
Windowed data sample rate	10 Hz
Receiver	3-component induction coil sensor
Measured response	voltage (dB/dt) and real time calculated B-field
Bandwidth	Base frequency to 25 kHz
Digital recording	all raw data channels

The following ancillary equipment will be installed:

Magnetometer	
Manufacturer	Scintrex
Type	Cesium vapour optically pumped split beam
Model	CS-2 or CS-3 in magnetometer bird
Sampling rate	10 Hz
Sensitivity	0.01 nT
GPS Receiver	
Manufacturer	Novatel
Type	12 channel C/ A code & carrier phase
Model	OEM4-G2L
Sampling rate	1.00 Hz
Differential position accuracy	< 3 m
Autonomous position accuracy	< 10 m
Radar Altimeter	
Manufacturer	King or Sperry
Type	Frequency modulated radio
Model	KRA40 or AA300
Sampling rate	Analog output - recorded at 10 Hz
Range	0 - 610 m
Accuracy	± 5%
Barometric Altimeter	
Manufacturer	Motorola
Type	Altitude transducer
Model	1241 M
Sampling rate	Analog output - recorded at 10 Hz
Range	-305 to 4570 m barometric
Accuracy	± 1.5 Kpa
Video Camera	
Manufacturer	Panasonic
Type	Colour NTSC
Model	WV-CL302
Recorder	Axis 241S Video Capture Server
Recording rate	2 Hz
DGPS (where available)	
Manufacturer	WAAS (if available)
Type	Satellite transmitted corrections

Base Station Equipment

During the survey a base station GPS was set up to collect data to allow post processing of the positional data for increased accuracy. The location of the GPS base station is recorded in Table 3

Status	Location Name	WGS84 Latitude (deg-min-sec)	WGS84 Longitude (deg-min-sec)	Orthometric Height EGM96 (m)	Date Setup	Date Torn Down
Primary	Coreshack landing site	48 51 20.59166	94 01 09.79331	377.218	15-Apr-11	29-Apr-11
Secondary	Coreshack landing site	48 51 20.76385	94 0110.04833	376.198	15-Apr-11	29-Apr-11
Primary	Coreshack landing site	48 42 58.71797	94 21 38.89813	339.932	29-Apr-11	4-May-11
Secondary	Coreshack landing site	48 42 58.36134	94 21 38.68592	334.196	29-Apr-11	4-May-11

Table 3. GPS Base Station Location

The magnetic base station locations are in Table 4.

Status	Location Name	WGS84 Latitude (deg-min-sec)	WGS84 Longitude (deg-min-sec)	Orthometric Height EGM96 (m)	Date Setup	Date Torn Down
Primary	Coreshack landing site	48 51 20.76385	94 01 10.04833	376.198	15-Apr-11	29-Apr-11
Secondary	Coreshack landing site	48 51 20.68415	94 01 10.34156	369.318	15-Apr-11	29-Apr-11
Primary	Pinewood Landing site	48 42 58.36134	94 21 38.68592	334.196	29-Apr-11	4-May-11
Secondary	Pinewood Landing site	48 42 58.05533	94 21 39.36159	328.665	29-Apr-11	4-May-11

Table 4. Magnetic Base Station Location

GPS Novatel OEM4/V receiver system

Magnetometer Scintrex CS-2 (Primary) & CS-3 (secondary) cesium vapor sensor with timing provided by CFI Marconi GPS receiver

Figure 4. Typical GPS Base station setup

Survey Specifications

Block Summary

Table 5 summarizes the survey specifications for the Rainy River blocks, including line spacing and flight directions.

BLOCK	LINES FROM	LINES TO	FLIGHT DIRECTION	LINE SPACING	MEASURED LINE km
1	10010	10290	NW-SE (315°)	200 metres	201.1
	10155	10295	NW-SE (315°)	infills	107.2
	19010	19040	NE-SW (45°)	2000 metres	22.3
2	20010	20310	NW-SE (328°)	200 metres	258.2
	20015	20185	NW-SE (328°)	infills	138.1
	29010	29040	NE-SW (58°)	2000 metres	24.8
3	30010	30760	NW-SE (337°)	200 metres	648.9
	30535	30765	NW-SE (337°)	infills	218.5
	39010	39040	NE-SW (75°)	2000 metres	61.4
4	40010	40330	NW-SE (339°)	200 metres	331.1
	40005	40015	NW-SE (339°)	infills	18.1
	49010	49050	NE-SW (69°)	2000 metres	33.0
5	50010	50950	N-S (0°)	200 metres	901.2
	59010	59060	E-W (90°)	2000 metres	86.8
				TOTAL:	3050.7

Table 5. Summary of Survey Specification

Survey Elevation

Optimum survey elevations for the helicopter and instrumentation during normal survey flying are:

Helicopter	83 metres
Magnetometer	63 metres
HELITEM Receiver	63 metres
HELITEM Transmitter	35 metres

Survey elevations will not deviate by more than 20% over a distance of 2 km from the contracted elevation.

Survey elevation is defined as the measurement of the helicopter radar altimeter to the tallest obstacle in the helicopter path. An obstacle is any structure or object which will impede the path of the helicopter to the ground and is not limited to and includes tree canopy, towers and power lines.

Survey elevations may vary based on the pilot's judgement of safe flying conditions around man-made structures or in rugged terrain.

Noise Levels

Electromagnetic Data

The noise envelopes of the EM data, as indicated on the raw traces of channel 30 (or calculated last off-time channel), shall not exceed the following tolerances continuously over a horizontal distance of 1,000 metres under normal survey conditions:

- 30 Hz configuration: dB/dt X and Z < +/- 5 nT/s and B-Field X and Z < +/- 12.5 pT

Noise level is specified as being plus or minus two standard deviations of the high-pass filtered channel data. The filter applied is an FFT high-pass centred at a period of 1.9 seconds.
Spheric pulses may occur having strong peaks but narrow widths. The EM data are considered acceptable when their occurrence is less than 10 spheric events exceeding the stated noise specification per 100 samples continuously over a distance of 2,000 metres.

Airborne High Sensitivity Magnetometer

Magnetic total-field intensity data will be recorded on-board the aircraft as follows:

- Sample interval will be 0.1 – second (10 samples/second)
- Magnetometer sensitivity will be 0.1 nT

Magnetometer noise level will not exceed ±1.0 nT for a distance of 1 km or more.

