MAR 20040014: LIEGE

Received date: Sep 22, 2004

Public release date: Oct 25, 2005

Alberta Mineral Assessment Reporting System

Alberta

977554 Alberta Ltd.

ASSESSMENT REPORT

LIEGE PROSPECT

**GEOCHEMICAL SAMPLING,
AIRBORNE EM SURVEY
AND
DIAMOND DRILLING
ON THE LIEGE PROSPECT
NORTHERN ALBERTA**

April 2004

Metallic and Industrial Mineral Permits
permits 9302050133, 9302050134

Geographic Co-ordinates
56° 52' N
113° 40' W
NTS Map Areas:
84A

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977554 Alberta Ltd.
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LIEGE PROSPECT

Summary

Kimberlite exploration on the Liege Prospect by 977554 Alberta Ltd. included indicator mineral sampling, airborne geophysics and diamond drilling. A total of 7 sites were sampled for indicators, 29.2 kilometres of Heli Mag/EM were flown and 2 diamond drill holes concluded without a kimberlite discovery.

Location and Access

The Liege Prospect is located in northern Alberta 97 kilometres north of the town of Wabasca and 140 kilometres west of the town of Fort McMurray (Figure 1). Winter access to the center of the property is along the Alpac road north from Wabasca to the 119 km marker and then west along cleared cut lines to the Clearwater Lake drill sites. Summer access is by helicopter or Argo.

Claim Information

Land acquisition began on May 24, 2002 when 2 permits totaling 18,432ha were recorded. On March 18, 2003 an additional 14 permits totaling 110,124ha were recorded.

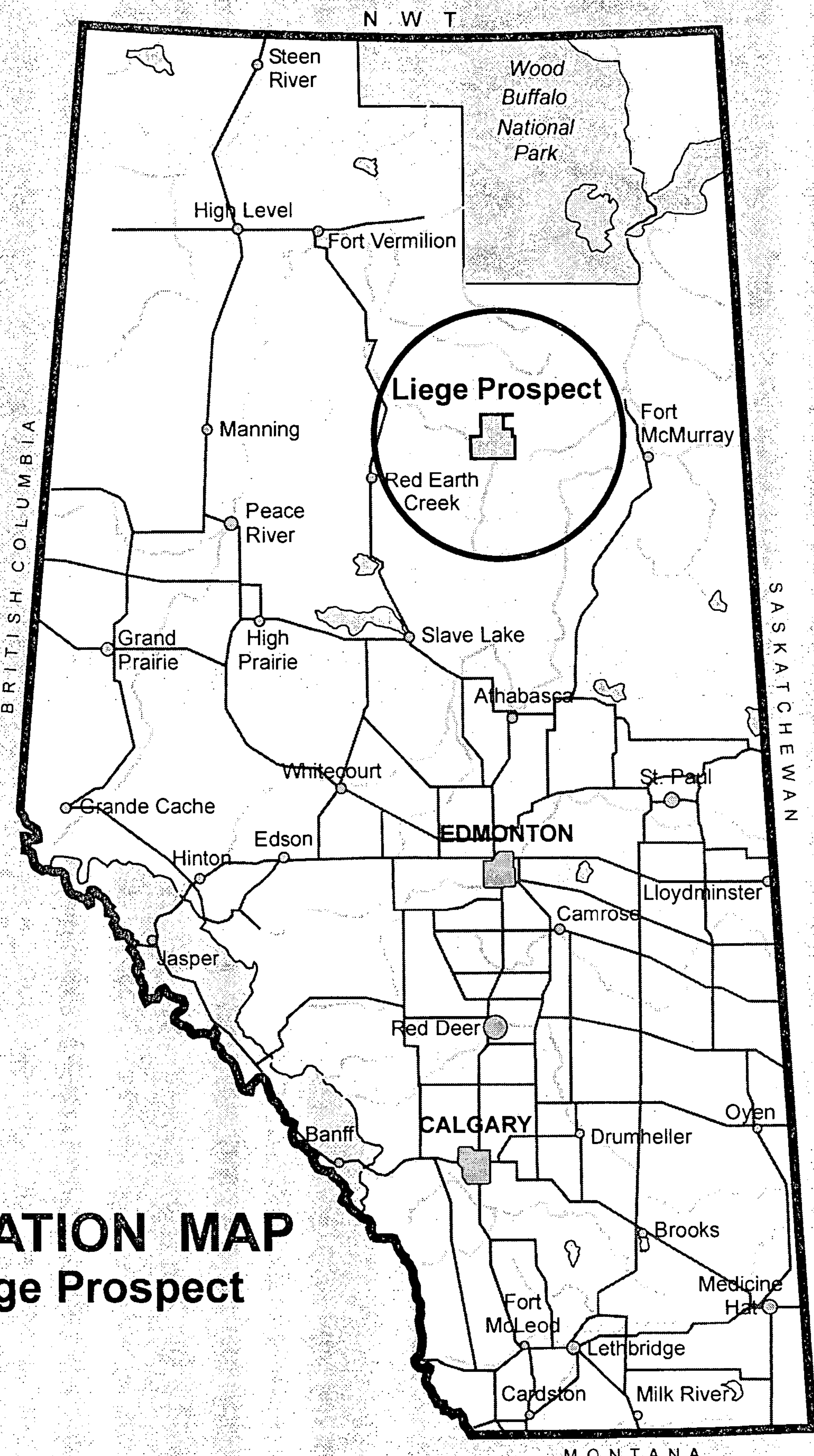
The Liege Prospect consists of 16 metallic and industrial mineral permits totaling 128,556 ha. A complete list of mineral permits is included in Table 1 and is shown on Figure 2.

Exploration History

Ashton Mining of Canada Ltd. began work in the area in 1996 as part of their regional Buffalo Hills Exploration Program. Airborne magnetic surveys and indicator mineral sampling were two of the exploration techniques employed. Assessment Reports filed by Ashton document the results.

977554 Alberta Ltd. Acquired the claims in 2002 and 2003 based on information it had concerning the possibility of kimberlite pipes in the area. Figure 2 shows the regional geology and Figure 3 is the geological legend (Alberta Geological Survey).

977554 ALBERTA LTD.



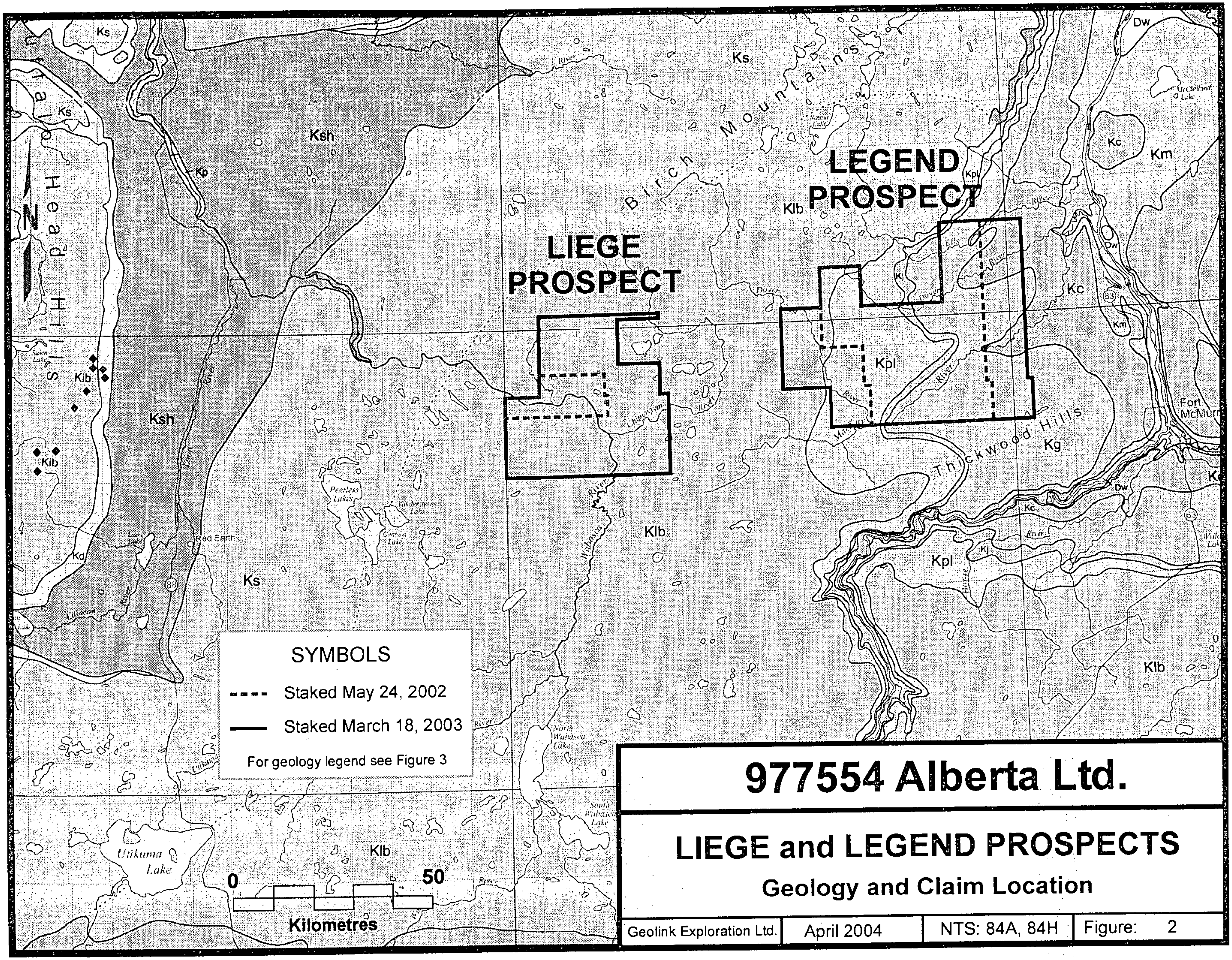
LOCATION MAP
Liege Prospect

April 2004

Figure 1

Table 1 - Claim Information

LIEGE PROSPECT			
Permit Number	**Location Meridian-Range-Township: Section**	**Area (ha)**	**Effective Date**
9303031185	4–25-89: 1-36	9,216	18-Mar-03
9303031186	4–24-89: 1-36	9,216	18-Mar-03
9303031187	4–23-89: 1-36	9,216	18-Mar-03
9303031188	4–22-89: 1-36	9,216	18-Mar-03
9303031189	4–25-90: 1-36	4,608	18-Mar-03
9303031190	4–24-90: 1-36	4,608	18-Mar-03
9303031191	4–23-90: 1-18, 22-27, 34-36	9,216	18-Mar-03
9303031192	4–22-90: 1-36	9,216	18-Mar-03
9303031193	4–22-91: 1-36	9,216	18-Mar-03
9303031194	4–24-91: 1, 2, 11-14, 19-36	6,144	18-Mar-03
9303031195	4–24-91: 20-29, 32-36	3,840	18-Mar-03
9303031196	4–24-92: 1-5, 8-17, 20-29, 32-36	7,980	18-Mar-03
9303031197	4–23-92: 1-36	9,216	18-Mar-03
9303031198	4–22-92: 1-36	9,216	18-Mar-03
14 Permits		**110,124**	
9302050133	4–23–90: 19-21, 28-33	9,216	24-May-02
	4–23–91: 3-10, 15-18		
	4–24–90: 22-27, 34-36		
	4–24–91: 1, 2, 11-14		
9302050134	4–24–90: 19-21, 28-33	9,216	24-May-02
	4–24–91: 3-5, 8-10, 15-17		
	4–25–90: 22-27; 34-36		
2 Permits		**18,432**	
16 Permits	**TOTAL PERMITS**	**128,556**	


LEGEND PROSPECT
LIEGE PROSPECT
Birch Mountains
Buffalo Head Hills
Thickwood Hills
Fort McMurray
Red Earth
Peerless Lakes
Utikuma Lake
North Wabasca Lake
South Wabasca Lake
Wabasca River
Chipewyan River
Dover River
Ells River
Loon River
Ks
Ksh
Kp
Kib
Kd
Klb
Kpl
Kc
Km
Kg
Kj
Dw
SYMBOLS
Staked May 24, 2002
Staked March 18, 2003
For geology legend see Figure 3
0
50
Kilometres
977554 Alberta Ltd.
LIEGE and LEGEND PROSPECTS
Geology and Claim Location
Geolink Exploration Ltd.
April 2004
NTS: 84A, 84H
Figure: 2

Geological Map of Alberta - Legend

EUB
Alberta Energy and Utilities Board

AGS
Alberta Geological Survey

Kpw — **PUSKWASKAU FORMATION:** dark grey fossiliferous shale, silty in upper part; marine

Kbh — **BAD HEART FORMATION:** fine-grained quartzose sandstone; ferruginous oolitic sandstone and mudstone; marine

Kk — **KASKAPAU FORMATION:** dark grey silty shale; thin concretionary ironstone beds; interbedded in lower part with fine-grained quartzose sandstone and thin beds of ferruginous oolitic mudstone; marine

Kd — **DUNVEGAN FORMATION:** grey, fine-grained, feldspathic sandstone with hard calcareous beds; laminated siltstone and grey silty shale; deltaic to marine

UPPER AND LOWER CRETACEOUS

Ksh — **SHAFTESBURY FORMATION:** dark grey fish-scale bearing shale, silty in upper part; numerous nodules and thin beds of concretionary ironstone; bentonite partings; lower part with thin silty and sandy intervals; marine.

LOWER CRETACEOUS

Kp — **PEACE RIVER FORMATION:** dark grey silty shale; fine-grained glauconitic sandstone, silty interbeds in lower part (**Harmon Member**); fine-grained quartzose sandstone (**Cadotte Member**); shoreline complex

Note: sandstone in lower part of map unit may be equivalent to **Notikewin Member** – uppermost member of underlying Spirit River Formation (Loon River Formation equivalent) in NW Alberta subsurface

Kl — **LOON RIVER FORMATION:** dark grey, fossiliferous, silty shale and laminated siltstone; nodules and thin beds of concretionary ironstone; marine

◆ Kib — **"Buffalo Head Hills intrusives":** ultrabasic volcanic rocks (kimberlite): lapilli-bearing olivine crystal tuffs, with shale (crustal) and peridotitic (mantle-derived) xenoliths; pipes

Ks — **SMOKY GROUP:** dark grey shale and silty shale, nodules and thin beds of concretionary ironstone; includes unnamed dark grey shale unit on Caribou Mountains and Buffalo Head Hills; marine

Kd — **DUNVEGAN FORMATION:** grey, fine-grained, feldspathic sandstone with hard calcareous beds: laminated siltstone and grey silty shale; deltaic to marine

UPPER AND LOWER CRETACEOUS

Ksh — **SHAFTESBURY FORMATION:** dark grey fish-scale bearing shale, silty in upper part; numerous nodules and thin beds of concretionary ironstone; bentonite partings; lower part with thin silty and sandy intervals; marine

LOWER CRETACEOUS

Kpl — **PELICAN FORMATION:** fine-grained quartzose sandstone, silty and glauconitic in lower part; marine

Kj — **JOLI FOU FORMATION:** dark grey fossiliferous shale, silty interbeds in upper part; marine

Kl — **LOON RIVER FORMATION:** dark grey, fossiliferous, silty shale and laminated siltstone; nodules and thin beds of concretionary ironstone; marine

Kb — **BASAL CRETACEOUS:** calcareous quartz sandstone (in Wood Buffalo National Park); origin uncertain

CRETACEOUS

UPPER AND LOWER CRETACEOUS

Klb — **LABICHE FORMATION:** dark grey shale and silty shale; ironstone partings and concretions; silty fish-scale bearing beds in lower part; marine

LOWER CRETACEOUS

Kpl — **PELICAN FORMATION:** fine-grained quartzose sandstone, silty and glauconitic in lower part; marine

Kj — **JOLI FOU FORMATION:** dark grey fossiliferous shale, silty interbeds in upper part; marine

Kg — **GRAND RAPIDS FORMATION:** fine-grained quartzose and feldspathic sandstone, laminated siltstone and silty shale; thin coal beds; shoreline complex

Kc — **CLEARWATER FORMATION:** dark grey, fossiliferous, silty shale; laminated siltstone and fine-grained cherty sandstone; glauconitic sandstone (**Wabiskaw Member**) near base; marine

Km — **McMURRAY FORMATION:** thick-bedded quartzose sandstone and siltstone; oil-impregnated; grey silty shale interbeds in upper part; nonmarine to deltaic

CREDITS

Geological compilation by Wylie N. Hamilton, Monica C. Price and C. Willem Langenberg
GIS (Arc/Info) map compilation by Monica C. Price
GIS consultation by Dennis K. Chao
Cartography (Canvas) by Dan Magee
Inset map and cross section compilation assistance by Matthias Grobe

External review by Robert Green, Consulting Geologist

Sources of Data

The map is modified from the Geological Map of Alberta, by R. Green, 1972, Alberta Geological Survey, Alberta Research Council. Revisions since 1972 have incorporated new mapping data from work by the Alberta Geological Survey and the Geological Survey of Canada, and by the Canadian Society of Petroleum Geologists through the contribution of its membership to the Geological Atlas of the Western Canada Sedimentary Basin.

Unpublished geological data on Paleocene and Upper Cretaceous formation boundaries were contributed by T. Jerzykiewicz, Consulting Geologist.

Information toward enhanced mapping of the Scollard Formation boundaries was provided by the Mine Development Group, Alberta Energy and Utilities Board.

The tectonic inset maps are based on information from various published sources: Precambrian Basement, primarily GSC reports; Phanerozoic, primarily the Geological Atlas of the Western Canada Sedimentary Basin. Glaciotectonic terrains are from unpublished information supplied by M.M. Fenton, Alberta Geological Survey.

The digital base map was supplied by Alberta Environmental Protection.

Any additional geological information known to the user or suggestions for enhancement of the map would be welcomed by the Alberta Geological Survey. The GIS digital file is updated as new information is obtained and is available on request.

Recommended citation

Hamilton, W.N., Price, M.C. and Langenberg, C.W. (compilers), 1999; Geological Map of Alberta, Alberta Geological Survey, Alberta Energy and Utilities Board, Map No. 236, scale 1:1,000,000.

977554 Alberta Ltd.

LIEGE and LEGEND PROSPECTS

Geology Legend

Geolink Exploration Ltd.	April 2004	NTS: 84A, 84H	Figure: 3

Work Performed and Results

Summary Geological and Geophysical Report - In April, 2003 a qualifying report (NI 43-101) was written by OreQuest Consultants Ltd. of Vancouver, B.C. The complete report is included in Appendix 1.

Indicator Sampling - Only 7 samples were collected on the property. Indicator sample sites and results are listed in Table 2. Ashton Assessment Report # 20010007 reported 109 samples in the Liege area. A summary of the sampling is listed in Table 3.

Airborne Geophysics - Fugro Airborne Surveys Corp. of Calgary, Alberta was contracted to fly a Heli Mag/EM system over two targets on the Liege Prospect, Targets A and B. A third target, a known kimberlite, was also flown to give a template for the geophysical signature. A total of 29.2 line kilometres of "Resolve" Heli Mag/EM were flown. Target B showed a large pipe like resistor and two holes were spotted to test the anomaly. The complete geophysical report is in Appendix 3.

Diamond Drilling - Two diamond drill holes were drilled to a depth of 103.6 metres to test Target B. Both holes bottomed in unconsolidated till with no core recovery. No bedrock was encountered. The drill hole locations are listed below and are shown on Figure 4.