Ground Base Station Magnetometer

Base station magnetometer information will be recorded digitally at a minimum of 3.0 second intervals.

For acceptance of the magnetic data, non-linear variations in the magnetic diurnal should not exceed 10 nT over a chord of 60 seconds.

Field Crew

The field crew for the survey were as follows:

Data Processors:	Shaolin (David) Lu
Pilot:	Danny Regan and Glenn Charbonneau
Electronics Operator:	Burke Schieman, David Kim, Timothy Nykolaichuk and Alex Korneev
Engineer:	Will Ward

Data Processing

Field

All digital data were verified for validity and continuity. The data from the aircraft and base station were transferred to the field PC. Basic statistics were generated for each parameter recorded, these included: the minimum, maximum, and mean values; the standard deviation; and any null values located. Data were checked in the field by the FUGRO AIRBORNE SURVEYS field geophysicist for adherence to the survey specifications as outlined in the survey specifications section. Any failure to meet the survey specifications resulted in a re-flight of the line or portion of the line unless aircraft safety was at risk or the client's on site representative approved the data.

Flight Path Recovery

The quality of the GPS navigation was controlled on a daily basis by recovering the flight path of the aircraft. The correction procedure used the raw ranges from the base station to create improved models of clock error, atmospheric error, satellite orbit, and selective availability. These models are used to improve the conversion of aircraft raw ranges to differentially corrected aircraft position.

To check the quality of the positional data the aircraft speed is calculated using the differentially corrected x, y and z data. Any sharp changes in the speed are used to flag possible problems with the positional data. Where speed jumps occur the data are inspected to determine the source of the error. The erroneous data are deleted and splined if less than two seconds in length. If the error is greater than two seconds the raw data are examined and if acceptable may be shifted and used to replace the bad data. The gps z component is the most common source of error. When it shows problems that cannot be corrected by recalculating the differential correction the barometric altimeter is used as a guide to assist in making the appropriate correction.

Altitude Data

Radar altimeter data is de-spiked by applying a one and a half second median and smoothed using a one and a half second Hanning filter. The data are then subtracted from the GPS elevation to create a digital terrain model that is gridded and consulted in conjunction with profiles of the radar altimeter and flight path video to detect any spurious points.

Barometric altimeter data is also smoothed with a 1.5 second Hanning filter.

Base Station Diurnal Magnetics

The raw diurnal data sampled at 1 Hz and are imported into a database. The data are filtered with a 5 second median filter and then a 5 second Hanning filter to remove spikes and smooth short wavelength variations. A nonlinear variation is then calculated and a flag channel is created to indicate where the variation exceeds the survey tolerance. Acceptable diurnal data are interpolated to a 10 Hz sample rate and the local regional field value calculated from the average of the first day's diurnal data is removed to leave the diurnal variation. This diurnal variation is then ready to be used in the processing of the airborne magnetic data.

Airborne Magnetics

Residual Magnetic Intensity (RMI)

The total magnetic intensity (TMI) data collected in flight were profiled on screen along with a fourth difference channel calculated from the TMI. Spikes were removed manually where indicated by the fourth difference. The de-spiked data were then corrected for lag by 26 samples. The diurnal variation that was extracted from the filtered ground station data was then removed from the de-spiked and lagged TMI. The IGRF (International Geomagnetic Reference Field) is removed from the TMI to generate the residual magnetic intensity (RMI) which is then tie line levelled, manually corrected and micro-levelled if necessary.

Calculated Vertical Gradient (CVG)

The first vertical derivative was calculated in the frequency domain from the final gridded RMI values to enhance subtleties related to geological structures. A first vertical derivative was also computed in the database along survey lines for display in the multi-parameter profiles.

Calculated Horizontal Gradient (HMG)

The first horizontal derivative was calculated in the frequency domain from the final gridded RMI values in the survey direction of each block to enhance subtle geological features perpendicular to the survey direction.

Electromagnetics

dB/dt Data

Lag correction: 0 sample

Data correction: The X, Y and Z component data were re-processed from the raw stream to produce the 30 raw channels at 10 samples per second.

The following processing steps were applied to the dB/dt data from all coil sets:

a) The data from channels 1 to 4 (on-time) and 5 to 30 (off-time) were corrected for drift in flight form by passing a linear fitting along each channel between the base level points selected where the pre- and post- flight background checks were conducted when the system is out of ground effect, via a graphic screen display;

b) Both the on-time and off-time data were corrected for the noise caused by the receiver coil oscillation which exhibits a period of about 2 seconds.

c) Spikes caused by spherics were corrected when necessary.

d) Noise filtering was done using an adaptive filter technique based on time domain triangular operators. Using a second difference value to identify changes in gradient along each channel, minimal filtering (3 point convolution) is applied over the peaks of the anomalies, ranging in set increments up to a maximum amount of filtering in the resistive background areas (31 points for both the X and the Z component data);

e) The filtered X, Y and Z component data were then levelled in flight form for any residual and nonlinear drift that was not adequately corrected during the drift correction.

f) Line based levelling is rarely needed but is applied if necessary.

B-field Data

The processing steps for the B-field data are exactly the same as those for the dB/dt data.

Note: The introduction of the B-Field data stream, as part of the HELITEM® system, provides the explorationist with a more effective tool for exploration in a broader range of geological environments and for a larger class of target priorities.

The advantage of the B-Field data compared with the normal voltage data (dB/dt) are as follows:

1. A broader range of target conductance that the system is sensitive to. (The B-Field is sensitive to bodies with conductance as great as 100,000 Siemens);
2. Enhancement of the slowly decaying response of good conductors;
3. Suppression of rapidly decaying response of less conductive overburden;
4. Reduction in the effect of spherics on the data;
5. An enhanced ability to interpret anomalies due to conductors below thick conductive overburden;
6. Reduced dynamic range of the measured response (easier data processing and display).

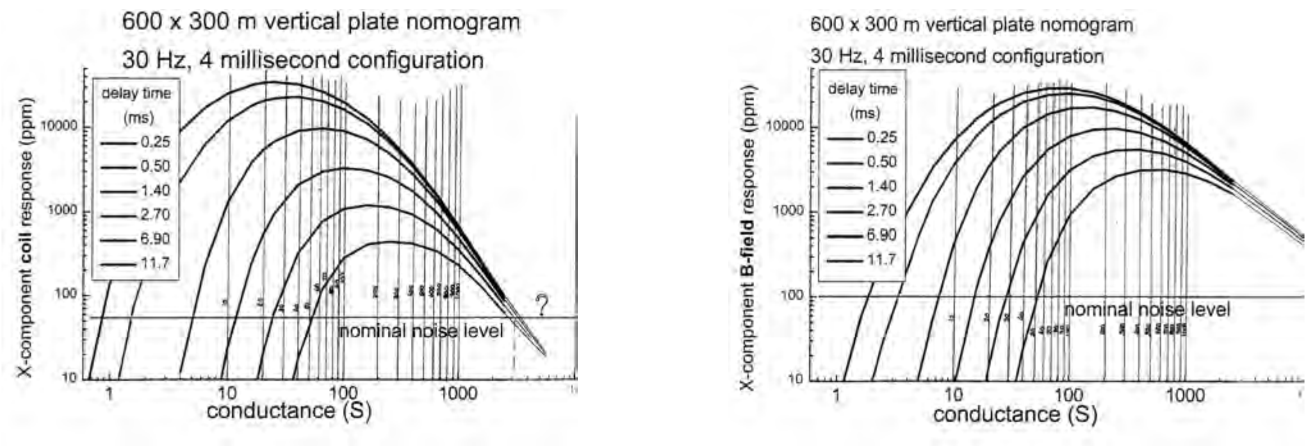


Figure 5. dB-dt Vertical Plate Nomogram (left), B-field Vertical Plate Nomogram (right).

Figure 5 displays the calculated vertical plate response for the GEOTEM® signal for the dB/dt and B-Field. For the dB/dt response, you will note that the amplitude of the early channel peaks at about 25 Siemens, and the late channels at about 250 Siemens. As the conductance exceeds 1000 Siemens the response curves quickly roll back into the noise level. For the B-Field response, the early channel amplitude peaks at about 80 Siemens and the late channel at about 550 Siemens. The projected extension of the graph in the direction of increasing conductance, where the response would roll back into the noise level, would be close to 100,000 Siemens. Thus, a strong conductor, having a conductance of several thousand Siemens, would be difficult to interpret on the dB/dt data, since the response would be mixed in with the background noise. However, this strong conductor would stand out clearly on the B-Field data, although it would have an unusual character, being a moderate to high amplitude response, exhibiting almost no decay.

In theory, the response from a super conductor (50,000 to 100,000 Siemens) would be seen on the B-Field data as a low-amplitude, non-decaying anomaly, not visible in the off-time channels of the dB/dt stream. Caution must be exercised here, as this signature can also reflect a residual noise event in the B-Field data. In this situation, careful examination of the dB/dt on-time (in-pulse) data is required to resolve the ambiguity. If the feature were strictly a noise event, it would not be present in the dB/dt off-time data stream. This would locate the response at the resistive limit, and the mid in-pulse channel (normally identified as channel 3) would reflect little but background noise, or at best a weak negative peak. If, on the other hand, the feature does indeed reflect a superconductor, then this would locate the response at the inductive limit. In this situation, channel 3 of the dB/dt stream will be a mirror image of the transmitted pulse, i.e. a large negative.

Coil Oscillation Correction

The electromagnetic receiver sensor of the HELITEM® is housed in a platform container which is slung below the helicopter using a cable and attached to the transmitter loop through a network of cables. The platform design reduces the rotations of the receiver coils in flight as well as improves the stability of the receiver-transmitter geometry. However sudden changes in airspeed of the aircraft, strong variable crosswinds, or other turbulence can still result in sudden moves of the platform. This can result in the induction sensors inside the platform rotating about their mean orientation. The rotation is most marked when the air is particularly turbulent. The changes in orientation result in variable coupling of the induction coils to the primary and secondary fields. For example, if the sensor that is normally aligned to measure the x-axis response pitches upward, it will be measuring a response that will include a mixture of the X and Z component responses. The effect of coil oscillation on the data increases as the signal from the ground (conductivity) increases and may not be noticeable when flying over areas which are generally resistive. This becomes more of a concern when flying over highly conductive ground.

Using the changes in the coupling of the primary field, it is possible to estimate the pitch, roll and yaw of the receiver sensors. In the estimation process, it is assumed that a smoothed version of the primary field represents the primary field that would be measured when the sensors are in the mean orientation. The orientations are estimated using a non-linear inversion procedure, so erroneous orientations are sometimes obtained. These are reviewed and edited to insure smoothly varying values of orientations. These orientations can then be used to un-mix the measured data to generate a response that would be measured if the sensors were in the correct orientation.

For the present datasets the data from all 30 channels of dB/dt and B-Field parameters have been corrected for coil oscillation.

dB/dt Z Data

The amplitude of the dB/dt Z component reflects the strength of the conductivities of the earth. Due to the geometry of the HELITEM® system, the Z component response from a near vertical discrete conductor peaks at either side of but nulls where the transmitter is on top of the conductor. This results an "M" shaped Z component anomaly over a vertical conductor. The amplitudes of, and the distance between the two peaks can be used to indicate the dip angle and dip direction of the conductor. For the present datasets, the grid images of the amplitude of the dB/dt Z component measured at 1.721 ms from the end of pulse are presented with this report.

dB/dt Fraser Filtered X Data

The asymmetry of geometry of the transmitter loop and the receiver's X-coil also affects the X component responses over discrete conductors. For a vertical conductor, the X component response reaches a maximum as the system approaches the conductor, rapidly decreases to zero near the top of the conductor and reaches a negative minimum on the other side of the conductor. The shape of the X component response over a discrete conductor depends on both the dipping angle and the flight direction, which renders a grid image of the X responses over discrete conductors complicated and hard to interpret. The Fraser Filter is a gradient filter which, when applied to the X component data, highlights the steep gradients near the zero crossing of the response on top of discrete conductors and suppresses the responses from half-space earth. Thus the Fraser filtered X component data are simplified with anomalous features indicating the existence and location of discrete conductors. For the present datasets, the grid images of the Fraser filtered dB/dt X component data at 1.721 ms from the end of pulse are presented with this report.