DIAMOND DRILL HOLE LOCATIONS

UTM Zone 12 NAD27

Hole Number	Easting	Northing	NTS Map	Total Depth (metres)
DDH04-5	337886	6304239	84A/13	103.6
DDH04-6	338220	6304263	84A/13	103.6

All holes were accessed by existing cut line cleared of snow. Hole DDH04-5 required 100 metres of new road to be built through 2" to 6" mixed poplar, spruce and birch trees. Hole DDH04-6 was located on a cut line.

Figure 4 summarizes the indicator sampling, geophysics and diamond drilling.

Conclusions and Recommendations

The two diamond drill holes spotted to test geophysical anomalies did not result in the discovery of kimberlite or even bedrock. The EM anomalies must therefore be related to the unexpectedly thick overburden.

More work should be done on the prospect such as:

- Detailed stream and till diamond indicator sampling.
- Fixed wing airborne EM survey (Geotem or Megatem – deep penetrating techniques).

Table 2 - Summary of Indicator Sampling

LIEGE PROSPECT

Diamond Indicator Sampling

Summary of Samples Collected

		UTM Zone 12 NAD27				
Sample Number	Sample Type	Easting	Northing	NTS Map		
LW03-1	Stream	340283	6255571	84A/5		
LW03-2	Stream	327469	6293470	84A/13		
LW03-3	Stream	332913	6305306	84A/13		
LW03-4	Stream	338324	6304590	84A/13		
LW03-5	Stream	336444	6304010	84A/13		
LW03-6	Stream	341331	6289497	84A/13		
LWT03-1	Till	338059	6304330	84A/12		

Picking Results from C.F. Mineral Research Ltd.

Sample Number	Possible Pyrope	Possible Chrome Diopside	Possible Olivine	Possible Ilmenite / Chromite	Total	Other
LW03-1	1	0	0	3	4	
LW03-2	3	1	0	0	4	
LW03-3	0	2	0	1	3	
LW03-4	0	0	0	0	0	
LW03-5	1	1	0	1	3	
LW03-6	2	2	3	0	7	4
LWT03-1	0	0	0	0	0	
Total	7	6	3	5	**21**	

Probe Results from C.F. Mineral Research Ltd.

See Appendix 2

Table 3 - Ashton Mining of Canada Diamond Indicator Sampling

LIEGE and LEGEND PROSPECTS						
Diamond Indicator Sampling by Ashton Mining of Canada Ltd.						
	Ashton Assessment Report # 20010007 - April 25, 2001					
Ashton Sample Number	UTM NAD 27 East	UTM NAD 27 North	Indicators	Total Indicators	Zone	Map Sheet
AL04-0105	670657	6277703	1pi	1	11V	84B/9
AL04-0108	682915	6279867	1pp	1	11V	84B/9
AL04-0111	674862	6282433	1pi	1	11V	84B/9
AL04-0112	680648	6287875	1ep	1	11V	84B/9
AL04-0118	320896	6290264	1c	1	12V	84A/12
AL04-0120	349910	6332197	1pp	1	12V	84H/3
AL04-0136	400085	6298147	6pp;1ep;1pi	8	12V	84A/15
AL04-0137	395848	6301651	1pp;5pi	6	12V	84A/15
AL04-0138	332800	6304989	2pp;2c;1pi;1ko	6	12V	84A/13
AL04-0139	328290	6303986	3pp;4ep;2c;2pi	11	12V	84A/13
AL04-0140	336030	6309000	1pp;3ep;3c;22pi	29	12V	84A/13
AL04-0141	324154	6317097	1ep;1c;2pi	4	12V	84A/13
AL04-0143	682365	6316592	2pi	2	11V	84B/16
AL04-0144	665278	6328261	1pp;1pi	2	11V	84G/1
AL04-0150	362607	6301824	1pp	1	12V	84A/14
AL04-0154	330700	6319962	1ko	1	12V	84A/13
AL04-0157	334960	6315050	3pi	3	12V	84A/13
AL04-0177	673815	6337200	1c	1	11V	84G/1
AL04-0178	345980	6314403	2c	2	11V	84D/13
AL04-0179	345970	6310500	1pi	1	11V	84D/13
AL04-0181	368161	6327305	1pp	1	12V	84H/3
AL04-0184	338700	6307790	1ko	1	12V	84A/13
AL04-0189	342185	6298320	3ko	3	12V	84A/13
AL04-0194	330000	6292920	1pp	1	12V	84A/13
AL04-0205	676432	6330857	1c	1	11V	84G/1
AL04-0206	670566	6329048	1ec	1	11V	84G/1
AL04-0212	677740	6314730	1pi	1	11V	84B/16
27 Samples	Total			92	Indicators	
	pp	Peridotic Pyrope				
	eg	Eclogetic Pyrope				
	cd	Chrome Diopside				
	cd	Chromite				
	pi	Picroilmenite				
	ko	Kimberlitic Olivine				
Note: Only anomalous samples listed here. See Assessment report # 20010007 for complete results for all 109 samples.						

APPENDIX 1

977554 Alberta Ltd.

ASSESSMENT REPORT

LIEGE PROSPECT

APPENDIX 1

Summary Geological and Geophysical Report

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SUMMARY GEOLOGICAL AND GEOPHYSICAL REPORT

on the

LIEGE and LEGEND PROPERTIES

EAST PEACE DISTRICT
ALBERTA
NTS 84A

for

977554 ALBERTA LTD.

George Cavey, P. Geo.
J. L. LeBel, P. Eng.
OreQuest Consultants Ltd.

April 24, 2003

OREQUEST

SUMMARY

977554 Alberta Ltd. has acquired 38 metallic and industrial mineral permits with a total area of 328,974 ha in two blocks, called the Liege and Legend properties, located in the East Peace District of north-central Alberta on NTS map 84A. The properties are prospective for diamond deposits. Exploration by other operators in the area has discovered the Buffalo Hills field of 41 kimberlite occurrences of which 25 are diamondiferous. Of these occurrences, six have diamonds in commercially significant grades. The known kimberlites lie immediately to the west and north of the properties. The discoveries are located approximately 370 km north of the city of Edmonton in north-central Alberta.

Paleozoic and Mesozoic mudstones and sandstones of the Western Canadian Sedimentary Basin underlie the region. Beneath the Phanerozoic sedimentary rocks, which is up to 5000 metres thick, lies the Precambrian basement rocks known as the Buffalo Head terrane. The Buffalo Head terrane is defined primarily by geophysics and is composed of rocks with ages estimated to be 2.0 to 2.3 billion years old. The new kimberlite discoveries are associated with the Peace River Arch (PRA), a series of Archean and Proterozoic tectonic domains that were subjected to a period of Devonian aged uplifts which formed the PRA and associated deep seated fault structures. These fault structures are not visible on the surface but do appear based on aeromagnetic signature, and to a lessor extent, horizontal gravity gradient data. These faults and associated zones of weakness could form conduits for the intrusion of kimberlite bodies. The entire region was glaciated during the Laurentide ice advance and its retreat deposited sediment consisting of till, lake-sediment and glaciofluvial sediments.

Exploration on the Buffalo Hills property began in 1996 with a property wide high-resolution airborne magnetic survey. Exploration efforts since 1996 have successfully identified a new diamondiferous kimberlite province in Canada. The discovery of diamondiferous kimberlites during the initial drill program in 1997 prompted Ashton and its joint venture partners to begin aggressive exploration that has included regional airborne geophysical surveys, ground geophysics, heavy mineral sampling, drilling and kimberlite mini-bulk and bulk sampling. Most of the known kimberlites have been found by aeromagnetic surveys although one, found by an unusual seismic survey anomaly generated from oil and gas exploration, was credited with attracting the first interest in the Buffalo Hills area. The host rocks are largely uniformly magnetic sedimentary rocks which produces a uniform background magnetic response through which the kimberlite anomalies readily standout. Gravity and previously existing seismic surveys have also proven to be effective geophysical tools for identifying kimberlite bodies beneath the glacial sediments, which are up to 200m thick.

The Legend and Liege properties encompass lands on which seismic reflection surveys have been done in the search for natural gas. There are seven anomalies in the seismic surveys, two on the Liege property and five on the Legend property, that are very similar to seismic reflection anomalies from some of the known kimberlites from the Buffalo Hills area

The properties, in part, encompass former lands held of the Ashton Mining of Canada Inc., Alberta Energy Corp. (now EnCana Corporation) and Pure Gold Minerals Inc. joint venture, one of the main operators in the area, on which kimberlite indicator mineral sampling and aeromagnetic and ground magnetic surveys have been done. The kimberlite indicator mineral sampling outlined several anomalies, for which the sources have not been established, that could have provenance on the properties, and the magnetic surveys outlined a number of untested kimberlite targets. The results of these surveys have not received a thorough evaluation.

The Liege and Legend properties have strong indications of additional kimberlites within a known kimberlite field, therefore an exploration program is warranted on the properties. An exploration program made up of: re-evaluating the existing data, airborne geophysical coverage, ground geophysics follow-up, kimberlite indicator mineral sampling, diamond drilling and diamond analysis is recommended. Cost of the proposed program is estimated at $1,152,000. Further exploration work will be contingent upon the successful completion of the work recommended in the proposed 2003 work program.

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INTRODUCTION AND TERMS OF REFERENCE

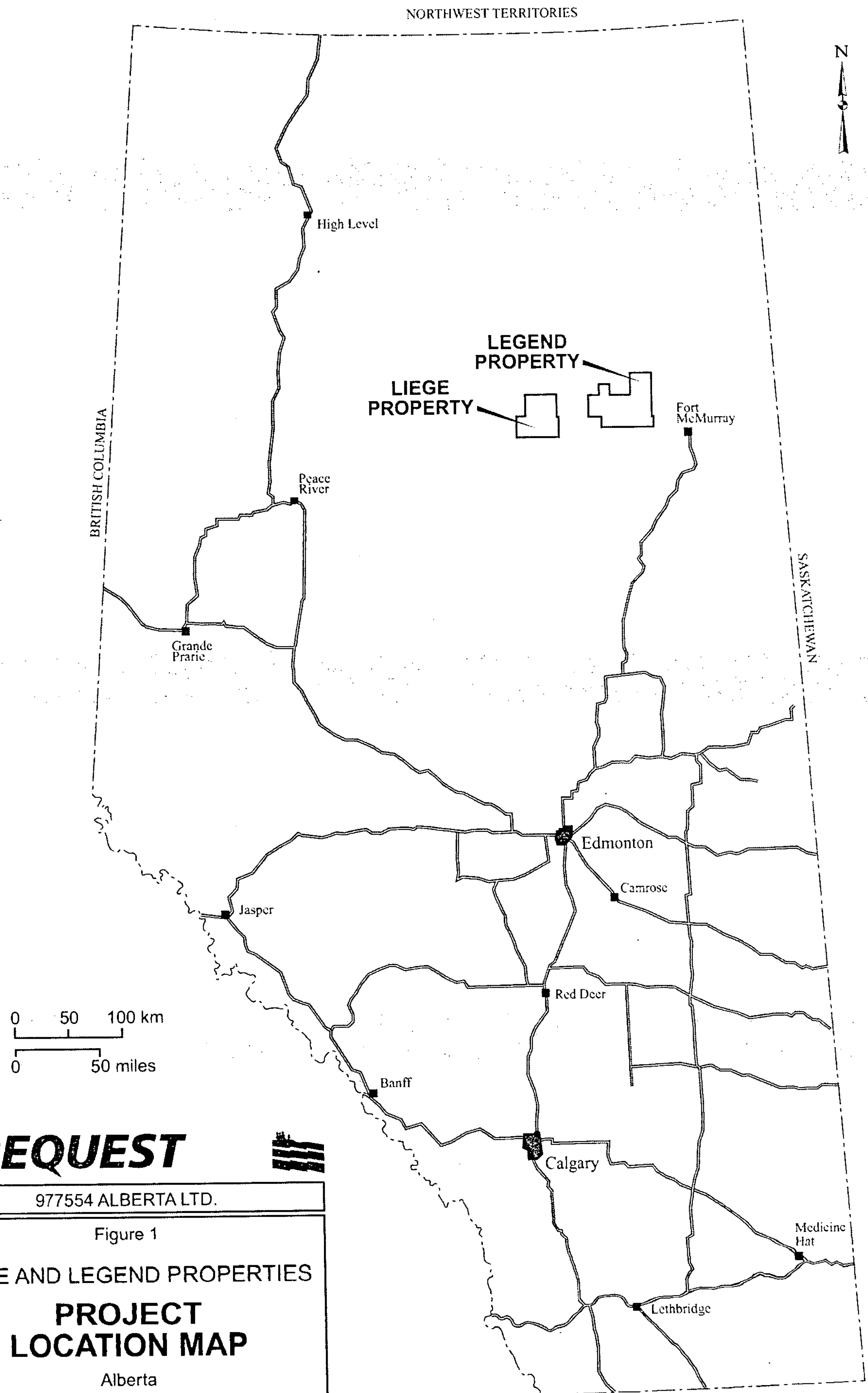
This report presents a summary geological and geophysical evaluation of two properties, the Liege Property and the Legend property, located in East Peace District of North Central Alberta for 977554 Alberta Ltd. which is a wholly owned subsidiary of Paramount Resources Ltd. The subject property permits cover a portion of north-central Alberta (Figure 1). The report is done by independent Qualified Persons as required by the National Instrument 43-101, Standards of Disclosure for Mineral Properties, according to the format and content specified in Form 43-101F1, Technical Report. This report has been completed to comply with 977554 Alberta Ltd.'s "Preliminary Prospectus" filing requirements and has been prepared under the terms set out in NI 43-101.

The information contained in this report comes from previous work done in the area as documented in reports listed in the References section of this report and information from the results of seismic reflection surveys conducted by Paramount Resources Ltd. for natural gas exploration. The material found in this technical report is an amalgamation of previous assessment reports, program updates, consultant reports, and corporate press releases available for review. There were no limitations put on the author in preparation of this report by Paramount or 977554 Alberta Ltd. The author Cavey of this report is familiar with the subject matter covering the preceding and intervening years and the current publicly available body of data and has authored or co-authored numerous diamond reports since 1993 dedicated to Alberta Diamond Exploration including Pure Gold Minerals Inc. on its diamondiferous Buffalo Hills property the Buffalo Hills area. A complete list of the reports prepared in whole or in part by the author on behalf of OreQuest Consultants Ltd. can be found in the References section of this report under the sub-heading "OreQuest Reports Previously Prepared". Author LeBel did a three hour helicopter reconnoiter of the properties on April 16, 2003 which entailed an examination of the sites of seven geophysical anomalies and a brief ground examination at one site to fulfill the requirements of National Instrument 43-101.

The exploration merits of the properties are embodied in geophysical anomalies which have no physical manifestation. A ground examination of all the specific anomaly sites could prove fruitless because the area is largely blanketed by thick overburden which is likely to conceal the sources of the geophysical anomalies from view. There is no known mineralization on the properties to observe and very little on-site physical work to be verified, and the local details of the geology are immaterial in the genesis and emplacement of diamond mineralization.

DISCLAIMER

Most of the information contained in this report comes from previous work done on the properties by other parties obtained from the reports referenced, herein. The authors have not verified the historical work, but recognized exploration and mining companies, registered professionals and reputable contractors and service companies did the work. As a result, the authors have no reason to question the veracity of the results. OreQuest has prepared this report based upon information believed to be accurate at the time of completion, but which is not guaranteed. Paramount Resources Ltd. have provided a compilation on legal title of the properties.



OREQUEST

977554 ALBERTA LTD.

Figure 1

LIEGE AND LEGEND PROPERTIES

PROJECT LOCATION MAP

Alberta

MAY 2003 XY3

Certain seismic reflection data, material to the properties has been supplied by Paramount Resources. The author LeBel is familiar with the seismic reflection method but not versed enough in details of seismic reflection data acquisition and data processing to comment on the veracity of the results. The seismic surveys were conducted for natural gas exploration and it would be natural for Paramount to insist on and ensure the highest quality data.

Therefore in writing this technical paper the author has relied on the truth and accuracy presented to us from the sources listed in the Reference section of this report. In addition information in this report was obtained from recent press releases authorized for distribution into the public domain from the participating companies.

PROPERTY DESCRIPTION AND LOCATION

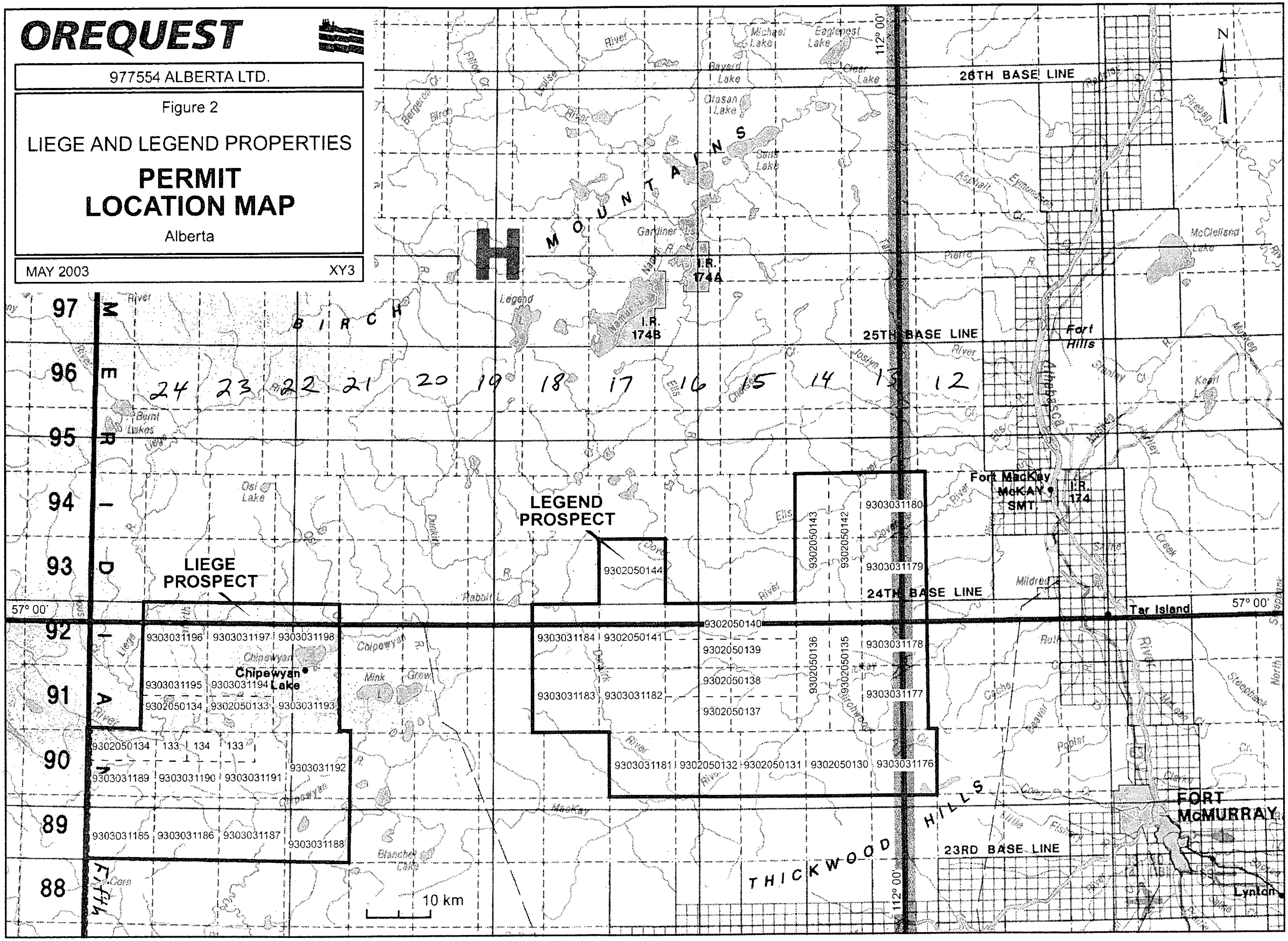
The Legend and Leige properties have a total area of 328,974 ha divided as to, 126,222 ha in the Liege property and 202,752 ha in the Legend property. (Figure 2). The permits are wholly owned by 977554 Alberta limited and not subject to any option agreements. The properties are located in North Central Alberta NTS map 84A at 56° 45'N latitude and 113° W longitude about 370 km due north of Edmonton as shown on Figure 1. Title information has been provided by Paramount Resources, a title search has not been completed by the authors. Complete title information should be obtained from the company or its solicitor.