EM Anomalies

EM anomalies are selected automatically with Fugro proprietary software from both X and Z components. These automatically generated anomalies were then examined in profile form for each line against the X & Z EM responses, decay information, magnetic responses, altimeter readings and flight path videos. Anomaly types (D – discrete thin conductors, B – bed rock conductors, S-surficial conductors, E – edge effects from the edges of broad conductors and L - cultural responses from such sources as power lines, highways, etc.) were then interpreted and assigned to each anomaly. For each anomaly, the conductivity-thickness-produc t(CTP), amplitude of the EM response, the last off-time channel that has an anomalous response, apparent depth and dip were included. The apparent CTP, dip and depth information were derived using a simple plate model which adequately describes single isolated thin conductor. If several conductors are closely positioned the integral EM responses from these conductors are more complicated and less well defined than a single isolated thin conductor. Consequently, the derived apparent parameters are less certain. The anomaly list files contain detailed information about the anomalies. The EM anomalies maps were compiled and were provided with this report. In the maps the anomaly types were color coded for easy use. Red – for D & B type anomalies; Blue – for S & E type anomalies; and Black for L type anomalies.

Differential Conductivity Depth Sections

Differential Resistivity/Conductivity is a simple, relatively accurate resistivity/conductivity section developed by Fugro to be derived from airborne electromagnetic data (Huang and Fraser, 1996). This type of resistivity/conductivity section is fast and robust, and provides an excellent picture of conductivity conditions in the earth. It can be derived from both frequency domain and time domain EM data.

Differential Resistivity/Conductivity is derived from a homogeneous halfspace model of the resistivity/conductivity calculated for each time channel or EM frequency, each at an approximate depth. The early time channel or high frequency data provide a measure of the shallow resistivity/conductivity, and the deeper (later time, lower frequency) halfspace resistivities/conductivities are modified using the shallow information to give a more accurate measure of the resistivity/conductivity at depth. The depth of investigation for each time channel or frequency is adjusted as well.

Differential Resistivity/Conductivity sections tend to smooth sharply defined layers (compared to layered-earth inversions) but provide an excellent model of the resistivity/conductivity, quickly and without the complex processing necessary for inversions. The sections are valuable as a QC tool, as an overview of the resistivity/conductivity distribution in the earth, and often to provide guidance and a starting model for more complex inversions.

The differential conductivity depth sections, derived from each survey line, are created as individual grids and displayed on the multi parameter profiles. The grids have been corrected for elevation variations such that the top of each section reflects the true terrain topography.

Reference:
Huang, Haoping and Fraser, Douglas, 1996, The differential parameter method for multifrequency airborne resistivity mapping, Geophysics Vol 61, No 1, January-February 1996, P 100-109.

Final Products

Digital Archives

Line and grid data in the form of Geosoft database (*.gdb) and Geosoft grids (*.grd) have been written to a DVD. The formats and layouts of these archives are further described in Appendix C (Data Archive Description). Hardcopies of all maps have been created as outlined below.

Maps

Scale:	1:20,000
Parameters:	Residual Magnetic Intensity Calculated Vertical Gradient from the residual magnetic intensity data Calculated Horizontal Gradient from the residual magnetic intensity data EM Amplitude dB/dt Z Component at 1.721 ms from the end of pulse EM Amplitude dB/dt Fraser Filtered X Component at 1.721 ms from the end of pulse EM Anomalies
Media/Copies:	PDF and 2 paper copies

Profile Plots

Scale:	1:20,000
Parameters:	Multi-parameter presentation with 23 offtime channels of both dB/dt and B field of X and Z component, Residual Magnetic Intensity, Calculated Vertical Gradient, Radar Altimeter, Transmitter height above the EGM96 Geoid, Powerline Monitor, Terrain, Helicopter height above the terrain, and Terrain adjusted Differential Conductivity Depth Section.
Media/Copies:	PDF

Report

Media/Copies:	2 paper & 1 digital (PDF format)

Flight Path Videos

Media/Copies:	10 DVDs (.Bin/BDX format)

All the grids and maps have been produced with the following coordinate system.

Projection:	Universal Transverse Mercator (UTM Zone 15N)
Datum:	WGS84
Central meridian:	63° West
False Easting:	500000 metres
False Northing:	0 metre
Scale factor:	0.9996

Appendix A

Helicopter Airborne Electromagnetic Systems

HELICOPTER AIRBORNE ELECTROMAGNETIC SYSTEMS

General

The operation of a helicopter time-domain electromagnetic system (EM) involves the measurement of decaying secondary electromagnetic fields induced in the ground by a series of short current pulses generated from a towed transmitter. Variations in the decay characteristics of the secondary field (sampled and displayed as windows) are analyzed and interpreted to provide information about the subsurface geology. The response of a related fixed-wing system utilizing a vertical-axis transmitter dipole and a multicomponent receiver coil has been documented by various authors including Smith and Keating (1991, Geophysics v.61, p. 74-81).

A number of factors combine to give the helicopter platforms good signal-to-noise ratio, depth of penetration and excellent resolution: 1) the principle of sampling the induced secondary field in the absence of the primary field (during the "off-time"), 2) the large dipole moment 3) the low flying height of the system and spatial proximity of the transmitter and receiver. Such a system is also relatively insensitive to noise due to air turbulence. However, also sampling in the "on-time" can result in excellent sensitivity for mapping very resistive features and very conductive features, and thus mapping the geology (Annan et al, 1991, Geophysics v.61, p. 93-99)

Through free-air model studies using the University of Toronto's Plate and Layered Earth programs it may be shown that the "depth of investigation" depends upon the geometry of the target and the conductivity of the overburden.

The method also offers very good discrimination of conductor geometry. This ability to distinguish between flat-lying and vertical conductors combined with good depth penetration results in good differentiation of bedrock conductors from surficial conductors.

Methodology

The Fugro time-domain helicopter electromagnetic system (HELITTEM®) uses the same high-speed digital EM receiver that is used in the GEOTEM® and MEGATEM® systems. The primary electromagnetic pulses are created by a series of discontinuous sinusoidal current pulses fed into a two-turn transmitting loop towed below the helicopter. The base frequency rate is selectable, with 25, 30, 75 and 90 currently being available. The length of the pulse can be tailored to suit the targets. Standard pulse widths available are 2.0 and 4.0 ms. The available off-time can be selected to be as great as 16 ms. The dipole moment depends on the pulse width and base frequency used on the survey. The specific dipole moment, waveform and gate settings for this survey are given in the main body of the report.

The receiver is a three-axis (x,y,z) induction coil housed in a platform suspended on the tow cable below the helicopter and above the transmitter. The tow cable is non-magnetic, to reduce noise levels. The tow cable is 53 m long, with the receiver being 27 m above the transmitter.

For each primary pulse a secondary magnetic field is produced by decaying eddy currents in the ground. These in turn induce a voltage in the receiver coils, which is the electromagnetic response. Good conductors decay slowly, poorer conductors more rapidly.

Operations, which are carried out in the receiver, are:

1. *Primary-field removal:* In addition to measuring the secondary response from the ground, the receiver sensor coils also measure the primary response from the transmitter. During flight, the receiver bird position and orientation changes slightly, and this has a very strong effect on the magnitude of the total response (primary plus secondary) measured at the receiver coils. The variable primary field response is distracting because it is unrelated to the ground response. The primary field can be measured by flying at an altitude such that no ground response is measurable. These calibration signals are used to define the shape of the primary waveform. By definition this primary field includes the response of the current in the transmitter loop plus the response of any slowly decaying eddy currents induced in the helicopter. We assume that the shape of the primary will be unchanged as the receiver bird position changes, but that the amplitude will vary. The primary-field-removal procedure involves solving for the amplitude of the primary field in the measured response and removing this from the total response to leave a secondary response. Note that this procedure removes any ("in-phase") response from the ground which has the same shape as the primary field.

2. *Digital Stacking:* Stacking is carried out to reduce the effect of broadband noise on the data.

3. *Windowing of data*: The digital receiver samples the secondary and primary electromagnetic field at 2048 points per EM pulse and windows the signal in up to 30 time gates whose centres and widths are software selectable and which may be placed anywhere within or outside the transmitter pulse. This flexibility offers the advantage of arranging the gates to suit the goals of a particular survey, ensuring that the signal is appropriately sampled through its entire dynamic range.

4. *Power Line Filtering:* Digital comb filters are applied to the data during real-time processing to remove power line interference while leaving the EM signal undisturbed. The RMS power line voltage (at all harmonics in the receiver passband) are computed, displayed and recorded for each data stack.

5. *Primary Field:* The primary field at the receiver sensor is measured for each stack and recorded as a separate data channel to assess the variation in coupling between the transmitter and the receiver sensor induced by changes in system geometry.

One of the major roles of the digital receiver is to provide diagnostic information on system functions and to allow for identification of noise events, such as sferics, which may be selectively removed from the EM signal. The high digital sampling rate yields maximum resolution of the secondary field.

System Hardware

The airborne EM system consists of the helicopter, the on-board hardware, and the software packages controlling the hardware. The software packages in the data acquisition system and in the EM receiver were developed in-house.

Transmitter System

The transmitter system drives high-current pulses of an appropriate shape and duration through the coils towed below the helicopter.

System Timing Clock

This subsystem provides appropriate timing signals to the transmitter, and also to the analog-to-digital converter, in order to produce output pulses and capture the ground response. All systems are synchronized to GPS time.

Platform Systems

A three-axis induction coil sensor is mounted inside a platform on the tow cable. A magnetometer sensor is attached to the EM transmitter loop.

Appendix B

Airborne Transient EM Interpretation

Interpretation of transient electromagnetic data

Introduction

The basis of the transient electromagnetic (EM) geophysical surveying technique relies on the premise that changes in the primary EM field produced in the transmitting loop will result in eddy currents being generated in any conductors in the ground. The eddy currents then decay to produce a secondary EM field which may be sensed in the receiver coil.

The HELITEM® airborne transient (or time-domain) EM system incorporates a high-speed digital receiver which records the secondary field response with a high degree of accuracy. Most often the earth's total magnetic field is recorded concurrently.

Although the approach to interpretation varies from one survey to another depending on the type of data presentation, objectives and local conditions, the following generalizations may provide the reader with some helpful background information.

The main purpose of the interpretation is to determine the probable origin of the responses detected during the survey and to suggest recommendations for further exploration. This is possible through an objective analysis of all characteristics of the different types of responses and associated magnetic anomalies, if any. If possible the airborne results are compared to other available data. Certitude is seldom reached, but a high probability is achieved in identifying the causes in most cases. One of the most difficult problems is usually the differentiation between surface conductor responses and bedrock conductor responses.

Types of Conductors

Bedrock Conductors

The different types of bedrock conductors normally encountered are the following:

1. *Graphites*. Graphitic horizons (including a large variety of carbonaceous rocks) occur in sedimentary formations of the Precambrian as well as in volcanic tuffs, often concentrated in shear zones. They correspond generally to long, multiple conductors lying in parallel bands. They have no magnetic expression unless associated with pyrrhotite or magnetite. Their conductivity is variable but generally high.

2. *Massive sulphides*. Massive sulphide deposits usually manifest themselves as short conductors of high conductivity, often with a coincident magnetic anomaly. Some massive sulphides, however, are not magnetic, others are not very conductive (discontinuous mineralization or sphalerite), and some may be located among formational conductors so that one must not be too rigid in applying the selection criteria.

   In addition, there are syngenetic sulphides whose conductive pattern may be similar to that of graphitic horizons but these are generally not as prevalent as graphites.

3. *Magnetite and some serpentinized ultrabasics*. These rocks are conductive and very magnetic.

4. *Manganese oxides*. This mineralization may give rise to a weak EM response.

Surficial Conductors

1. Beds of clay and alluvium, some swamps, and brackish ground water are usually poorly conductive to moderately conductive.

2. Lateritic formations, residual soils and the weathered layer of the bedrock may cause surface anomalous zones, the conductivity of which is generally low to medium but can occasionally be high. Their presence is often related to the underlying bedrock.