The properties consists of 38 metallic and industrial mineral permits, 22 in the Legend property and 16 in the Liege property, registered to 977554 Alberta Ltd. as described in Appendix I and illustrated in Figure 2. The sequence numbers in location column of Appendix I refer to Meridian, Range, Township, and Section, respectively.

The permits have been issued by the government under the Metallic and Industrial Regulations of Alberta. Metallic and Industrial permits in Alberta have a term of 10 years, after which time the permit holder may apply for a lease. During the first two years a minimum of $5 per hectare assessment work must be expended to hold the permit in good standing. During years three to six the assessment work requirements are $10 per hectare and from years seven to ten $15 per hectare are required. The permit holder is allowed to reduce the area of a permit once during a two year period, except in the last 60 days of the two year period. The properties have not been surveyed by a legal land survey.

The properties are in an area of active natural gas exploration and development. Paramount Resources Ltd., the parent company of 977554 Alberta Ltd. has extensive production, collection and processing facilities in the area, including camps. A major gas pipeline extends to the south from between the two properties. Other man-made features include a network of winter service roads and cut lines for seismic surveys and several airstrips at the gas production sites.

The authors are not aware of any pre-existing environmental liabilities on the properties for which 977554 Alberta Ltd. might eventually be found responsible. There are no known native land claims filed against the permits. An area around Chipewyan Lake and two small blocks of land on



OREQUEST
977554 ALBERTA LTD.
Figure 2
LIEGE AND LEGEND PROPERTIES
PERMIT
LOCATION MAP
Alberta
MAY 2003
XY3
LIEGE PROSPECT
LEGEND PROSPECT
26TH BASE LINE
25TH BASE LINE
24TH BASE LINE
23RD BASE LINE
FORT McMURRAY
Fort MacKay
Tar Island
Lynton
57° 00'
112° 00'
10 km
97
96
95
94
93
92
91
90
89
88
24 23 22 21 20 19 18 17 16 15 14 13 12
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BIRCH MOUNTAINS
THICKWOOD HILLS

the Liege property are withdrawn from 'staking'. Neither of these small blocks lies close to principal areas of interest that will be discussed in this report.

An exploration permit is required from the Alberta Department of Environment as a prerequisite to drilling. 977554 Alberta Ltd. intends to require the necessary permits as needed. Other companies have successfully operated diamond exploration programs in the area and no difficulty in obtaining the necessary permits is anticipated.

ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

The Legend and Liege properties are located approximately 370 kilometres north of the city of Edmonton in north-central Alberta. Fort McMurray connected to Edmonton via paved highway and is serviced by several daily commercial flights from Edmonton and Calgary. Most supplies to support exploration and development can also be obtained in Fort McMurray which is the main center for the development of the Alberta tar sands projects.

The area is readily accessible by several modes. The are several airstrips in the area maintained at natural gas production facilities capable of handling large fixed wing aircraft. One of these airstrips is located at Chipewyan Lake on the Liege property. The Alpac Paper Company maintains an all season haulage road in the area that comes in from Athabasca to the south. The natural gas production facilities are also serviced by a winter road which comes into the area form Fort McMurray to the east. Fort McMurray is also the permanent base of three helicopter companies. Access in and around the properties for exploration purposes is available by helicopter or 4-wheel drive vehicle/all terrain vehicle/snowmobiles along winter gas field service roads and numerous seismic lines or on foot.

There are no permanent human residents in the area. The closest community is Fort McMurray which is 140 km west of the center of the Liege property and 60 km west of the center of the Legend property. There are several camps at gas plants in the area which are manned by maintenance personnel on a 2 week rotation where field crews could be based.

The topography is a flat-lying plateau with a few shallow lakes, numerous swamps and a few slow moving meandering rivers and creeks. Many of the creeks are dammed by beaver dams. The average elevation is 500 m to 550 m a.s.l. What little relief there is comes in the form of low broad hills a maximum of 50 m high and river valleys incised as much as tens of meters. The area is at the height of land between the drainage basins of the Peace and Athabaska Rivers. Drainage in the Liege property is to the north to the Peace River and to the east in the Legend property to the Athabasca River. The vegetation is boreal forest, a mix of 25% open swamp, 25% swamp with scrub conifers and 50% coniferous-deciduous forests of spruce and poplar trees. The poplar stands prefer the better drained areas and the spruce trees prefer the wetter ground.

The physiography of the area is a function of the pre-glacial fluvial processes. Rivers deposited gravels and sands onto sedimentary rocks that in turn were uplifted and further eroded into plateau benchland landscape with deep river valleys. Later glaciation broadened and smoothed valleys while thin layers of till were deposited on the plains. Morainal materials and glacial lake sediments were also deposited. Ice directions are reasonably well defined and appear to be simple to understand. The dominant surficial materials in the area are glaciolacustrine clays that occur as blankets over the low relief landscape. Glacial deposits are generally less than 90 metres in thickness but can be up to150 metres in depth in certain areas of the permit lands.

The climate is typically 'continental' with long cold winters and short cool summers. Annual precipitation is 500 – 600 mm with 150 – 200 mm as snow in the winter. Sunshine averages 200 hours per month in the summer from May to September. The climate is not an impediment to exploration which can continue year around. However, work such as drilling that requires road building and moving heavy equipment on the ground is best suited to the winter when the ground and swamps are frozen.

The Legend and Leige permit blocks contains numerous sources of water that will be sufficient for all levels of exploration and future development. The property covers a large area with plenty of space for the building of infrastructure for any advanced exploration or development.

HISTORY

Interest in diamond exploration in north central Alberta developed as a result Geological Survey of Canada (GSC) and the Alberta Geological Survey (AGS) till and sediment sampling surveys throughout Alberta between 1991-1994 (Dufresne et al, 1996). Of seven samples collected from the area of the Legend and Leige properties, two were anomalous, with more than two indicator mineral grains with a total of six diamond indicator minerals, five G1-G10 garnets and one chrome diopside.

In 1996 Pure Gold Resources acquired exploration permits in and around the Buffalo Hills area and entered into an exploration and development joint venture with Ashton Mining of Canada Inc and the Alberta Energy Corp (now EnCana Corporation) with Ashton as operator. Work by the joint venture resulted in the discovery of diamondiferous kimberlites early in 1997. Up to June 2002, the joint venture has expended approximately $6.3 million on exploration and discovered 31 kimberlite occurrences. Seven other kimberlites have been discovered by other operators in the area. Most of the known kimberlites have been found by aeromagnetic surveys although one, found by an unusual seismic survey anomaly generated from oil and gas exploration, was credited with attracting the first interest in the Buffalo Hills area. The Liege and Legend properties in part encompass the former Rabbit Lake property of the Pure Gold, Ashton and EnCana land holdings that was allowed to expire.

The area has not likely been the focus of any previous base metal or precious metal (including diamonds) exploration. It has been examined and is still being examined for its oil and gas potential. There has been no known production from any previous base metal or precious metal (including diamonds) deposits. Previous and ongoing exploration and discoveries by the oil and gas sector will not be discussed in this report.

GEOLOGICAL SETTING

The discussion of the basement geology is the result of geophysical work carried out by the petroleum exploration industry supplemented by drilling data from ten core or cutting samples from petroleum wells. Much of it is interpretative and will be subject to many revisions, as further information becomes available. It is presented, as regional geological terranes comprised of Proterozoic magmatic, accreted Proterozoic, and Archean subdivisions. The tectonic subdivision of the Archean crystalline basement of Alberta has been subdivided into geophysical domains on the basis of aeromagnetic signature, and, to a lessor extent, horizontal gravity gradient data (Figure 3a).

Regional Geology

Precambrian to Devonian

Northern Alberta is underlain by a succession of Phanerozoic sedimentary rocks of the Western Canadian which lie on the Precambrian basement rocks.

The Precambrian basement rocks comprise the western extension of the Churchill Structural province of the Canadian Shield. They are subdivided into a number of tectonic and metamorphic domains, including Proterozoic magmatic terranes, accreted Proterozoic terranes and Archean crystalline terranes (Figure 3a). The Buffalo Head terrane composed of rocks with crystallization ages of 2.0 to 2.3 billion years underlies the property area. There are a number of regional structures in the area (Figure 3b), these include; the Great Slave Shear Zone (GSLSZ), northeast striking a crustal lineament to the north and the Snowbird tectonic Zone (STZ) which strikes northeast through the center of the province to the south. The Peace River Arch (PRA), an east-northeast-trending asymmetrical structure that extends from the British Columbia border on the west to northeastern Alberta on the east, is the dominant structure in the area. The PRA is a complex a series of deep-seated fault structures that were from Late Proterozoic to the Late Cretaceous. These fault structures are not visible on the surface but are inferred from aeromagnetic data, and to a lessor extent, horizontal gravity gradient data. They could form zones of weakness and provide the conduits for the intrusion of kimberlite or lamproitic bodies.

The Phanerozoic sedimentary rocks that overlie the basement range in age from Paleozoic and Mesozoic and are up to 5000 metres thick. At the surface are Cretaceous mudstones and sandstones ranging in age from 80 to 100 million years. The Mesozoic-Cenozoic rocks consist of Lower Cretaceous marine to deltaic sedimentary rocks that completely cover the older and deeper Palaeozoic strata. The Lower Cretaceous rocks are in turn overlain by Upper Cretaceous marine to continental clastic sedimentary rocks.

Pleistocene and Recent

The entire region was glaciated by episodic advances and retreats of the Laurentide ice sheet which deposited a complex blanket of glacial, lacustrine and fluvial sediment in the area which varies from shallow up to 150 m in thickness. The dominant directions of glacial advance are from the northeast in the eastern part of the area and form the northwest in the western part of the area.

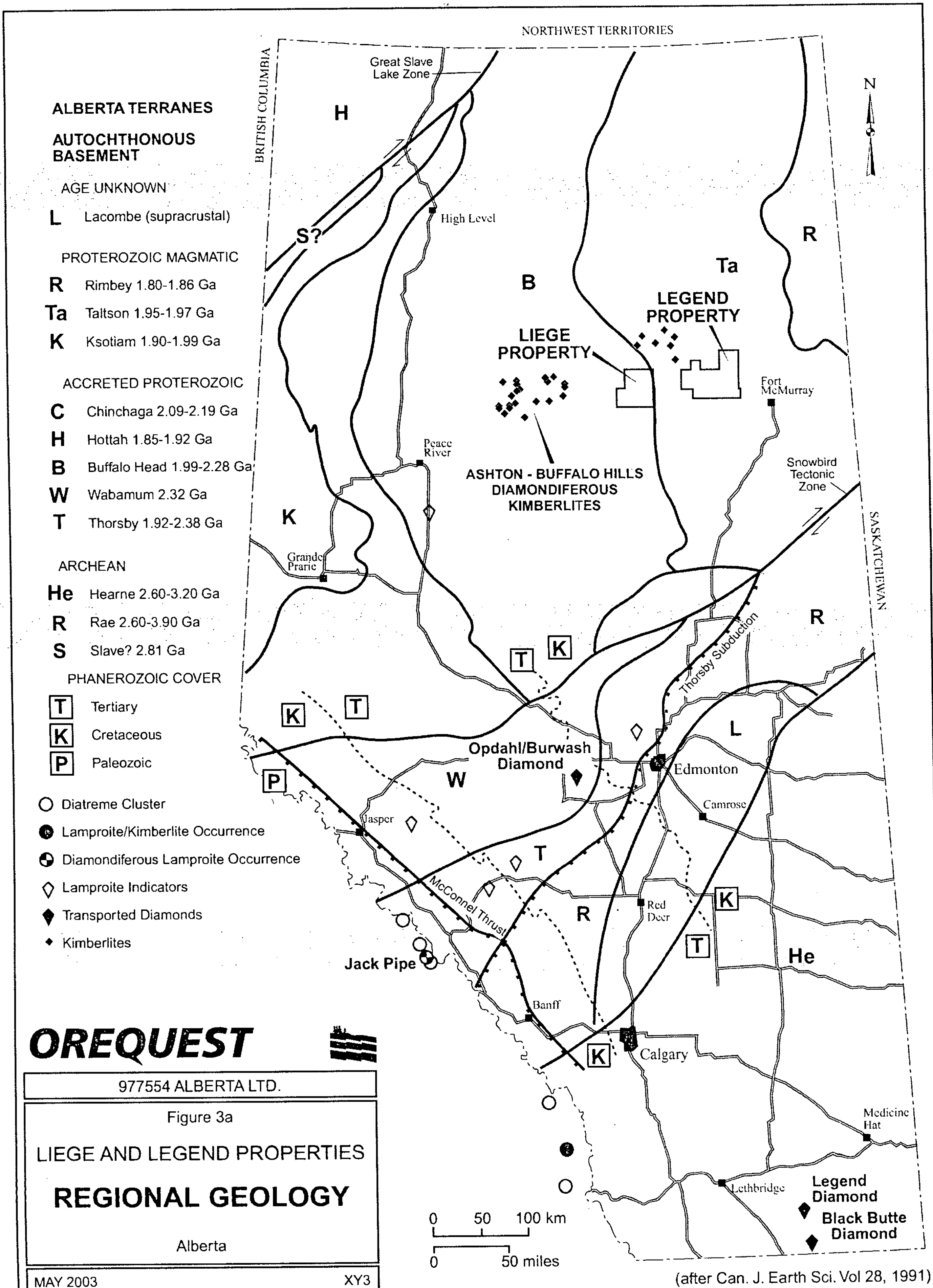
NORTHWEST TERRITORIES
BRITISH COLUMBIA
SASKATCHEWAN
ALBERTA TERRANES
AUTOCHTHONOUS BASEMENT
AGE UNKNOWN
L Lacombe (supracrustal)
PROTEROZOIC MAGMATIC
R Rimbey 1.80-1.86 Ga
Ta Taltson 1.95-1.97 Ga
K Ksotiam 1.90-1.99 Ga
ACCRETED PROTEROZOIC
C Chinchaga 2.09-2.19 Ga
H Hottah 1.85-1.92 Ga
B Buffalo Head 1.99-2.28 Ga
W Wabamum 2.32 Ga
T Thorsby 1.92-2.38 Ga
ARCHEAN
He Hearne 2.60-3.20 Ga
R Rae 2.60-3.90 Ga
S Slave? 2.81 Ga
PHANEROZOIC COVER
T Tertiary
K Cretaceous
P Paleozoic
Diatreme Cluster
Lamproite/Kimberlite Occurrence
Diamondiferous Lamproite Occurrence
Lamproite Indicators
Transported Diamonds
Kimberlites
Great Slave Lake Zone
High Level
Peace River
Grande Prairie
Fort McMurray
LIEGE PROPERTY
LEGEND PROPERTY
ASHTON - BUFFALO HILLS DIAMONDIFEROUS KIMBERLITES
Snowbird Tectonic Zone
Thorsby Subduction
Opdahl/Burwash Diamond
Edmonton
Camrose
Jasper
McConnel Thrust
Red Deer
Jack Pipe
Banff
Calgary
Medicine Hat
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Figure 3a
LIEGE AND LEGEND PROPERTIES
REGIONAL GEOLOGY
Alberta
MAY 2003
XY3
(after Can. J. Earth Sci. Vol 28, 1991)

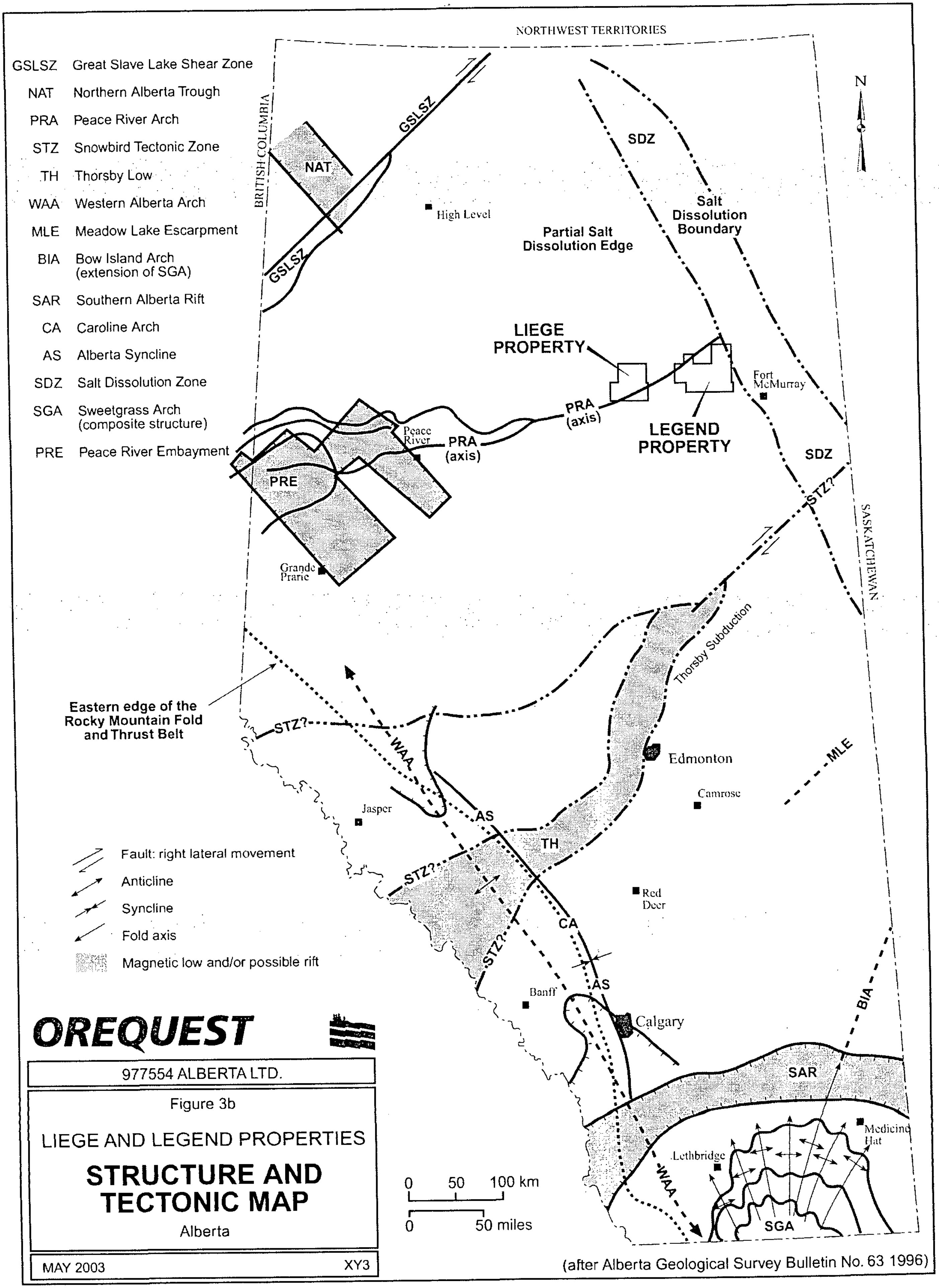

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Figure 3b

LIEGE AND LEGEND PROPERTIES

STRUCTURE AND TECTONIC MAP

Alberta

MAY 2003 XY3

(after Alberta Geological Survey Bulletin No. 63 1996)

Local and Property Geology

The formations present in the area are, the Upper Creteaceous, Smokey Group, the upper Cretaceous, Dunvegan Formation and the Middle Cretaceous, Shaftsberry Formation. The Smokey Group is composed of dark grey calcereous shale, marine foredeep deposits. The Dunvegan Formation is composed of marine conglomerate, sandstone, siltstone and shale. The Shaftsberry Formation is interpreted as a foredeep clastic wedge both marine and non-marine in origin composed of deltaic sandstone, fossiliferous silty shale and laminated siltstone. A detailed property geology map with the particular locations of these units is not presented herein, because the occurrence of kimberlites is governed by regional geology and tectonic forces, not the details of the local geology.