Cultural Conductors (Man-Made)

3. *Power lines*. These frequently, but not always, produce a conductive type of response. In the case when the radiated field is not removed by the power line comb filter, the anomalous response can exhibit phase changes between different windows. In the case of current induced by the EM system in a grounded wire, or steel pylon, the anomaly may look very much like a bedrock conductor.

4. *Grounded fences or pipelines*. These will invariably produce responses much like a bedrock conductor. Whenever they cannot be identified positively, a ground check is recommended.

5. *General culture*. Other localized sources such as certain buildings, bridges, irrigation systems, tailings ponds etc., may produce EM anomalies. Their instances, however, are rare and often they can be identified on the visual path recovery system.

Analysis of the Conductors

The rate of decay of a conductor is generally indicative of the conductivity of the anomalous material. However, the decay rate alone is not generally a decisive criterion in the analysis of a conductor. In particular, one should note:

- its shape and size,
- all local variations of characteristics within a conductive zone,
- any associated geophysical parameter (e.g. magnetics),
- the geological environment,
- the structural context, and
- the pattern of surrounding conductors.

The first objective of the interpretation is to classify each conductive zone according to one of the three categories which best defines its probable origin. The categories are cultural, surficial and bedrock. A second objective is to assign to each zone a priority rating as to its potential as an economic prospect.

Bedrock Conductors

This category comprises those anomalies which cannot be classified according to the criteria established for cultural and surficial responses. It is difficult to assign a universal set of values which typify bedrock conductivity because any individual zone or anomaly might exhibit some, but not all, of these values and still be a bedrock conductor. The following criteria are considered indicative of a bedrock conductor:

1. An intermediate to high conductivity identified by a response with slow decay, with an anomalous response present in the later windows.

2. For vertical conductors, the anomaly should be narrow, relatively symmetrical, with two well-defined z-component peaks and a null between the peaks.

3. If the conductor is thin, the response characteristics varies as a function of depth and dips. If the conductor is wider, the responses might look more similar to the sphere responses.

4. A small to intermediate amplitude. Large amplitudes are normally associated with surficial conductors. The amplitude varies according to the depth of the source.

5. A degree of continuity of the EM characteristics across several lines.

6. An associated magnetic response of similar dimensions. One should note, however, that those magnetic rocks which weather to produce a conductive upper layer will possess this magnetic association. In the absence of one or more of the characteristics defined in 1, 2, 3, 4 and 5, the related magnetic response cannot be considered significant.

Most obvious bedrock conductors occur in long, relatively monotonous, sometimes multiple zones following formational strike. Graphitic material is usually the most probable source. Massive syngenetic sulphides extending for many kilometres are known in nature but, in general, they are not common. Long formational structures associated with a strong magnetic expression may be indicative of banded iron formations.

In summary, a bedrock conductor reflecting the presence of a massive sulphide would normally exhibit the following characteristics:

- a high conductivity,
- an appropriate anomaly shape,
- a small to intermediate amplitude,
- an isolated setting,
- a short strike length (in general, not exceeding one kilometre), and
- preferably, with a localized magnetic anomaly of matching dimensions.

Surficial Conductors

This term is used for geological conductors in the overburden, either glacial or residual in origin, and in the weathered layer of the bedrock. Most surficial conductors are probably caused by clay minerals. In some environments the presence of salts will contribute to the conductivity. Other possible electrolytic conductors are residual soils, swamps, brackish ground water and alluvium such as lake or river-bottom deposits, flood plains and estuaries.

Normally, most surficial materials have low to intermediate conductivity so they are not easily mistaken for highly conductive bedrock features. Also, many of them are wide and their anomaly shapes are typical of broad horizontal sheets.

When surficial conductivity is high it is usually still possible to distinguish between a horizontal plate (more likely to be surficial material) and a vertical body (more likely to be a bedrock source) thanks to the characteristic shapes of the two anomalies and the differences in the x-component responses.

One of the more ambiguous situations as to the true source of the response is when surface conductivity is related to bedrock lithology as for example, surface alteration of an underlying bedrock unit. At times, it is also difficult to distinguish between a weak conductor within the bedrock (e.g. near-massive sulphides) and a surficial source.

In the search for massive sulphides or other bedrock targets, surficial conductivity is generally considered as interference but there are situations where the interpretation of surficial-type conductors is the primary goal. When soils, weathered or altered products are conductive, and in-situ, the responses are a very useful aid to geologic mapping. Shears and faults are often identified by weak, usually narrow, anomalies.

Analysis of surficial conductivity can be used in the exploration for such features as lignite deposits, kimberlites, paleochannels and ground water. In coastal or arid areas, surficial responses may serve to define the limits of fresh, brackish and salty water.

Cultural Conductors

The majority of cultural anomalies occur along roads and are accompanied by a response on the power line monitor. This monitor is set to 50 or 60 Hz, depending on the local power grid. In some cases, the current induced in the power line results in anomalies which could be mistaken for bedrock responses. There are also some power lines which have no response whatsoever.

The power line monitor, of course, is of great assistance in identifying cultural anomalies of this type. It is important to note, however, that geological conductors in the vicinity of power lines may exhibit a weak response on the monitor because of current induction via the earth.

Fences, pipelines, communication lines, railways and other man-made conductors can give rise to responses, the strength of which will depend on the grounding of these objects.

Another facet of this analysis is the line-to-line comparison of anomaly character along suspected man-made conductors. In general, the amplitude, the rate of decay, and the anomaly width should not vary a great deal along any one conductor, except for the change in amplitude related to terrain clearance variation. A marked departure from the average response character along any given feature gives rise to the possibility of a second conductor.

In most cases a visual examination of the site will suffice to verify the presence of a man-made conductor. If a second conductor is suspected the ground check is more difficult to accomplish. The object would be to determine if there is (i) a change in the man-made construction, (ii) a difference in the grounding conditions, (iii) a second cultural source, or (iv) if there is, indeed, a geological conductor in addition to the known man-made source.