The physical properties of the host rocks have important implications concerning the effectiveness of the geophysical surveys commonly used to look for kimberlites and the occurrence of spurious anomalies from other non-kimberlite sources. Geophysical logging of numerous holes in the area by Ashton (Bauman, 1999a, 1999b) shows most of typical sedimentary formations are mildly magnetic with a magnetic susceptibility of less than $4X10^{-3}$ SI units, but very uniform, compared to kimberlite which typically exhibit magnetic susceptibility greater than $6X10^{-3}$ SI units. The presence of a uniform background magnetic signature gives an advantage in reducing the number of spurious anomalies, compared to places like the Lac de Gras area of the Northwest Territories. In places, however, the overburden exhibits anomalous magnetic susceptibility and in at least one unsuccessful drill hole, namely DDHLL21-1 (Skelton and Willis, 2001) the target anomaly was attributed to an overburden feature. Resistivity geophysical drill hole logging shows the sedimentary formations to be conductive with variable resistivity as low as 5 ohm-m. Two kimberlite intersections exhibited uniform resistivity of 50 ohm-m and 67 ohm-m, still on the low side for a crystalline rock but significantly higher than the background. These kimberlite bodies would be reflected in electromagnetic surveys as resistivity highs and indeed one of the kimberlites discovered by Ashton was found with an airborne electromagnetic survey.

There is also an appreciable contrast the density and acoustic impedance between the host rocks and kimberlite but gravity and seismic surveys are not typically applied in reconnaissance exploration for kimberlites because they are too expensive.

A problematic source of spurious geophysical anomalies in the area is the large number of natural gas production facilities. Although these man-made objects may produce magnetic and electromagnetic anomalies, the anomalies are usually 'spikes' which are limited in size compared to the response of a kimberlite that is 'smooth' and much larger. The location of natural gas production facilities also appear on government maps and for any questionable anomalies arising from man made sources the flight video may reveal the presence of man-made structures.

DEPOSIT TYPES

The Legend and Leige properties have potential for diamond mineralization.

Diamonds form in the crust and mantle at temperatures varying between 900° C and 1300° C and at pressures of 45 to 60 kilobars, in two types of rocks; peridotites (P-type diamonds) and eclogites (E-type diamonds).

Diamond bearing peridotites are predominantly garnet-bearing harzburgite and more rarely lherzolite. Eclogitic kimberlite comprises mainly granular, red almandine-pyrope garnet and green omphacite pyroxene. Peridotite most commonly forms within the mantle. Eclogite is typically found in deep crustal metamorphic regions within continents. Eclogite forms by a solid state (metamorphic) transformation of previously existing rock - likely basalt through the subduction of crustal rocks.

Diamond is a high temperature and pressure polymorph of carbon. The carbon sources for diamonds are believed to be the original components of the primitive earth accumulated in the mantle, in the case of peridotite; and subducted upper crustal material transported to depth, in the case of eclogite.

Magmatic intrusions of kimberlite and lamproite volcanic rocks transport the diamonds to the earth's surface. These rocks originate at depths varying between 150 and 350 kilometres by partial melting of peridotitic or eclogitic material. This material rapidly ascends to the surface, rafting-up the diamondiferous xenoliths or xenocrysts. A rate of ascent of 10 to 30 kilometres per hour (Kirkley et al, 1991) brings diamonds from a 150 kilometre storage depth to the surface in 5 to 15 hours without allowing for structural breakdown. The kimberlites and lamproites ascend along fractures that extend below the base of the craton in geologically stable areas. Within two to three kilometres of surface, the resultant pressure drop facilitates the expansion of gases creating violent explosions that increase the ascension velocity to several hundred kilometres per hour, until the intrusion erupts at the surface.

Kimberlites are volatile-rich potassic ultrabasic rocks with a distinctive inequigranular texture. Kimberlites are made up of material from three sources:

1. Mantle derived xenoliths (xenocrysts) of garnet lherzolite, harzburgite, eclogite and dunite; including diamond.
2. Megacrysts (1-20 cm), single crystals, of low chromium titanium pyrope, magnesian (picro)ilmenite, olivine, titanium poor chromite, chromium poor clinopyroxene, subcalcic to calcic diopside, enstatite, phlogopite and zircon;
3. Primary phase (groundmass) phenocrysts or microphenocrysts of olivine, phlogopite, spinel, ilmenite, perovskite, diopside, monticellite, apatite, calcite and serpentine. The early formed minerals are commonly altered by serpentinization and carbonatization.

Diamonds are also found in lamproites, which are potassium-rich mafic to ultramafic alkaline rocks and ultrapotassic leucite bearing (lamprophyric) rocks. According to Mitchell (1986) lamproites are characterized by the presence of one or more of the following minerals as major, minor or accessory phases; titanian (Al_2O_3 poor) phlogopite, titanian tetraferriphlogopite, potassian titanian richterite, forsteritic olivine, diopside, sanidine, leucite, priderite, potassian zirconian silicate, wadeite, apatite, perovskite, magnesiochromite, magnesian titaniferous magnetite, jeppeite, armalcolite, shcherbakovite anatase, ilmenite and enstatite. Alteration or other secondary phases include chlorite, silica, carbonate, zeolite, serpentine, barite and clay minerals. Lamproites may be distinguished from other potassic rocks and undersaturated alkaline rocks by the absence of nepheline, sodalite, hauyn, nosean, kalsilite, melilite, plagioclase, monticellite and melanite. The unique high temperature and pressure minerals peculiar to kimberlites and lamproites alone are often used as pathfinders in diamond exploration.

Primary diamond deposits are found within the earth's stable cratonic belts of Precambrian age (1.5 - 3.0 billion years), but commonly are at least of Archean age. These areas are believed to have been subjected to zones of uplift, are located near major faults, and dyke swarms. Within these areas, both diamondiferous and barren kimberlite and lamproite pipes occur. Kimberlites occur in clusters of three to fifty or more and can encompass a region stretching for 10's of kilometres commonly known as a field, in turn located in a geologically favourable environment called a kimberlite province. Within world renowned kimberlite provinces, in countries such as Russia, South Africa and the Northwest Territories of Canada diamondiferous pipes collectively occur over distances of hundreds of kilometres.

Kimberlite pipes vary in size from a few square metres to 217 hectares for the M1 kimberlite pipe in Botswana. The individual kimberlite pipes are generally elliptical to circular in shape and 'carrot' shaped in cross section, hence the term 'pipe'. A classic kimberlite pipe is comprised of a root zone of dykes and sills, a tapered diatreme zone, and a shallow crater facies at surface. The level of erosion of a pipe has an important impact on the economics of a diamondiferous kimberlite pipe. The middle, diatreme facies, makes up the greatest volume and has the highest and most homogenous diamond grade. The upper, crater facies has inconsistent grades and the deep root zones are irregular in both shape and grade.

In contrast to the kimberlites, lamproites studied to date are generally shaped like a 'champagne glass' rather than like a 'carrot'. A kimberlite shows two to three kilometres of vertical flaring while a lamproite will only show 100-500 metres of vertical flaring. Because of the higher volatility of kimberlites due to the increased CO_2 and H_2O components, kimberlites tend to exhibit a final explosive phase thus giving them their 'carrot' like appearance.

The largest pipe in a kimberlite cluster is the one generally most likely to be economic, although there are two clusters of pipes in South Africa that contain more than one economic pipe. In the Northwest Territories, on the other hand, the economic pipes tend to be small, generally 2 ha or less in size. In addition, diamondiferous pipes within a kimberlite cluster do not appear to have a predictable distribution pattern, likely due to the explosive nature of their emplacement.

Most of the kimberlites in Northern Alberta are interpreted to be crater facies occurrences. They are described as volcaniclastic olivine-rich kimberlites with varying amounts of lapilli and xenoliths. A variety of indicator minerals are present; olivine is the dominant mineral followed by chromite, peridotitic and eclogitic pyrope garnets and rare picroilmenite.

Ashton Mining and their Buffalo Hills joint venture partners, Pure Gold and EnCana, have discovered 36 kimberlite pipes of which 24 are diamondiferous indicating that Buffalo Head Hills area is a new kimberlite province (Figure 3a).

MINERALIZATION

The following is a general description of kimberlites found on the nearby Ashton/Pure Gold/EnCana Buffalo Hills property. No diamond mineralization or kimberlite intrusions are known to occur on the Liege and Legend properties so this description only indicates the type of occurrence that Paramount and 977554 Alberta Ltd. will seek on their two properties.

The detailed geology of one of the Ashton/Pure Gold/EnCana kimberlites is best described by Clements and Skelton (2001) as "*Kimberlite outcrops were identified in four locations while in other areas, overburden up to 127 metres was intersected during drilling. Size estimates based on geophysical modeling range from one to 47 hectares. All but one of the kimberlites are classified as crater facies; most of them can be described as volcaniclastic olivine-rich kimberlites with varying amounts of lapilli and xenoliths. A variety of indicator minerals is present; olivine is the dominant mineral followed by chromite, peridotitic and eclogitic pyrope garnets and rare picroilmenite. Kimberlites in the southern part of the province contain rare subcalcic (G10) garnets. Kimberlites located in the central and northern regions of the province contain a higher number of subcalcic garnets, some with exceptionally high chromium contents of up to 17.8 weight percent* Cr_2O_3."

A sample of kimberlite from Ashton BH225 was sent to Geospec Consultants of Australia for U-Pb perovskite age dating. The sample was collected at a depth of 75.3m and returned $^{206}P/^{238}U$ age date of 85.1±1.2 Ma. No kimberlite intrusions are known to occur on the Liege and Legend properties so this description only indicates the possible age of the type of occurrence that Paramount and 977554 Alberta Ltd. will seek on their two properties.

EXPLORATION

Neither 977554 Alberta Ltd. nor its parent company Paramount Resources Ltd. has carried out any exploration on the properties directly for diamond mineralization. However, the properties cover areas on which Paramount has conducted exploration for natural gas, including seismic reflection surveys and drilling.

Seismic surveys are not a primary exploration tool in diamond exploration. However, in a sedimentary environment, a kimberlite diatreme intrudes through the sedimentary layering, it may be indicated by interruptions and/or disruptions in the seismic reflections from the normal sedimentary layering. Indeed, on the Buffalo Hills property of Ashton Mining of Canada just to the west seismic reflection surveys were instrumental in the identification of the K2, K4, K5, K6, K7, K32 and K92 kimberlites and aided in the determining the geometry and structure of the kimberlites (Skelton and Bursey, 1999a).

There are seven seismic anomalies on the properties, two on the Liege property (seismic anomaly A and B) and five on the Legend property (seismic anomalies 1,2,3,4 and 5) that could indicate kimberlite bodies, as shown on Figure 4. Of these, anomalies B, 1,2, 3,4 and 5 look identical to the seismic signatures of known kimberlites on the Buffalo Hills property, in that deep continuous seismic reflections are interrupted. The interruptions occur across significant widths and may be used to infer the widths of the potential kimberlite pipes as follows; B - 900 m, 1- 2635 m, 2 – 300 m, 3 – 750 m, 4 – 570 m and 5 – 340 m. In anomaly A on the Liege property, some vague shallow reflections are interrupted but the deeper reflectors are not. The seismic results from anomaly A bear some resemblance to results from the K-5 pipe (Skelton and Bursey, 1999a) and to a seismic survey over a kimberlite 'bed' in the Fort a la Corne area of Saskatchewan (Gendzwill and Matieshin, 1996). Based on drilling where vertical holes pass through kimberlite intersections, some of the known kimberlites on the Buffalo Hills property appear to be 'beds' rather than pipes, so anomaly A could reflect a kimberlite bed or a pipe with a shallow 'root'. It is also possible that the seismic reflections from the deep horizons are not disrupted because pipe is off the seismic section. Consideration also needs to be given to some other near surface feature, unrelated to kimberlites, has caused noise in the seismic survey. In seismic reflection surveys, these are called 'statics' and they are normally removed by the data processing to bring the reflectors into 'focus'.

The seven seismic anomaly sites were reconnoitered from the air by author LeBel on April 16, 2003 and one (anomaly B) received a brief ground examination. With the exception of anomaly B on the Liege property which underlies a broad, low hill and anomaly 4 on the Legend property which underlies some recumbent meanders in a river, neither of which should affect the seismic results, nothing of note was observed at the anomaly sites. Each site looked much like other parts of the property where numerous other seismic surveys have been done with no 'kimberlite' anomalies recorded.

The Liege property and western 1/3 of the Legend property are encompassed by the former Rabbit Lake property of Ashton Mining of Canada Ltd., on which Ashton carried out the following more conventional diamond exploration; a fixed-wing aeromagnetic survey with 250 m flight line spacing (High Sense Geophysics Ltd., 1998), two detailed helicopter aeromagnetic surveys of selected amomalies on flight lines spaced at 100 m (High Sense Geophysics Ltd., 1996 and High Sense Geophysics Ltd., 1997), a detailed DighemV electromagnetic and magnetic a helicopter aeromagnetic survey of selected anomalies (Rudd, 1998), ground magnetic surveys on 18 selected targets (Skelton and Bursey, 1999d), kimberlite indicator mineral sampling (Skelton and Willis, 2001) and diamond drilling of one target (Skelton and Willis, 2001). This data provides a solid data base for further exploration on the majority of the Liege and legend properties. The fixed-wing aeromagnetic survey was flown By High Sense Geophysics with a terrain clearance of 100 m and a 250 m line spacing. The helicopter aeromagnetic surveys were conducted by either High Sense Geophysics Ltd. or Dighem Surveys Ltd. at a terrain clearance of 30 m on lines spaced at 100 m. Modern airborne magnetometers take measurements at 0.1 sec intervals which equates to readings at approximately every 8 m at fixed-wing aircraft flying speeds and 3 m at helicopter flying speeds. The

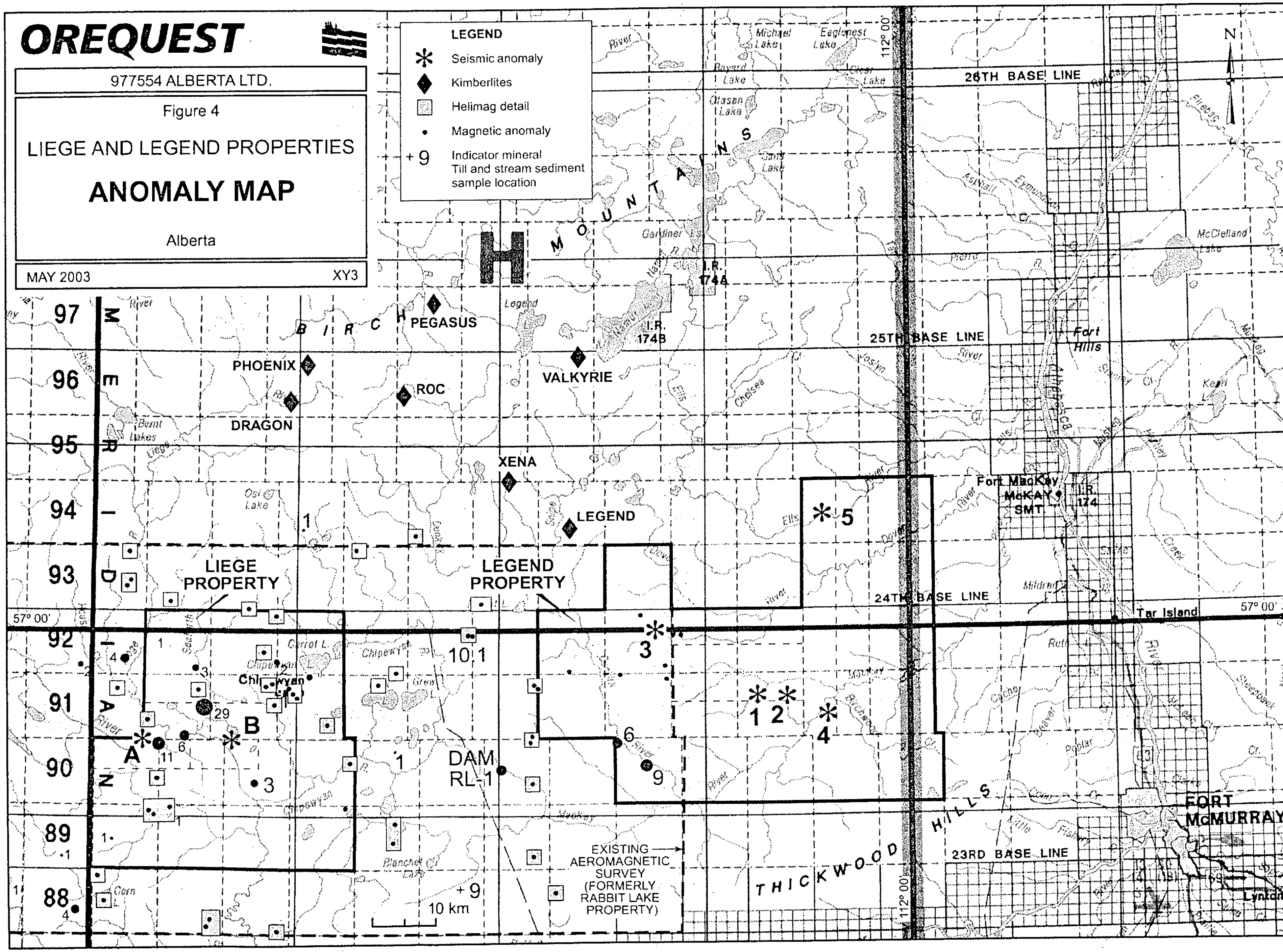
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Figure 4
LIEGE AND LEGEND PROPERTIES
ANOMALY MAP
Alberta
MAY 2003
XY3
LEGEND
Seismic anomaly
Kimberlites
Helimag detail
Magnetic anomaly
+9 Indicator mineral
Till and stream sediment sample location
26TH BASE LINE
25TH BASE LINE
24TH BASE LINE
23RD BASE LINE
BIRCH MOUNTAINS
THICKWOOD HILLS
PEGASUS
PHOENIX
ROC
DRAGON
VALKYRIE
XENA
LEGEND
LIEGE PROPERTY
LEGEND PROPERTY
DAM RL-1
EXISTING AEROMAGNETIC SURVEY (FORMERLY RABBIT LAKE PROPERTY)
10 km
57° 00'
112° 00'
Tar Island
Fort MacKay
FORT McMURRAY
Fort Hills
Lynton
I.R. 174A
I.R. 174B
I.R. 174
Gardiner L.
McClelland Lake
Burnt Lakes
Osi Lake
Chipewyan
MERIDIAN
97
96
95
94
93
92
91
90
89
88
A
B
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2
3
4
5
N

ground magnetic surveys typically employed 100 m line spacing. The ground surveys were conducted by Ashton Mining of Canada Inc.

Standard airborne magnetic calibration procedures, including figure of merit tests and data acquisition and processing procedures would have been practiced by aeromagnetic contractors, including; diurnal monitoring with a base station magnetometer, and curtailing flying operations during periods of erratic diurnal variations which exceed contract specifications. For large surveys flown at some distance from a base of operations it is not feasible to correct the results with a base station magnetometer because the variations recorded at the base of operations will differ from the survey area. Leveling the data was largely done using frequently spaced tie lines. Furthermore, anomalies from small sources like kimberlites tend to be short lived with respect to flying time, along a flight line, for example, a 500m wide anomaly would be traversed by the aircraft in 5 seconds flying at 100 m per second, when compared to the longer period of active diurnal variations. All the ground magnetic surveys were corrected for diurnal variations using base station magnetometers. However, it is not clear whether the base stations were set up at the base of operations or locally at the site of the survey.

From this data, Ashton identified 21 magnetic kimberlite targets on the Liege property and 7 on the Legend property as shown on Figure 4. None of these anomalies correlate with the seismic anomalies on the properties. The authors have relied on the Ashton interpretation of the results for the purposes of this report and have not reviewed the data in detail to look for more magnetic targets on the properties, including anomalies that might correlate with the seismic anomalies. In the authors' opinions, the Ashton data has not been thoroughly evaluated. The non-magnetic host rocks create a bland uniform background in which the anomalies from kimberlites readily standout, as comparatively 'sharp' anomalies, due to shallow features. Shallow deposits of magnetic material in the overburden appear to be the only alternative cause for these distinctive anomalies. The great thickness of the cover rocks eliminates responses from the basement in comparison to areas such as the Lac de Gras area where the 'basement' host produces a plethora of anomalies unrelated to kimberlites.

Ashton also collected 36 heavy mineral, kimberlite indicator mineral samples from the Liege property and two from the Legend property (Skelton and Willis, 2001). Eight (8) of the samples from the Liege property returned anomalous indicator mineral results, including three adjacent samples, AL04-0138, 0139 and 0140 with 6, 11 and 29 indicator mineral grains, respectively and the two samples from the Legend property Al04-0137 and 0138 returned 9 and 6 kimberlite indicator mineral grains, respectively. The sample density is not sufficient to establish the provenance of the kimberlite indicator mineral anomalies. Glacial transport direction in the area is from the northeast or the northwest (Fulton, 1996) and there is up-ice 'room' from the anomalous sample sites for the kimberlite sources to be located on the properties. The glacial transport distance for the area is not known, so it is possible that the known kimberlites located to the north and northeast of the properties be responsible for the anomalous samples. Also the anomalous samples appear to be stream sediments, based on there locations on water courses, rather then tills, although the samples are not specifically identified as stream sediments by Ashton, where fluvial winnowing could lead to higher than normal heavy mineral grain concentrations.

DRILLING

Ashton drilled one hole (DDHRL1-01) to test an aeromagnetic anomaly (RL-1) in the vicinity of the Legend property but it is not directly on the property. There are a large number of natural gas exploration and production wells in the area that are not germane to kimberlite exploration.

SAMPLING METHOD AND APPROACH

All the sampling on the property was done previously by Ashton Mining of Canada Inc. Ashton and its joint venture partners have followed a systematic approach to diamond exploration in the Canadian north involving the use of regional till sampling in conjunction with airborne and ground magnetic and electromagnetic surveys, any or all of which can assist in locating kimberlite bodies. Dispersion trains of indicator minerals, mineral assemblages generally considered unique to kimberlites, are disbursed by forces of erosion but can be detected by heavy mineral analyses and through careful sampling the dispersion train followed back to its source. Once an area is selected from regional surveys detailed grid based till sampling and ground geophysical surveys, in conjunction with mapping and prospecting are used to select prospective areas for drill testing. A discovery of kimberlite on surface can lead directly to the drilling phase.

SAMPLE PREPARATION, ANALYSIS AND SECURITY

All the sampling on the property was done previously by Ashton Mining of Canada Inc. Samples are collected with the aid of helicopter; a GPS system is utilized to record the sample location. Samples locations and relevant sample and geological data are logged into a computer database. Samples are securely stored on site. All samples are shipped to Ashton's North Vancouver laboratory for preparation and analysis; Ashton employees have complete control of the sample "chain of custody".

Till samples of approximately 25 kg are collected from sites prospective for the trapping of heavy minerals. If grid based till sampling is conducted then generally speaking the sample size is smaller but the sample density is much greater. In areas of in-situ kimberlite, or kimberlite float and talus rock samples of varying weights are collected and analyzed. The heavy mineral samples are collected in bags, sealed with security tags and shipped to the Ashton North Vancouver lab by truck. During the kimberlite drilling phase, kimberlite core is collected in core boxes which are shipped to the Ashton North Vancouver lab by truck. Ashton employees supervise all aspects of the sampling handling and shipping procedures.

The author Cavey has reviewed the Ashton sampling procedures. It is the authors' opinion that the Ashton sampling, sample preparation, security and analytical procedures are adequate and meet or exceed the standards as discussed in NI 43-101. The successful discovery of 36 kimberlites in the Buffalo Head Hills area of which 24 are diamondiferous is evidence that the techniques used by Ashton are appropriate in Alberta.

DATA VERIFICATION

The authors cannot ensure the quality of the data and results presented in this report as all the data was collected directly by Ashton personnel and therefore the authors must rely upon the professional measures used by the employees of Ashton for all aspects sampling and analytical procedures. The author Cavey has reviewed the Ashton quality control procedures and are of the opinion that the quality control measures Ashton has in place are adequate and meet or exceed the standards as discussed in NI 43-101. The authors havecompleted no independent sampling on the Legend and Leige properties and are of the opinion that none is required at this early stage of the exploration program.

ADJACENT PROPERTIES

It was the Ashton/Pure Gold/EnCana discovery of diamond-bearing kimberlites in the Buffalo Head Hills area of northern Alberta that triggered a province-wide staking rush in 1997. At its peak in early 1998, more than 50 different junior exploration companies held an interest in various permits. Unfortunately, disappointing results in 1998 deflated the play. Drilling programs by Lucero Resource, Meteor Minerals, Primero Industries and Montello Resources, primarily on geophysical anomalies were all unsuccessful at locating new kimberlites (Northern Miner, Vol. 85, No. 7, April 12-18, 1999).

There are 36 known kimberlite occurrences on the Ashton Mining of Canada Inc., Buffalo Hills property immediately to the west of the Liege property of which 24 are diamondiferous (Cavey, 2002). The grades of the 6 best occurrences in carats/100 tonnes are as follows (Cavey, 2002); K252 - 55.0, K14 - 17.0 (from exploration drilling) – 11.7 (from mini-bulk sample), K91 – 12.7. K6 – 9.4, K11 - 4.4 and BH225 – 3.5, based on diamonds greater than 0.8 mm in one dimension, except for the K14 mini-bulk sample which is based on diamonds greater than 1.2 mm in one dimension.

Most of the known kimberlites on the Buffalo Hills property have been discovered by drilling 'bull's eye' magnetic highs. One of the known kimberlites, K252, lacks a magnetic signature and was found by a GEOTEM airborne electromagnetic survey, as a resistivity high. Two of the main pipes, the K14 and the K6, produce distinct anomalies in a horizontal loop electromagnetic survey (Dujakovic and Rockel, 1997) that are interpreted here, by author LeBel, to reflect flat-lying, disk-shaped conductors. Seismic reflection surveys have also been instrumental in finding some of the pipes and have aided in the determining the geometry and structure of the kimberlites. Drilling at the K252 pipe was guided by a well defined, 600 m by 400 m gravity high (Cavey, 2002). Estimated dimensions of the kimberlites from their respective anomalies very from 100 m by 100 m for K160 to 600 m by 600 m for K5. Ashton's 'show-piece' kimberlite in the area, the K14 pipe, for example, exhibits a 250 m by 150 m 400 nT magnetic high. Four of the known kimberlites are reported to outcrop (Cavey, 2002) on hills. One eventual pipe is reported to have provided a convenient treeless, helicopter landing site for forestry and natural gas exploration crews prior to its discovery.

Although most of the known kimberlites in the area are magnetic highs, it is well known that kimberlite pipes are compositionally heterogeneous and have variable magnetic susceptibility which results in a variety of magnetic signatures (Macnae, 1979), even within the same cluster, including remnant magnetism lows and no magnetic signature at all (St. Pierre, 1999).

In addition, seven kimberlites, referred to as the Legend kimberlites, have been discovered to the north and northeast of the properties by junior resource companies Montello Resources, Redwood Resources, New Blue Ribbon Resources and joint venture partner Kennecott Canada but none of these are apparently diamondiferous (Cavey and Raven, 2002).

The occurrence of diamondiferous kimberlites on adjacent properties **is not necessarily indicative of any diamond mineralization on the Liege and Legend properties**. However, kimberlites invariably occur in 'clusters', several of which commonly make up 'fields' of kimberlites within a kimberlite 'province' that may span 100's of kilometers. For example, from the single kimberlite discovery at Point Lake in 1991, the Slave diamond province in the Northwest Territories, now incorporates several hundred kimberlites over a distance of 460 km. from the Doyle Lake sill in the south to Kikerk 1 pipe near the Coronation Gulf in the north and probably extends even farther north to the Diamonds North Resources Ltd. discoveries on Victoria Island.

MINERAL PROCESSING AND METALLURGICAL TESTING

Not applicable.

MINERAL RESOURCE AND MINERAL RESERVE ESTIMATION

There are no known proven or probable reserves or resources on either of the subject properties.

INTERPRETATION AND CONCLUSIONS

The Liege and Legend properties are located North Central Alberta west of Fort McMurray in an area where the regional basement geology and structure is favourable for hosting diamond bearing kimberlites. Exploration in the area by Ashton Mining of Canada Inc and partners has lead to the discovery of 36 kimberlite bodies, some of which are diamondiferous, in the Buffalo Hills area just west of the properties and there are seven known kimberlites located to the north and east of the properties.

At least six of the kimberlites in the Buffalo Head Hills kimberlite province have estimated grades greater than three carats per hundred, a value Ashton has determined is important when evaluating the economic potential of a kimberlite province. As in all evaluations of diamond deposits, the presence of commercial-sized and high quality stones is also essential. The Buffalo Head Hills area contains a series of roads and support facilities established by the oil and gas industry that provide easier access and better infrastructure development than exists in other parts of Canada, especially compared with the logistical problems encountered with mine exploration in the NWT. Ashton is of the opinion that the economic threshold for diamond mining in Alberta may be lower than that which exists in more remote regions of the country such as the NWT. The joint venture is encouraged by the regions potential to host an economic diamond deposit and it is highly recommended that exploration continue on the Buffalo Hills joint venture lands.

The properties also cover former Rabbit Lake property on which Ashton Mining of Canada Inc and partners carried out regional fixed-wing aeromagnetic surveys, helicopter aeromagnetic and ground magnetic follow-up and kimberlite indicator mineral sampling. The properties host a total of 10 magnetic targets that have not been tested by drilling and a review of the data could yield more favourable anomalies. In addition, there are some kimberlite indicator mineral anomalies on the properties, situated such that the source of the anomalies could be located on the properties.

The properties cover lands on which seismic reflection surveys have been conducted in the search for natural gas. In these surveys, there are seven seismic reflection anomalies that are similar to the seismic anomalies over known kimberlites in the area.

There are several available camps and airstrips at natural gas production plants in the area and a network of gas field service roads which simplify the accommodation and transportation logistics on the properties.

It is concluded that the Liege and Legend properties are strategically located in an existing kimberlite field where there are indications of more kimberlites and that an exploration an exploration program is warranted on the properties.

RECOMMENDATIONS

The exploration program consisting of the following elements is recommended for the Legend and Leige properties:

1. Review the existing magnetic geophysical database to confirm pre-existing targets and look for more targets, especially in the vicinity of the seven seismic targets.
2. Conduct fixed-wing airborne geophysical surveys over the part of the Legend property that has not received such coverage. The area involved is 16 of the 22 permits, an area of 147,456 ha. It is possible that pre-existing surveys are available from parts of this area. At 200 m line spacing and tie lines every 5 km the survey entails approximately 7,500 line kilometers.
3. Conduct ground geophysics to prepare the targets for drilling, including the 6 existing seismic targets and any targets developed from (1) and (2).
4. Diamond drill the targets and analyze the samples for diamond content.

Reconnaissance kimberlite mineral sampling on the Legend property. Although airborne geophysics is considered the primary exploration method for the area, the kimberlite indicator mineral sampling might provide some focus and encouragement particularly for kimberlites that do not have a geophysical signature.

Further exploration work will be contingent upon the successful completion of the work recommended in the proposed 2003 work program. The authors recommend that 977554 Alberta Ltd. proceed with the proposed exploration program.

2003 BUDGET ESTIMATES

The following budget is estimated for the proposed exploration program:

Airborne Data Review		
Geophysicist [redacted]	$ 15,000	
Report preparation	5,000	
	$ 20,000	**$ 20,000**
Airborne Geophysical Survey		
7,500 km @ $40/km	$ 300,000	
Interpretation and report	20,000	
	$ 320,000	**$ 320,000**
Ground geophysics (all inclusive)		
12 targets @ $10,000/target	$ 120,000	**$ 120,000**
Diamond Drilling and Analyses (12 targets assumed)		
Drilling 2000 m @ $150/m (all inclusive)	$ 300,000	
Road Building	40,000	
Analyses 12 samples @ $5000/sample	60,000	
	$ 400,000	**$ 400,000**
Kimberlite Indicator Mineral Sampling		
50 samples @ $2000/sample (all inclusive)	$ 100,000	**$ 100,000**
Total Direct Exploration		**$ 960,000**
Contingency at 10%		**96,000**
Operating Costs (supervision, administration, land etc.)		**96,000**
GRAND TOTAL		**$1,152,000**

Dated at Vancouver, British Columbia, this 24th day of April , 2003.

/s/"George Cavey" s/"J.L. LeBel"

George Cavey, P.Geo. J.L.LeBel, P.Eng.

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CERTIFICATE OF AUTHOR

I, George Cavey, of 306-595 Howe Street, Vancouver British Columbia, hereby certify:

1. I am a graduate of the University of British Columbia (1976) and hold a B.Sc. degree in geology.
2. I am presently employed as a consulting geologist with OreQuest Consultants Ltd. of #306-595 Howe Street, Vancouver, British Columbia.
3. I have been employed in my profession by various mining companies since graduation, with OreQuest Consultants Ltd. since 1982.
4. I am a member of the Association of Professional Engineers and Geoscientists of British Columbia, and have been a member since 1992. I am also a member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta and have been a member since 1989 (except for a two-year period from 1999-2001). I am also a member of the Association of Professional Engineers and Geoscientists of Manitoba.
5. I have read the definitions of "Qualified Person" set out in NI 43-101 and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "Qualified Person" for the purposes of NI 43-101.
6. I am a co-author of this report utilizing data summarized in the References section of this report. I have not visited the subject property.
7. I have had no previous direct involvement with the Legend or Leige properties although from 1993-2002, I have been the author or co-author of 20 technical reports dedicated to Alberta Diamond Exploration.
8. I am not aware of any material fact or material change with respect to the subject matter of the technical report which is not reflected in the technical report, the omission to disclose which makes the technical report misleading.
9. I am independent of 977554 Alberta Ltd. and Paramount Resources Ltd. applying all the tests in Section 1.5 of NI 43-101.
10. I have read NI 43-101 and NI 43-101F1 and the technical report has been prepared in compliance with that instrument and form.
11. I consent to the use of this report for the purpose of complying with the requirements set out in NI 43-101 for completing a 977554 Alberta Ltd. Prospectus and to be submitted to SEDAR for electronic filing.

/s/"George Cavey"

George Cavey, P. Geo.

DATED at Vancouver, British Columbia, this 24th day of April , 2003.

CERTIFICATE OF AUTHOR

I, J. L. LeBel, P. Eng., am a Professional Engineer living at 2684 Violet Street in the City of North Vancouver in the province of British Columbia hereby certify:

1. I graduated from Queen's University with a Bachelor of Applied Science degree in geological engineering in 1971, and I obtained a Master of Science degree in geophysics from the University of Manitoba in 1973.
2. I am presently a Senior Geophysicist with Orequest Consultants Ltd., 306 – 595 Howe Street, Vancouver, B.C., V6C 2T5.
3. I have been employed in my profession by various mining companies since graduation in 1972. I have been involved in diamond exploration from time to time since 1992 as a geophysical consultant on properties in the Northwest Territories, Nunavut, Greenland, Alberta, Ontario and Quebec.
4. I am a member of the Association of Professional Engineers and Geoscientists of British Columbia and have been since 1984.
5. I have read the definitions of "Qualified Person" set out in NI 43-101 and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "Qualified Person" for the purposes of NI 43-101.
6. I am the co-author of this report prepared using the data and information from the reports listed in the References section of this report. I have relied on data and information from previous work done on the property without verifying such data and information.
7. I visited the properties on April 16, 2003 which entailed flying over some of the geophysical anomaly sites in a helicopter and briefly examining one site on the ground.
8. I have had no previous direct involvement with the Legend or Leige properties.
9. I am not aware of any material fact or material change with respect to the subject matter of the technical report which is not reflected in the technical report, the omission to disclose which makes the technical report misleading.
10. I am independent of 977554 Alberta Ltd. and Paramount Resources Ltd. applying all the tests in Section 1.5 of NI 43-101.
11. I have read NI 43-101 and NI 43-101F1 and the technical report has been prepared in compliance with that instrument and form.
12. I consent to the use of this report for the purpose of complying with the requirements set out in NI 43-101 for completing a 977554 Alberta Ltd. Prospectus and to be submitted to SEDAR for electronic filing.

/s/"J.L. LeBel"

J.L. LeBel, P. Eng.

DATED at Vancouver, British Columbia, this 24th day of April , 2003.