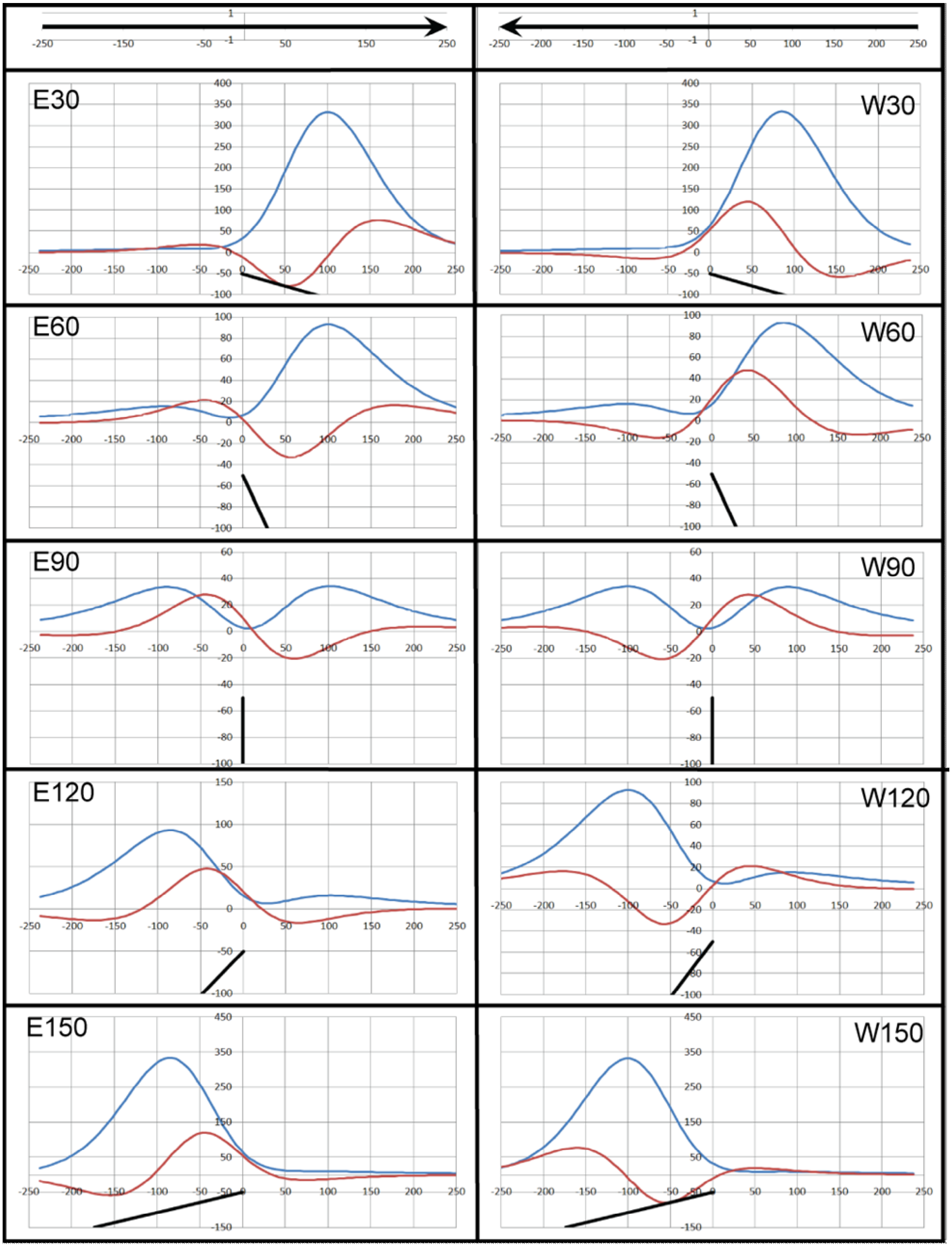
The selection of targets from within extensive (formational) belts is much more difficult than in the case of isolated conductors. Local variations in the EM characteristics, such as in the amplitude, decay, shape etc., can be used as evidence for a relatively localized occurrence. Changes in the character of the EM responses, however, may be simply reflecting differences in the conductive formations themselves rather than indicating the presence of massive sulphides and, for this reason, the degree of confidence is reduced.

Another useful guide for identifying localized variations within formational conductors is to examine the magnetic data in map or image form. Further study of the magnetic data can reveal the presence of faults, contacts, and other features which, in turn, help define areas of potential economic interest.

Finally, once ground investigations begin, it must be remembered that the continual comparison of ground knowledge to the airborne information is an essential step in maximizing the usefulness of the airborne EM data.

HELITEM™ Plate Models

The figure below depicts the HELITEM™ models over a simple 200mx200m plate at 50 m depth striking 90 to the flight line. The blue curve represents the Z component and the red curve X component.



HELITEM models, 200m x 200m plate, 50m deep, strike 90 to flight line. (Z, X)

Appendix C

Data Archive Description

Data Archive Description:

Reference: CDVD00805
Archive Date: September 16, 2011

This archive contains data and grids of an airborne geophysical survey conducted by FUGRO AIRBORNE SURVEYS CORP for Rainy River Resources Ltd. from April 12, 2011 to May 5, 2011 over its Rainy River property in Rainy River Area, ON.

Job # 11021

This archive comprises files in 6 directories and in the root directory:

\readme.txt - This file

GRIDS\

Grids of the survey blocks 1 to 5 in Geosoft format with associated .GI files

CVG_RainyRiver_Block#.GRD -	Calculated Vertical Magnetic Gradient nT/m
HMG_RainyRiver_Block#.GRD -	Calculated Horizontal Magnetic Gradient nT/m
RMI_RainyRiver_Block#.GRD -	Residual Magnetic Intensity nT
ZDB_RainyRiver_Block#.GRD -	dB/dt Z component at 1.721 ms from the end of pulse
XDBFF_RainyRiver_Block#.GRD -	dB/dt Fraser Filtered x component at 1.721 ms from the end of pulse

DataBases\

Databases of the survey blocks 1 to 5 in Geosodt GBD format with header information

RainyRiver_Block#.GDB -	Data archive in Geosoft GDB format
Database_Header.txt -	Summary of line data archive

Maps\

Maps (sheet# 1 to 3) in PDF format

CVG_RainyRiver_#.pdf -	maps of Calculated Vertical Magnetic Gradient nT/m
HMG_RainyRiver_#.pdf -	maps of Calculated Horizontal Magnetic Gradient
RMI_ RainyRiver_#.pdf -	maps of Total Magnetic Intensity nT
ZDB_ RainyRiver_#.pdf -	maps of dB/dt Z component at 1.721 ms from the end of pulse
XDBFF_ RainyRiver_#.pdf -	maps of dB/dt Fraser Filtered X component at 1.721 ms from the end of pulse
AEM_RainyRiver_#.pdf	maps of EM anomalies