APPENDIX I

METALLIC AND INDUSTRIAL PERMIT SCHEDULE

LIEGE AND LEGEND PROPERTIES

APPENDIX I: METALLIC AND INDUSTRIAL PERMIT SCHEDULE LIEGE AND LEGEND PROPERTIES

Permit Number	Location Meridian-Range-Township: Section	Area (ha)	Effective Date
LEGEND			
9302050130	4–14-90: 1-36	9216.00	May 24, 2002
9302050131	4–15-90: 1-36	9,216.00	May 24, 2002
9302050132	4–16-90: 1-36	9,216.00	May 24, 2002
9302050135	4–14–91: 1-3, 10-15, 22-27, 34-36 4–14–92: 1-3, 10-15, 22-27, 34-36	9,216.00	May 24, 2002
9302050136	4–14–91: 4-9, 16-21, 28-33 4–14–92: 4-9, 16-21, 28-33	9,216.00	May 24, 2002
9302050137	4–15-91: 1-18 4–16-91: 1-18	9,216.00	May 24, 2002
9302050138	4–15-91: 19-36 4–16-91: 19-36	9,216.00	May 24, 2002
9302050139	4–15-92: 1-18 4–16-92: 1-18	9,216.00	May 24, 2002
9302050140	4–15-92: 19-36 4–16-92: 19-36	9,216.00	May 24, 2002
9302050141	4–17-92: 1-36	9,216.00	May 24, 2002
9302050142	4–14–93: 1-3, 10-15, 22-27, 34-36 4–14–94: 1-3, 10-15, 22-27, 34-36	9,216.00	May 24, 2002
9302050143	4–14–93: 4-9, 16-21, 28-33 4–14–94: 4-9, 16-21, 28-33	9,216.00	May 24, 2002
9302050144	4–17-93: 1-36	9,216.00	May 24, 2002
9303031176	4–13-90: 1-36	9,216.00	March 18, 2003
9303031177	4–13-91: 1-36	9,216.00	March 18, 2003
9303031178	4–13-92: 1-36	9,216.00	March 18, 2003
9303031179	4–13-93: 1-36	9,216.00	March 18, 2003
9303031180	4–13-94: 1-36	9,216.00	March 18, 2003
9303031181	4–17-90: 1-36	9,216.00	March 18, 2003
9303031182	4–17-91: 1-36	9,216.00	March 18, 2003
9303031183	4–18-91: 1-36	9,216.00	March 18, 2003
9303031184	4–18-92: 1-36	9,216.00	March 18, 2003
22 Permits		**202,752 ha**	

Permit Number	Location Meridian-Range-Township: Section	Area (ha)	Effective Date
LIEGE			
9303031185	4–25-89: 1-36	9,216.00	March 18, 2003
9303031186	4–24-89: 1-36	9,216.00	March 18, 2003
9303031187	4–23-89: 1-36	9,216.00	March 18, 2003
9303031188	4–22-89: 1-36	9,216.00	March 18, 2003
9303031189	4–25-90: 1-36	4608.00	March 18, 2003
9303031190	4–24-90: 1-36	4608.00	March 18, 2003
9303031191	4–23-90: 1-18, 22-27, 34-36	9,216.00	March 18, 2003
9303031192	4–22-90: 1-36	9,216.00	March 18, 2003
9303031193	4–22-91: 1-36	9,216.00	March 18, 2003
9303031194	4–24-91: 1, 2, 11-14, 19-36	6144.00	March 18, 2003
9303031195	4–24-91: 20-29, 32-36	3840.00	March 18, 2003
9303031196	4–24-92: 1-5, 8-17, 20-29, 32-36	7980.00	March 18, 2003
9303031197	4–23-92: 1-36	9,216.00	March 18, 2003
9303031198	4–22-92: 1-36	9,216.00	March 18, 2003
9302050133	4–23–90: 19-21, 28-33 4–23–91: 3-10, 15-18 4–24–90: 22-27, 34-36 4–24–91: 1, 2, 11-14	9,216.00	May 24, 2002
9302050134	4–24–90: 19-21, 28-33 4–24–91: 3-5, 8-10, 15-17 4–25–90: 22-27; 34-36	9,216.00	May 24, 2002
16 Permits		**126,222 ha**	

TOTAL LEGEND AND LEIGE PERMITS

38 permits		**328,974 ha**	

APPENDIX 2

977554 Alberta Ltd.

ASSESSMENT REPORT

LIEGE PROSPECT

APPENDIX 2

Indicator Sampling Results

Bob Ryziuk
Geolink Exploration Ltd.
10961 University Avenue
Edmonton, Alberta T6G 1Y1

977554 Alberta Ltd.
4700 - 888 3rd Street SW
Calgary, Alberta T2P 5C5

C.F. MINERAL RESEARCH LIMITED

1677 POWICK ROAD
KELOWNA, BRITISH COLUMBIA
CANADA V1X 4L1

TEL (250) 860-8525
FAX (250) 862-9435

30 December 2003

INVOICE# : 9042975
CFM W.O. : DB34
BATCH : 03-2310

Mr. Bob Ryziuk
GEOLINK EXPLORATION LTD.
10961 University Ave.
Edmonton, Alta. T6G 1Y1

Client Ref :
Series : LE.. and LW..

INVOICE

ELECTRON MICROPROBE ANALYSIS
of indicator grains from -16+60 fractions
from 11 samples

• Mounting grains in cells and epoxying, polishing mounts to at least 1 micron after sectioning, and carbon coating polished mount to ~200 Angstroms **26 grains**	ANA-21-D-MNT	@ $ 1.00 each	26.00
• Electron microscope scanning of grains for mineral identification **26 grains**	ANA-22-D-SCR	@ $ 1.40 each	36.40
• Carbon coating polished thin sections to ~200 Angstroms 0 slides	ANA-20-D-SLID		
• Describe and tabulate mineral grain morphology and characteristics by specialist with emphasis on source proximity 0 grains	ANA-31-D-MOR		
• Categorisation and printed listings of all scanned grains into 3 distinctive mineral types and subdivisions 0 grains	ANA-23-D-CAT		
• X-ray microanalysis, using SX-50 electron microprobe with up to 11 major and significant minor elements per analysis of all the suitable mineral grains identified from the scans **23 analyses**	ANA-24-D-QUDI	@ $ 12.00 each	276.00
• Low level sodium analysis of eclogitic garnets, using 2 trace analyses per grain 0 L.L. analyses	ANA-25-D-TRNA		
• Advanced comprehensive diamond indicator mineral classification of each analysis (including any future classification improvements) **23 analyses**	ANA-27-D-CLAS	@ $ 1.00 each	23.00
Sub Total			361.40
7% G.S.T. (10090 5777 RT0001)			25.30
Total this invoice in Canadian Funds			**C$386.70**
Terms: Payment due upon receipt of invoice			

Invoice#	9042975
CFM W.O.	DB34
Client Ref Series	LE.. and LW..

SUMMARY OF ELECTRON MICROPROBE ANALYSIS

Samples in this invoice : 11

Analyses in this invoice: 23

Mounts: 4213

	Sample Name	CFM Batch	Analyses To date	Analyses Invoiced To date	Last Invoice# For Sample	Analyses This Invoice
1	LE03-1	03-2310	2	0		2
2	LE03-2	03-2310	1	0		1
3	LW03-1	03-2310	4	0		4
4	LW03-2	03-2310	4	0		4
5	LW03-3	03-2310	2	0		2
6	LW03-4	03-2310	0	0		0
7	LW03-5	03-2310	3	0		3
8	LW03-6	03-2310	7	0		7
9	LWT03-1	03-2310	0	0		0
10	LET03-1	03-2310	0	0		0
11	LET03-2	03-2310	0	0		0
						23

C.F. MINERAL RESEARCH LIMITED

TEL (250) 860-8525
FAX (250) 862-9435

1677 POWICK ROAD
KELOWNA, BRITISH COLUMBIA
CANADA V1X 4L1

30 December 2003

INVOICE# : 9032973
CFM W.O. : DB34
BATCH : 03-2310

Mr. Bob Ryziuk
GEOLINK EXPLORATION LTD.
10961 University Ave.
Edmonton, Alta. T6G 1Y1

Client Ref :
Series : LE.. and LW..

INVOICE

DIAMOND INDICATOR PICKING
of -16+60 fractions
from 11 samples

Optical Picking Diamond Indicator Mineral Grains • Pick representative portions of the specified concentrates • Pick for kimberlitic, lamproitic and diamond indicator minerals • Especially purple pyrope, chrome diopside, possible orange eclogitic garnet, chromite, picroilmenite and a representative number of any olivine, orthopyroxene and tourmaline indicators • Includes detailed picking and complete checking of both the picked indicator grains and the fully picked portion of the concentrates 27.75 hours PIK-11-D-KLDIM @ $ 32.60/hour	904.65
Sub Total 7% G.S.T. (10090 5777 RT0001)	904.65 63.33
Total this invoice in Canadian Funds **Terms: Payment due upon receipt of invoice**	C$967.98

Invoice#	9032973
CFM W.O.	DB34
Client Ref	
Series	LE.. and LW..

SUMMARY OF DIAMOND INDICATOR PICKING

Samples in this invoice: 11
Hours picking in this invoice: 27.75

	Sample Name	CFM Batch	Hours Picking To date	Hours Invoiced To date	Last Invoice# For Sample	Hours This Invoice
1	LE03-1	03-2310	3.50	0.00		3.50
2	LE03-2	03-2310	1.50	0.00		1.50
3	LET03-1	03-2310	0.75	0.00		0.75
4	LET03-2	03-2310	0.50	0.00		0.50
5	LW03-1	03-2310	3.75	0.00		3.75
6	LW03-2	03-2310	4.00	0.00		4.00
7	LW03-3	03-2310	4.00	0.00		4.00
8	LW03-4	03-2310	1.25	0.00		1.25
9	LW03-5	03-2310	4.00	0.00		4.00
10	LW03-6	03-2310	4.00	0.00		4.00
11	LWT03-1	03-2310	0.50	0.00		0.50
						27.75

C.F. MINERAL RESEARCH LIMITED

TEL (250) 860-8525
FAX (250) 862-9435

1677 POWICK ROAD
KELOWNA, BRITISH COLUMBIA
CANADA V1X 4L1

30 December 2003

INVOICE# : 9032972
CFM W.O. : DB34
BATCH : 03-2310

Mr. Bob Ryziuk
GEOLINK EXPLORATION LTD.
10961 University Ave
Edmonton, Alta. T6G 1Y1

Client Ref :
Series : LE.. and LW..

INVOICE

HEAVY MINERAL CONCENTRATION
of 11 till (clay) samples
To MAKE -16+60 HIL, HPY, HD, HM and -60 H

High recovery diamond indicator extraction package (clay) • Wet sieving, sizing, semigravity concentration, drying and dry sieving concentrates up to: 3 kg of -16+35, 3 kg of -35+60, all -60 • Tetrabromoethane separation using 0.5-1.0 micron triple filtration of **three 3 kg** concentrates **(-16+35, -35+60 and -60)** • Sieving and electromagnetic separation of up to 500 grams of heavy concentrate to make 4 diamond indicator fractions **(IHIL, IHPY, IHD, IHM)**			
1 sample	HRH-31D-16C-33-4M	@ $185.00/sample	185.00
9 samples	HRH-32D-32C-33-4M	@ $220.00/sample	1,980.00
1 sample	HRH-33D-48C-33-4M	@ $255.00/sample	255.00
Optional processing: - Processing overweight samples in additional 12 kg increments			
0 overweight increments	HRH-51-D-OPT-OW		
√ Process through TBE additional 3 kg dry concentrate			
9 concentrates	HRH-52-D-OPT-TBE	@ $ 25.75/3 kg	231.75
- Collect and clean all TBE 'light' fraction			
0 samples	HRH-53-D-OPT-L		
√ Methylene iodide separation using 0.5-1.0 micron triple filtration of up to 250 cc HI concentrate (or representative split)			
11 concentrates	HRH-54-D-OPT-MI	@ $ 36.50/250 cc	401.50
√ Make any additional four DI magnetic fractions			
- 3 samples (no electromagnetic separation)	HRH-00-D-OPT-MAG	@-$ 23.75 each	- 71.25
√ Create and complete sample record form			
11 samples	HRH-56-D-OPT-REP	@ $ 7.00/sample	77.00
Sub Total			3,059.00
7% G.S.T. (10090 5777 RT0001)			214.13
Total this invoice in Canadian Funds **Terms: Payment due upon receipt of invoice**			C$3,273.13

Invoice#	9032972
CFM W.O.	DB34
Client Ref	
Series	LE.. and LW..

SUMMARY OF HEAVY MINERAL PROCESSING

Samples in this invoice: 11

	Sample Name	CFM Batch	Sample Weight (kg)	Last Invoice# For Sample
1	LE03-1	03-2310	16.26	
2	LE03-2	03-2310	15.82	
3	LET03-1	03-2310	31.94	
4	LET03-2	03-2310	28.18	
5	LW03-1	03-2310	16.72	
6	LW03-2	03-2310	17.94	
7	LW03-3	03-2310	17.56	
8	LW03-4	03-2310	16.90	
9	LW03-5	03-2310	16.44	
10	LW03-6	03-2310	17.16	
11	LWT03-1	03-2310	33.68	

DIAMOND INDICATOR FRACTION DESCRIPTIONS

-m+n - the size fraction, where m defines the upper size (based on Tyler sieve size) limit and n the lower size limit. Grains found in this size fraction possess dimensions somewhere between these limits.

-m - the size fraction, where m defines the upper size limit (based on the Tyler sieve size). Grains found in this size fraction possess dimensions m and smaller.

+n - the size fraction, where n defines the lower size limit (based on the Tyler sieve size). Grains found in this size fraction possess dimensions n and larger.

H - High density fraction ("heavies") consisting of grains which possess specific gravities normally greater than ~3.1.

I - Intermediate density fraction ("intermediates") consisting of grains which possess specific gravities less than the H fraction, but greater than the L fraction. (~2.9-~3.1)

L - Low density fraction ("lights") consisting of grains which possess specific gravities less than that of the I fraction, normally less than ~2.9.

M - Magnetite magnetic fraction, consisting of grains which are ferromagnetic (e.g. magnetite).

IL - Ilmenite magnetic fraction, consisting of grains which possess strong magnetic susceptibilities (e.g. picroilmenite, chromite).

PY - Pyrope/Chromium Diopside magnetic fraction, consisting of grains which possess weak magnetic susceptibilities.

D - Diamond magnetic fraction consisting of grains which possess weak or no magnetic susceptibilities

Fraction	-	Examples -16+32 H D, -32+60 H IL, -32+60 H PY
Sieve	-	Typical mesh used and the respective wire space sizes

Mesh	Aperture (mm)
16	1.0
32	0.5
60	0.25

Beta - Beta Value calculation:

IH-A = weight in grams of all the sinks from TBE

IH = the weight in grams of that proportion of IH-A submitted for MI separation

$$\text{Beta Value} = \frac{\text{IH-A}}{\text{IH}}$$

Thus, if all of the IH-A is submitted for MI separation, Beta = 1. If Beta > 1 then there is some IH-A available. Therefore, if 8 purples are found in the appropriate fraction from a sample with a Beta value of 1.5, then one might expect, within statistical limits, there to be 12 purples (8x1.5) from the whole sample.

PICKING DATA SHEET CODE DESCRIPTIONS

PP	potential peridotitic garnets
OR	potential eclogitic garnets
CD	potential diatreme clinopyroxenes
OLV/OPX	potential diatreme orthopyroxenes or olivines
SAP/OTH	sapphires or other garnets
BLKS	potential diatreme picroilmenites or chromites

ustomer: DB34
robe Batch: dec23c (p)
omment:

ELECTRON MICROPROBE ANALYSIS FROM C.F. MINERAL RESEARCH LTD.
Batch File: 03-2310

5-Jan-2004 11:08 am
File: prb2310.prn

ample ame	Fraction	Mount	Cel	Grn	=== Classifications ======= SA	CFM	DI	SiO2	TiO2	Al2O3	V2O3	Cr2O3	Fe2O3	FeO	MgO	CaO	MnO	NiO	ZnO	Nb2O5	Na2O	Max Trace Na2O	K2O	Total
:03-1	-16+60HPY	4213	1	102	CE	CP2	-	54.04	.03	1.16		.38		5.17	15.03	22.60	.22	.06			.68		.01	99.38
:03-1	-16+60HPY	4213	1	103	CP	CP2		52.67	.11	2.51		.94		4.96	16.71	20.58	.24	.00			.42		.00	99.13
:03-2	-16+60HPY	4213	1	104	CP	CPX	-	53.65	.20	1.92		1.23		3.37	16.69	21.49	.12	.03			.70		.01	99.40
:T03-1						*																		
:T03-2						*																		
J03-1	-16+60HIL	4213	1	106		PIL			51.79	.58		.41	9.65	24.97	12.32	.01	.24		.00	.17				100.14
J03-1	-16+60HIL	4213	1	201		PIL			52.34	.66		.50	9.16	22.79	13.87	.02	.26		.05	.05				99.71
J03-1	-16+60HIL	4213	1	202		PIL			52.28	.62		.44	8.62	24.59	12.79	.02	.28		.06	.11				99.80
J03-1	-16+60HPY	4213	1	105	P	G11-1		41.51	.17	19.75		5.37		7.79	19.20	5.29	.39	.00			.04		.00	99.50
J03-2	-16+60HPY	4213	1	205	CE	CPX	-	54.63	.02	1.21		.39		3.49	16.14	23.04	.12	.04			.58		.00	99.66
J03-2	-16+60HPY	4213	1	203	P	G 9		41.79	.03	22.28		2.34		9.39	18.46	4.98	.63	.00			.00		.00	99.89
J03-2	-16+60HPY	4213	1	204	P	G11-1		41.87	.19	19.93		5.32		7.09	19.41	5.57	.46	.02			.04		.00	99.90
J03-2	-16+60HPY	4213	1	206	P	G11-1		41.85	.03	19.52		5.99		7.15	19.19	5.76	.37	.00			.02		.01	99.90
J03-3	-16+60HPY	4213	1	301	CE	CPX	-	54.18	.04	1.15		.48		4.86	15.79	22.32	.22	.02			.59		.00	99.64
J03-3	-16+60HPY	4213	1	207	CP	CPX	-	54.31	.03	.82		.58		3.94	16.01	23.17	.13	.09			.47		.01	99.54
J03-4						*																		
J03-5	-16+60HIL	4213	1	305		CR		.00	.61	16.83	.25	40.36	8.44	29.32	3.39	.00	.45	.10	.17					99.92
J03-5	-16+60HPY	4213	1	304	CV	CP5	-	52.54	.35	6.14		1.09		2.99	15.21	20.27	.11	.05			1.45		.00	100.20
J03-5	-16+60HPY	4213	1	303	P	G11		41.08	.05	18.78		6.39		8.60	17.42	6.89	.45	.00			.00		.00	99.67
J03-6	-16+60HPY	4213	1	405		OLV-FORS	-	40.65	.03	.00		.00		9.62	48.41	.01	.15	.40			.00		.00	99.27
J03-6	-16+60HPY	4213	1	406		OLV-FORS	-	41.14	.02	.00		.01		8.80	48.25	.04	.17	.35			.00		.00	98.78
J03-6	-16+60HPY	4213	1	407		OLV-FORS	-	41.38	.02	.02		.00		8.57	48.86	.02	.15	.25			.00		.01	99.27
J03-6	-16+60HPY	4213	1	403	CP	CP5	-	54.59	.04	1.12		.76		3.28	16.08	22.93	.09	.04			.67		.01	99.60
J03-6	-16+60HPY	4213	1	404	CP	CPX		53.95	.04	1.26		.75		4.03	14.89	23.71	.17	.00			.78		.00	99.57
J03-6	-16+60HPY	4213	1	402	P	G 1		42.10	.71	20.03		3.75		7.61	20.34	5.11	.28	.02			.04		.00	100.01
J03-6	-16+60HPY	4213	1	401	P	G11		40.76	.14	17.29		8.12		8.46	16.68	7.55	.60	.02			.01		.01	99.63
JT03-1						*																		

* Sample contained no grains worthy of analysis

SAMPLE				FRACTION			PICKING RESULTS							
#	Batch	Name	Weight kgs	Code	Name	Weight gms	Picked	PP	OR	CD	OLV/ OPX	SAP/ OTH	BLKS	BETA VAL
1	03-2310	LE03-1	16.26	37-520	-16+60HIL	58.02	58.02	0	0	0	0	0	0	1
1	03-2310	LE03-1	16.26	37-530	-16+60HPY	12.08	12.08	0	0	3	0	0	0	1
2	03-2310	LE03-2	15.82	37-520	-16+60HIL	5.45	5.45	0	0	0	0	0	0	1
2	03-2310	LE03-2	15.82	37-530	-16+60HPY	6.52	6.52	0	0	1	0	0	0	1
3	03-2310	LW03-1	16.72	37-520	-16+60HIL	55.45	55.45	0	0	0	0	0	3	1
3	03-2310	LW03-1	16.72	37-530	-16+60HPY	13.96	13.96	1	0	0	0	0	0	1
4	03-2310	LW03-2	17.94	37-520	-16+60HIL	81.43	24.77	0	0	0	0	0	0	1
4	03-2310	LW03-2	17.94	37-530	-16+60HPY	16.53	16.53	3	0	1	0	0	0	1
5	03-2310	LW03-3	17.56	37-520	-16+60HIL	79.56	60.36	0	0	0	0	0	1	1
5	03-2310	LW03-3	17.56	37-530	-16+60HPY	20.36	20.36	0	0	2	0	0	1	1
6	03-2310	LW03-4	16.90	37-520	-16+60HIL	11.32	11.32	0	0	0	0	0	0	1
6	03-2310	LW03-4	16.90	37-530	-16+60HPY	2.23	2.23	0	0	0	0	0	0	1
7	03-2310	LW03-5	16.44	37-520	-16+60HIL	102.56	66.52	0	0	0	0	0	1	1
7	03-2310	LW03-5	16.44	37-530	-16+60HPY	14.12	14.12	1	0	1	0	0	0	1
8	03-2310	LW03-6	17.16	37-520	-16+60HIL	112.39	27.81	0	0	0	0	0	0	1
8	03-2310	LW03-6	17.16	37-530	-16+60HPY	20.44	20.44	2	0	2	3	4	0	1
9	03-2310	LWT03-1	33.68	37-500	-16+60H	5.92	5.92	0	0	0	0	0	0	1
10	03-2310	LET03-1	31.94	37-500	-16+60H	3.34	3.34	0	0	0	0	0	0	1
11	03-2310	LET03-2	28.18	37-500	-16+60H	0.99	0.99	0	0	0	0	0	0	1

APPENDIX 3

977554 Alberta Ltd.

ASSESSMENT REPORT

LIEGE PROSPECT

APPENDIX 3

Airborne Geophysics

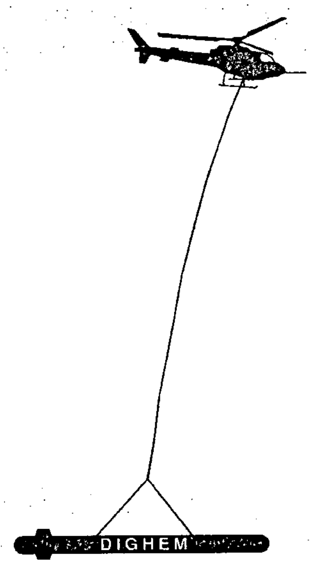
Bob Ryziuk
Geolink Exploration Ltd.
10961 University Avenue
Edmonton, Alberta T6G 1Y1

977554 Alberta Ltd.
4700 - 888 3rd Street SW
Calgary, Alberta T2P 5C5

Report #03094

RESOLVE SURVEY
FOR
977554 ALBERTA LTD.

FT. MCMURRAY AREA, AB



Fugro Airborne Surveys Corp.
Mississauga, Ontario

January 19, 2004

Michael J. Cain
Geophysicist

SUMMARY

This report describes the logistics, data acquisition and processing of a RESOLVE airborne geophysical survey carried out for 977554 Alberta Ltd., over the Ft McMurray area, Alberta. Total coverage of the survey blocks amounted to 83 km. The survey was flown on December 31, 2003.

The purpose of the survey was to detect kimberlite targets. This was accomplished by using a RESOLVE multi-coil, multi-frequency electromagnetic system, supplemented by two high sensitivity cesium magnetometers in a horizontal gradiometer configuration. The information from these sensors was processed to produce maps that display the magnetic and conductive properties of the survey area. 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. Map products and digital data were provided in accordance with the scales and formats specified in the Survey Agreement.

CONTENTS

APPENDICES

A. List of Personnel
B. Optional Products
C. Background Information
D. Data Archive Description

1. INTRODUCTION

A RESOLVE electromagnetic/resistivity/magnetic survey was flown for 977554 Alberta Ltd. on December 31, 2003, over the Ft McMurray area, Alberta.

Survey coverage consisted of 83 line-km, over 7 blocks. Flight lines were flown in an azimuthal direction of 90° with a line separation of 50 metres. A single tie line was flown perpendicular to the survey lines on all blocks except the Legend block.

The survey employed the RESOLVE electromagnetic system. Ancillary equipment consisted of a horizontal magnetic gradiometer, radar, laser and barometric altimeters, video camera, analog and digital recorders, and an electronic navigation system. The instrumentation was installed in an AS350-BA turbine helicopter (Registration C-GJIX) that was provided by Questral Helicopters Ltd. The helicopter flew at an average airspeed of 135 km/h with an EM sensor height of approximately 35 metres.

Figure 1: Fugro Airborne Surveys RESOLVE EM bird with AS350-B3

2. SURVEY OPERATIONS

The base of operations for the survey was established at Legend camp, Alberta. The survey was flown from on December 31, 2003 over seven survey blocks. The survey area can be located on NTS map sheets 84A/13,16; 84H/1,2 (Figure 2).

Total survey coverage consisted of 83 line-km

The survey specifications were as follows:

Parameter	Specifications
Traverse line direction	90°/270°
Traverse line spacing	50 m
Tie line direction	0°/180°
Tie line spacing	-
Sample interval	10 Hz or 3.8 m at 135 km/hr
Aircraft mean terrain clearance	62 m
EM sensor mean terrain clearance	35 m
Mag sensor mean terrain clearance	35 m
Average speed	135 km/hr
Navigation (guidance)	±5 m, Real-time GPS
Post-survey flight path	±2 m, Differential GPS

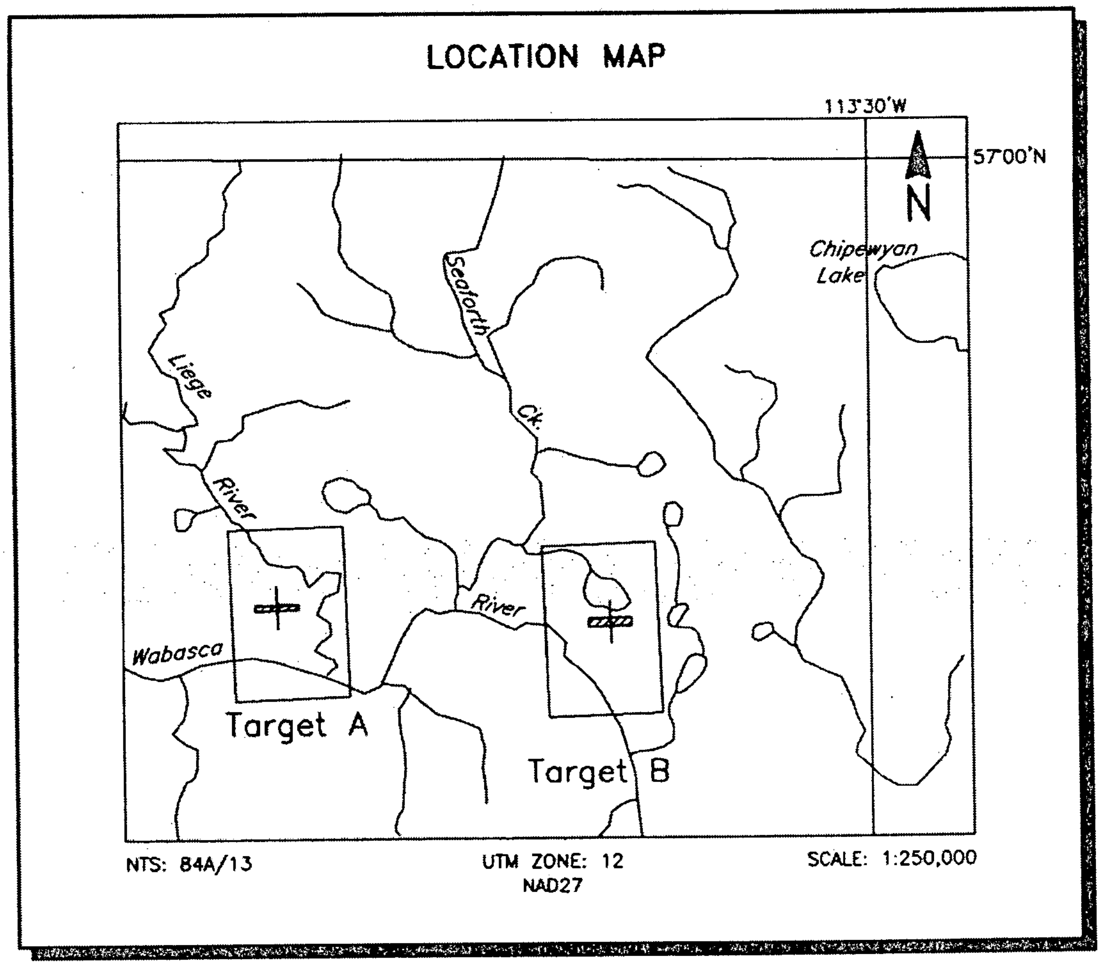


Figure 2a
Location Map and Sheet Layout
Target A and Target B
Ft McMurray Area
Job # 03094

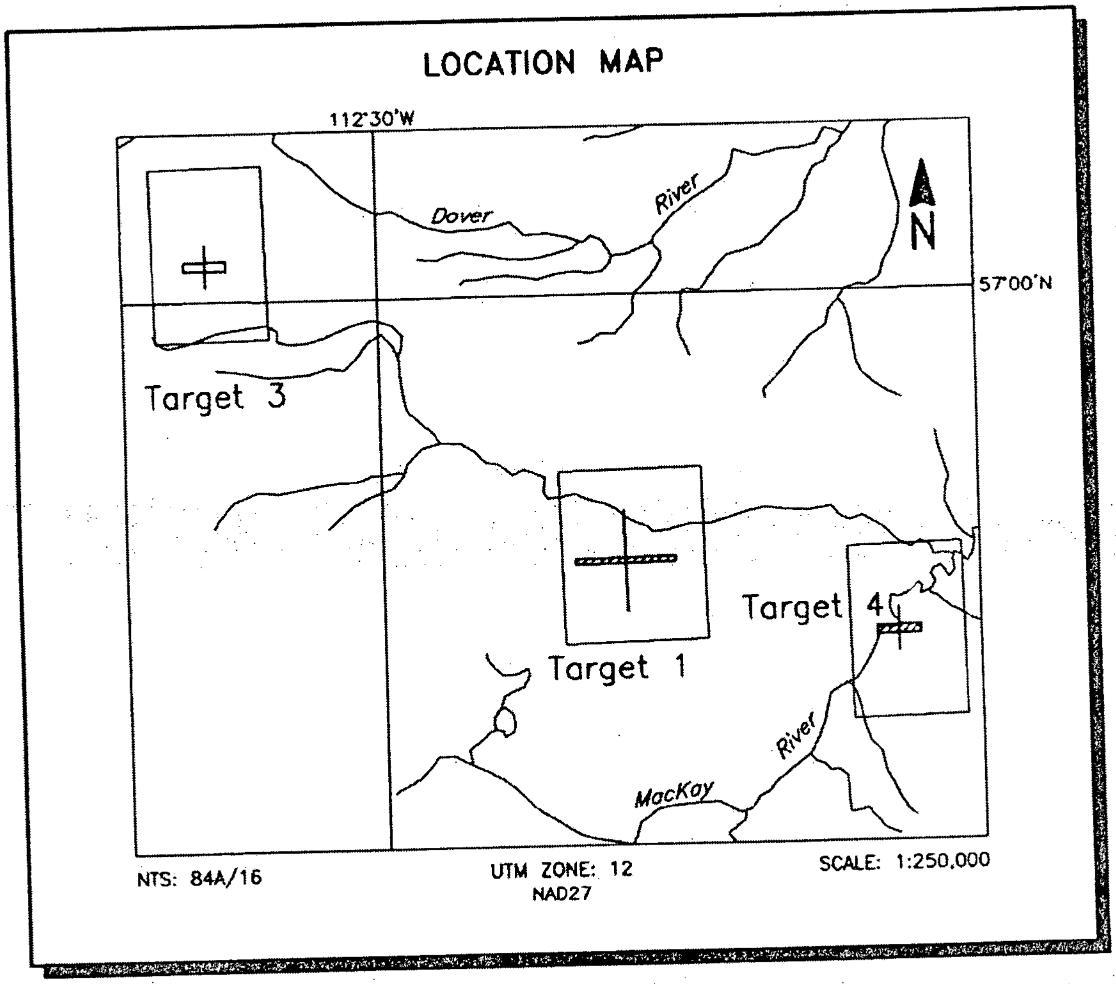


Figure 2b
Location Map and Sheet Layout
Target 1, Target 3 and Target 4
Ft McMurray Area
Job # 03094

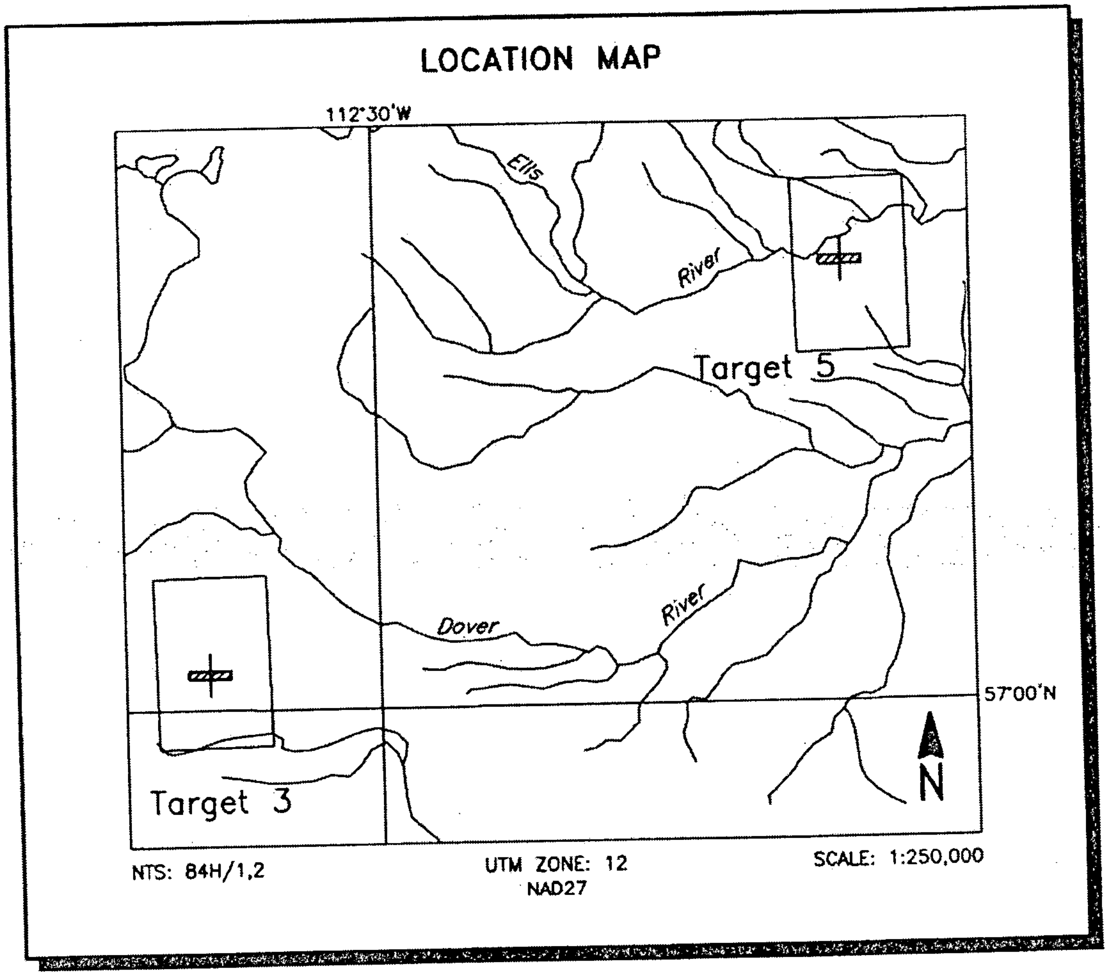


Figure 2c
Location Map and Sheet Layout
Target 3 and Target 5 blocks
Ft McMurray Area
Job # 03094

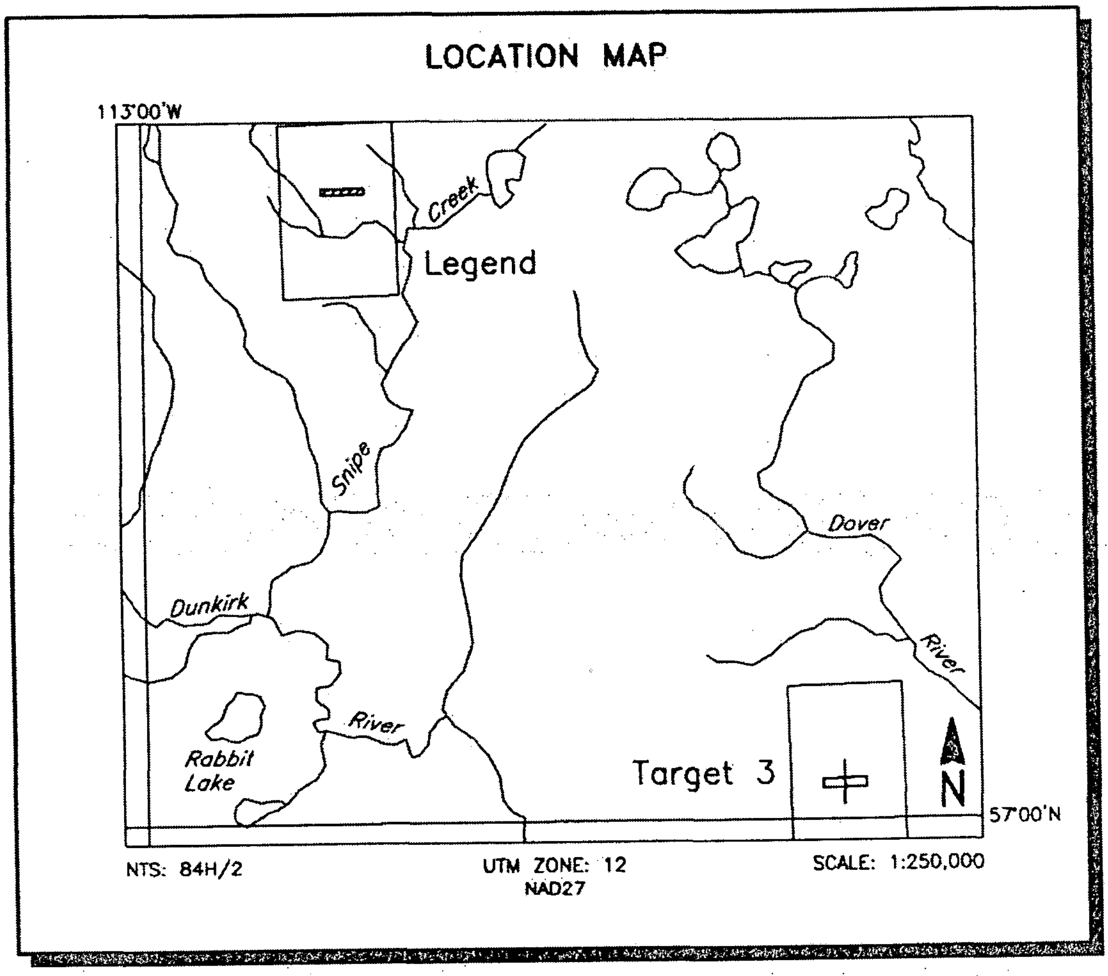


Figure 2d
Location Map and Sheet Layout
Target 3 and Legend blocks
Ft McMurray Area
Job # 03094

3. SURVEY EQUIPMENT

This section provides a brief description of the geophysical instruments used to acquire the survey data and the calibration procedures employed. The geophysical equipment was installed in an AS350-BA helicopter. This aircraft provides a safe and efficient platform for surveys of this type.