GeosoftMaps\

Maps (sheet# 1 to 3) in Geosoft format

CVG_RainyRiver_#.map -	maps of Calculated Vertical Magnetic Gradient nT/m
HMG_RainyRiver_#.map -	maps of Calculated Horizontal Magnetic Gradient
RMI_ RainyRiver_#.map -	maps of Total Magnetic Intensity nT
ZDB_ RainyRiver_#.map -	maps of dB/dt Z component at 1.721 ms from the end of pulse
XDBFF_ RainyRiver_#.map -	maps of dB/dt Fraser Filtered X component at 1.721 ms from the end of pulse
AEM_RainyRiver_#.map	maps of EM anomalies

Profiles\

RainyRiver_Block#_LINE.pdf -	multi parameter profiles in PDF format

Where LINE denotes the line number

REPORT\

R11021_RainyRiver_sept2011.PDF -	Project Report
EMAnom_RainyRiver_Block#.csv	EM Anomaly lists of blocks 1 to 5 in csv format

Database Header Information

Project # : 11021
Type of Survey: Fugro HELITEM and magnetics Survey
Client: Rainy River Resources Ltd.
Area: Rainy River, Ontario, Canada
****

Survey Data Format

# Channel	Time	Units	Description
1 x_heli_nad83	0.1	m	helicopter easting NAD83 (UTM Zone 15N)
2 y_heli_nad83	0.1	m	helicopter northing NAD83 (UTM Zone 15N)
3 fid	0.1		fiducial increment
4 latitude_heli	0.1	degrees	helicopter latitude WGS 84
5 longitude_heli	0.1	degrees	helicopter longitude WGS 84
6 x_tx_nad83	0.1	m	transmitter loop easting NAD83 (UTM Zone 15N)
7 y_tx_nad83	0.1	m	transmitter loop northing NAD83 (UTM Zone 15N)
8 latitude_tx	0.1	degrees	transmitter loop latitude WGS 84
9 longitude_tx	0.1	degrees	transmitter loop longitude WGS 84
10 flight	0.1		flight number
11 date	0.1		flight date (yyyymmdd)
12 altrad	0.1	m	height above surface from radar altimeter
13 gpsz_heli	0.1	m	helicopter height above Geoid (EGM96)
14 gpsz_tx	0.1	m	transmitter height above Geoid (EGM96)
15 dtm	0.1	m	digital terrain model (above EGM96 Geoid))
16 diurnal	1.0	nT	measured diurnal ground magnetic intensity
17 diurnal_cor	0.1	nT	diurnal correction - base removed
18 mag_raw	0.1	nT	total magnetic intensity - spike rejected
19 mag_lag	0.1	nT	total magnetic intensity - corrected for lag
20 mag_diu	0.1	nT	total magnetic intensity - diurnal variation removed
21 rmi	0.1	nT	magnetic intensity
22 IGRF	0.1	nT	international geomagnetic reference field
23 x_db_filt	0.1	nT/s	dB/dt X component channels 1 - 30 - unlevelled
24 y_db_filt	0.1	nT/s	dB/dt Y component channels 1 - 30 - unlevelled
25 Z_db_filt	0.1	nT/s	dB/dt Z component channels 1 - 30 - unlevelled
26 x_bf_filt	0.1	pT	B field X component channels 1 - 30 - unlevelled
27 y_bf_filt	0.1	pT	B field Y component channels 1 - 30 - unlevelled
28 Z_bf_filt	0.1	pT	B field Z component channels 1 - 30 - unlevelled
29 x_db_lev	0.1	nT/s	dB/dt X component channels 1 - 30 - levelled
30 y_db_lev	0.1	nT/s	dB/dt Y component channels 1 - 30 - levelled
31 Z_db_lev	0.1	nT/s	dB/dt Z component channels 1 - 30 - levelled
32 x_bf_lev	0.1	pT	B field X component channels 1 - 30 - levelled
33 y_bf_lev	0.1	pT	B field Y component channels 1 - 30 - levelled
34 Z_bf_lev	0.1	pT	B field Z component channels 1 - 30 - levelled
35 x_db_ff	0.1	nT/s/m	dB/dt Fraser Filtered X component channels 1 – 30
36 x_bf_ff	0.1	pT/m	B Field Fraser Filtered X component channels 1 – 30
37 DiffCond_DB_Z	0.1	mS/m	Differential conductivity section array (5 meter thickness, up tp 500m) dB/dt Z

38 DiffCond_BF_Z	0.1	mS/m	Differential conductivity section array (5 meter thickness, up tp 500m) BF Z
39 Powerline	0.1	uV	power line monitor channel
40 tx_current	0.1	A	transmitter peak current

Datum	NAD83
Spheroid	GRS80
Projection	UTM
Central meridian	93 West (15N)
False easting	500000
False northing	0
Scale factor	0.9996
Northern parallel	N/A
Base parallel	N/A
WGS84 to local conversion method	Molodensky
Delta X shift	0
Delta Y shift	0
Delta Z shift	0

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Appendix D

LIST OF PERSONNEL

The following personnel were involved in the acquisition, processing, and presentation of data, relating to the HeliGEOTEM airborne geophysical survey carried out at the Rainy River property, Ontario.

David Miles	Manager, Helicopter Operations
Graham Konieczny	Manager, Data Processing and Interpretation
Adriana Pagliero	Project manager
Burke Schieman	Equipment operator
David Kim	Equipment operator
Alex Korneev	Equipment operator
Timothy Nykolaichuk	Equipment operator
Shaolin (David) Lu	Field data processor
Glenn Charbonneau	Pilot (GHSL)
Danny Regan	Pilot (GHSL)
Will Ward	Aircraft Maintenance Engineer
Graham Konieczny	Geophysicist, processing
Tianyou Chen	Geophysicist, processing/interpretation
Lyn Vanderstarren	Drafting Supervisor
Albina Tonello	Office secretary and expeditor

All personnel are employees of Fugro Airborne Surveys, except for the pilots who are employees of Great Slave Helicopters Ltd (GHSL).