Electromagnetic System

Model: RESOLVE

Type: Towed bird, symmetric dipole configuration operated at a nominal survey altitude of 30 metres. Coil separation is 7.9 metres for 400 Hz, 1500 Hz, 6400 Hz, 25,000 Hz and 115,000 Hz coplanar coil-pairs; and 9.0 metres for the 3300 Hz coaxial coil-pair.

Coil orientations/frequencies:

orientation	nominal	actual
coplanar	400 Hz	389 Hz
coplanar	1500 Hz	1574 Hz
coaxial	3300 Hz	3245 Hz
coplanar	6400 Hz	6075 Hz
coplanar	25,000 Hz	25,300 Hz
coplanar	115,000 Hz	114,940 Hz

Channels recorded:
6 in-phase channels
6 quadrature channels
2 monitor channels

Sensitivity:
0.12 ppm at 400 Hz CP
0.12 ppm at 1500 Hz CP
0.12 ppm at 3300 Hz CX
0.24 ppm at 6400 Hz CP
0.60 ppm at 25,000 Hz CP
0.60 ppm at 115,000 Hz CP

Sample rate: 10 per second, equivalent to 1 sample every 3.8 m, at a survey speed of 135 km/h.

The electromagnetic system utilizes a multi-coil coaxial/coplanar technique to energize conductors in different directions. The coaxial coils are vertical with their axes in the flight direction. The coplanar coils are horizontal. The secondary fields are sensed simultaneously by means of receiver coils that are maximum coupled to their respective transmitter coils. The system yields an in-phase and a quadrature channel from each transmitter-receiver coil-pair.

RESOLVE System Calibration

Calibration of the system during the survey uses the Fugro AutoCal automatic, internal calibration process. At the beginning and end of each flight, and at intervals during the flight, the system is flown up to high altitude to remove it from any "ground effect" (response from the earth). Any remaining signal from the receiver coils (base level) is measured as the zero level, and removed from the data collected until the time of the next calibration. Following the zero level setting, internal calibration coils, for which the response phase and amplitude have been determined at the factory, are automatically triggered – one for each frequency. The on-time of the coils is sufficient to determine an accurate response through any ambient noise. The receiver response to each calibration coil "event" is compared to the expected response (from the factory calibration) for both phase angle and amplitude, and the applied phase and gain corrections are adjusted to bring the data to the correct value. In addition, the output of the transmitter coils are continuously monitored during the survey, and the applied gains adjusted to correct for any change in transmitter output.

Because the internal calibration coils are calibrated at the factory (on a resistive halfspace) ground calibrations using external calibration coils on-site are not necessary for system calibration. A check calibration may be carried out on-site to ensure all systems are working correctly. All system calibrations will be carried out in the air, at sufficient altitude that there will be no measurable response from the ground.

The internal calibration coils are rigidly positioned and mounted in the system relative to the transmitter and receiver coils. In addition, when the internal calibration coils are calibrated at the factory, a rigid jig is employed to ensure accurate response from the external coils.

Using real time Fast Fourier Transforms and the calibration procedures outlined above, the data will be processed in real time from measured total field at a high sampling rate to in-phase and quadrature values at 10 samples per second.

Airborne Magnetometer

Configuration:	Horizontal Gradiometer
Model:	Fugro AM102 processor with two Scintrex CS2 sensors
Type:	Optically pumped cesium vapour
Sensitivity:	0.01 nT
Sample rate:	10 per second

The horizontal gradiometer consists of two high sensitivity cesium sensors housed in a transverse mounted rigid boom at the rear of the HEM bird. The sensor separation is 5 m and is flown 27 m below the helicopter.

Magnetic Base Station

<u>Primary</u>

Model:	Fugro CF1 base station with timing provided by integrated GPS	
Sensor type:	Geometrics G822	
Counter specifications:	Accuracy:	±0.1 nT
	Resolution:	0.01 nT
	Sample rate	1 Hz
GPS specifications:	Model:	Marconi Allstar
	Type:	Code and carrier tracking of L1 band, 12-channel, C/A code at 1575.42 MHz
	Sensitivity:	-90 dBm, 1.0 second update
	Accuracy:	Manufacturer's stated accuracy for differential corrected GPS is 2 metres

Environmental Monitor specifications:

Temperature:
- Accuracy: ±1.5°C max
- Resolution: 0.0305°C
- Sample rate: 1 Hz
- Range: -40°C to +75°C

Barometric pressure:
- Model: Motorola MPXA4115A
- Accuracy: ±3.0° kPa max (-20°C to 105°C temp. ranges)
- Resolution: 0.013 kPa
- Sample rate: 1 Hz
- Range: 55 kPa to 108 kPa

Backup Magnetometer

Model:	GEM Systems GSM-19T
Type:	Digital recording proton precession
Sensitivity:	0.10 nT
Sample rate:	3 second intervals

A digital recorder is operated in conjunction with the base station magnetometer to record the diurnal variations of the earth's magnetic field. The clock of the base station is synchronized with that of the airborne system, using GPS time, to permit subsequent removal of diurnal drift.

Navigation (Global Positioning System)

Airborne Receiver for Real-time Navigation & Guidance

Model:	Ashtech Glonass GG24 with PNAV 2100 interface
Type:	SPS (L1 band), 24-channel, C/A code at 1575.42 MHz, S code at 0.5625 MHz, Real-time differential.
Sensitivity:	-132 dBm, 0.5 second update
Accuracy:	Manufacturer's stated accuracy is better than 5 metres real-time

The antenna for the GPS guidance system is mounted on the tail fin of the helicopter.

Airborne Receiver for Flight Path Recovery

Model:	Ashtech Dual Frequency Z-Surveyor
Type:	Code and carrier tracking of L1 band, 12-channel, dual frequency C/A code at 1575.2 MHz, and L2 P-code 1227 MHz
Sensitivity:	0.5 second update
Accuracy:	Manufacturer's stated accuracy for differential corrected GPS is better than 1 metre

The antenna for the GPS flight path recovery system is housed on the rear of the EM bird.

Primary Base Station for Post-Survey Differential Correction

Model:	Ashtech Dual Frequency Z-Surveyor
Type:	Code and carrier tracking of L1 band, 12-channel, dual frequency C/A code at 1575.2 MHz, and L2 P-code 1227 MHz
Sensitivity:	1.0 second update
Accuracy:	Manufacturer's stated accuracy for differential corrected GPS is better than 1 metre

Secondary GPS Base Station

Model:	Marconi Allstar OEM, CMT-1200
Type:	Code and carrier tracking of L1 band, 12-channel, C/A code at 1575.42 MHz
Sensitivity:	-90 dBm, 1.0 second update
Accuracy:	Manufacturer's stated accuracy for differential corrected GPS is 2 metres.

The Ashtech GG24 is a line of sight, satellite navigation system that utilizes time-coded signals from at least four of forty-eight available satellites. Both Russian GLONASS and American NAVSTAR satellite constellations are used to calculate the position and to provide real time guidance to the helicopter. For flight path processing an Ashtech Z-surveyor was used as the mobile receiver. A similar system was used as the primary base station receiver. The mobile and base station raw XYZ data were recorded, thereby permitting post-survey differential corrections for theoretical accuracies of better than 2 metres. A Marconi Allstar GPS unit was used as a secondary (back-up) base station.

Radar Altimeter

Manufacturer:	Honeywell/Sperry
Model:	RT330
Type:	Short pulse modulation, 4.3 GHz
Sensitivity:	0.3 m

The radar altimeter measures the vertical distance between the helicopter and the ground. This information is used in the processing algorithm that determines conductor depth.

Barometric Pressure and Temperature Sensors

Model:	DIGHEM D 1300	
Type:	Motorola MPX4115AP analog pressure sensor AD592AN high-impedance remote temperature sensors	
Sensitivity:	Pressure: Temperature:	150 mV/kPa 100 mV/°C or 10 mV/°C (selectable)
Sample rate:	10 per second	

The D1300 circuit is used in conjunction with one barometric sensor and up to three temperature sensors. Two sensors (baro and temp) are installed in the EM console in the aircraft, to monitor pressure and internal operating temperatures.

Laser Altimeter

Manufacturer:	Optech
Model:	G150
Type:	Fixed pulse repetition rate of 2 kHz
Sensitivity:	±5 cm from 10°C to 30°C ±10 cm from -20°C to +50°C

The laser altimeter is housed in the EM bird, and measures the distance from the EM bird to ground, except in areas of dense tree cover.

Analog Recorder

Manufacturer:	RMS Instruments
Type:	DGR33 dot-matrix graphics recorder
Resolution:	4x4 dots/mm
Speed:	1.5 mm/sec

The analog profiles are recorded on chart paper in the aircraft during the survey. Table 3-1 lists the geophysical data channels and the vertical scale of each profile.

Digital Data Acquisition System

Manufacturer:	RMS Instruments
Model:	DGR 33
Recorder:	San Disk compact flash card (PCMCIA)

The data are stored on flash cards and are downloaded to the field workstation PC at the survey base for verification, backup and preparation of in-field products.

Flight Path Video Recording System

Recorder:	Panasonic AG-720

Fiducial numbers are recorded continuously and are displayed on the margin of each image. This procedure ensures accurate correlation of analog and digital data with respect to visible features on the ground.

Table 3-1. The Analog Profiles

Channel Name	Parameter	Scale units/mm
400I	coaxial in-phase (400 Hz)	5 ppm
400Q	coaxial quad (400 Hz)	5 ppm
1K5I	coplanar in-phase (1500 Hz)	5 ppm
1K5Q	coplanar quad (1500 Hz)	5 ppm
1X8I	coaxial in-phase (3300 Hz)	5 ppm
1X8Q	coaxial quad (3300 Hz)	5 ppm
6K2I	coplanar in-phase (6200 Hz)	10 ppm
6K2Q	coplanar quad (6200 Hz)	10 ppm
25KI	coplanar in-phase (25,000 Hz)	40 ppm
25KQ	coplanar quad (25,000 Hz)	40 ppm
100I	coplanar inphase (115,000 Hz)	40 ppm
100Q	coplanar quad (115,000 Hz)	40 ppm
ALTL	altimeter (laser)	3 m
ALTR	altimeter (radar)	3 m
MAG1	magnetics, coarse	20 nT
1SP	coaxial spherics monitor	
2SP	coplanar spherics monitor	
2PL	coplanar powerline monitor	
1KPA	altimeter (barometric)	30 m
2TDC	internal (console) temperature	1° C
3TDC	external temperature	1° C

4. QUALITY CONTROL AND IN-FIELD PROCESSING

Digital data for each flight were transferred to the field workstation, in order to verify data quality and completeness. A database was created and updated using Geosoft Oasis Montaj and proprietary Fugro Atlas software. This allowed the field personnel to calculate, display and verify both the positional (flight path) and geophysical data on a screen or printer. Analog records were examined as a preliminary assessment of the data acquired for each flight.

In-field processing of Fugro survey data consists of differential corrections to the airborne GPS data, verification of EM calibrations, drift correction of the raw airborne EM data, spike rejection and filtering of all geophysical and ancillary data, verification of flight videos, calculation of preliminary resistivity data, diurnal correction, and preliminary leveling of magnetic data.

All data, including base station records, were checked on a daily basis, to ensure compliance with the survey contract specifications. Reflights were required if any of the standard specifications were not met.

5. DATA PROCESSING

Flight Path Recovery

The raw range data from at least four satellites are simultaneously recorded by both the base and mobile GPS units. The geographic positions of both units, relative to the model ellipsoid, are calculated from this information. Differential corrections, which are obtained from the base station, are applied to the mobile unit data to provide a post-flight track of the aircraft, accurate to within 2 m. Speed checks of the flight path are also carried out to determine if there are any spikes or gaps in the data.

The corrected WGS84 latitude/longitude coordinates are transformed to the coordinate system used on the final maps. Images or plots are then created to provide a visual check of the flight path.

Electromagnetic Data/Apparent Resistivity

EM data are processed at the recorded sample rate of 10 samples/second. Spheric rejection median and Hanning filters were applied to reduce noise to acceptable levels.

The apparent resistivity in ohm-m were generated from the in-phase and quadrature EM components for all of the coplanar frequencies, using a pseudo-layer half-space model. The inputs to the resistivity algorithm are the inphase and quadrature amplitudes of the secondary field. The algorithm calculates the apparent resistivity in ohm-m, and the apparent height of the bird above the conductive source. Any difference between the apparent height and the true height, as measured by the radar altimeter, is called the pseudo-layer and reflects the difference between the real geology and a homogeneous halfspace. This difference is often attributed to the presence of a highly resistive upper layer. Any errors in the altimeter reading, caused by heavy tree cover, are included in the pseudo-layer and do not affect the resistivity calculation. The apparent depth estimates, however, will reflect the altimeter errors. Apparent resistivity calculated in this manner may behave quite differently from those calculated using other models.

In areas of high magnetic permeability or dielectric permittivity, the calculated resistivities will be erroneously high. Various algorithms and inversion techniques can be used to partially correct for this effect.

The preliminary apparent resistivity maps and images were carefully inspected to identify any lines or line segments that might require base level adjustments. Subtle changes between in-flight calibrations of the system can result in line-to-line differences that are more recognizable in resistive (low signal amplitude) areas. Manual leveling was carried out to eliminate or minimize resistivity differences that can be attributed, in part, to changes in operating temperatures. These leveling adjustments were usually very subtle, and do not result in the degradation of discrete anomalies.

After the manual leveling process is complete, the data were subjected to a microleveling technique in order to remove any remaining line-to-line differences within the calculated resistivities.

Apparent resistivity grids, which display the conductive properties of the survey areas, were produced from the 400 Hz, 1500 Hz, 6400 Hz, 25,000 Hz and 115,000 Hz coplanar data. The calculated resistivities for the five coplanar frequencies are included in the XYZ and grid archives. Values are in ohm-metres on all final products.

Total Magnetic Field

The aeromagnetic data were inspected in grid and profile format. Spikes were removed manually with the aid of a fourth difference calculation. A Geometrics G822 cesium vapour magnetometer was operated at the survey base to record diurnal variations of the earth's magnetic field. The clock of the base station was synchronized with that of the airborne system to permit subsequent removal of diurnal drift. The data were inspected for spikes and filtered. The filtered diurnal data were subtracted from the total field magnetic data. Grids of the diurnally corrected aeromagnetic data were created and contoured. A lag correction was applied to the magnetic data. The results were then leveled using tie and traverse line intercepts. Manual adjustments were applied to any lines that required leveling, as indicated by shadowed images of both the total field magnetic data and the calculated vertical gradient data. A microleveling algorithm was used to make any remaining subtle leveling adjustments.

Contour, Colour and Shadow Map Displays

The geophysical data are interpolated onto a regular grid using a modified Akima spline technique. The resulting grid is suitable for image processing and generation of contour maps. The grid cell size was 10 metres or 20% of the line interval.

Colour maps are produced by interpolating the grid down to the pixel size. The parameter is then incremented with respect to specific amplitude ranges to provide colour "contour" maps.

The colour distribution used for the differential resistivity maps was selected to cover the resistivity range of all the target blocks. The same distribution was used for all maps to allow easy visual comparison; each colour on the scale represents the same resistivity value on all maps. The total magnetic field distribution was generated to cover the magnetic intensity for each individual block.

Monochromatic shadow maps or images can be generated by employing an artificial sun to cast shadows on a surface defined by the geophysical grid. There are many variations in the shadowing technique. These techniques can be applied to total field or enhanced magnetic data, magnetic derivatives, resistivity, etc. The shadowing technique is also used as a quality control method to detect subtle changes between lines.

Resistivity-depth Sections

The apparent resistivities for all frequencies can be displayed simultaneously as coloured resistivity-depth sections. Usually, only the coplanar data are displayed as the close frequency separation between the coplanar and adjacent coaxial data tends to distort the section. The sections can be plotted using the topographic elevation profile as the surface. The digital terrain values, in metres a.m.s.l., can be calculated from the GPS Z-value or barometric altimeter, minus the aircraft radar altimeter.

Resistivity-depth sections can be generated in three formats:

(1) Sengpiel resistivity sections, where the apparent resistivity for each frequency is plotted at the depth of the centroid of the in-phase current flow[1]; and,

(2) Differential resistivity sections, where the differential resistivity is plotted at the differential depth[2].

(3) Occam[3] or Multi-layer[4] inversion.

Both the Sengpiel and differential methods are derived from the pseudo-layer half-space model. Both yield a coloured resistivity-depth section that attempts to portray a smoothed approximation of the true resistivity distribution with depth. Resistivity-depth sections are most useful in conductive layered situations, but may be unreliable in areas of moderate to high resistivity where signal amplitudes are weak. In areas where in-phase responses have

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1 Sengpiel, K.P., 1988, Approximate Inversion of Airborne EM Data from Multilayered Ground: Geophysical Prospecting 36, 446-459.

2 Huang, H. and Fraser, D.C., 1993, Differential Resistivity Method for Multi-frequency Airborne EM Sounding: presented at Intern. Airb. EM Workshop, Tucson, Ariz.

3 Constable et al, 1987, Occam's inversion: a practical algorithm for generating smooth models from electromagnetic sounding data: Geophysics, 52, 289-300.

4 Huang H., and Palacky, G.J., 1991, Damped least-squares inversion of time domain airborne EM data based on singular value decomposition: Geophysical Prospecting, 39, 827-844.

been suppressed by the effects of magnetite, or adversely affected by cultural features, the computed resistivities shown on the sections may be unreliable.

Both the Occam and multi-layer inversions compute the layered earth resistivity model that would best match the measured EM data. The Occam inversion uses a series of thin, fixed layers (usually 20 x 5m and 10 x 10m layers) and computes resistivities to fit the EM data. The multi-layer inversion computes the resistivity and thickness for each of a defined number of layers (typically 3-5 layers) to best fit the data.

6. Discussion

Kimberlite Signatures

In plan view, kimberlite pipes are usually circular or oblate, and can often be elongated with the long axis parallel to and/or coincident with structural lineations. These zones of structural weakness often control or influence the emplacement of kimberlitic material.

Unweathered kimberlites can contain up to 10% magnetic oxides (magnetite, ilmenite) and, as a result, can often produce a strong magnetic response. However, moderate to strong magnetic lows, due to remanent magnetization, are also observed over some kimberlites. In some cases, the magnetic responses can be very weak, and may not be easily recognized in areas of moderate to steep magnetic gradients.

Kimberlites weather relatively rapidly because of their high porosity and permeability. The crater facies weathers to a conductive, clay-rich material with a lower magnetic mineral content than the unweathered source. The top of a weathered pipe assumes a flat-lying disc shape that can be several tens of metres in thickness.

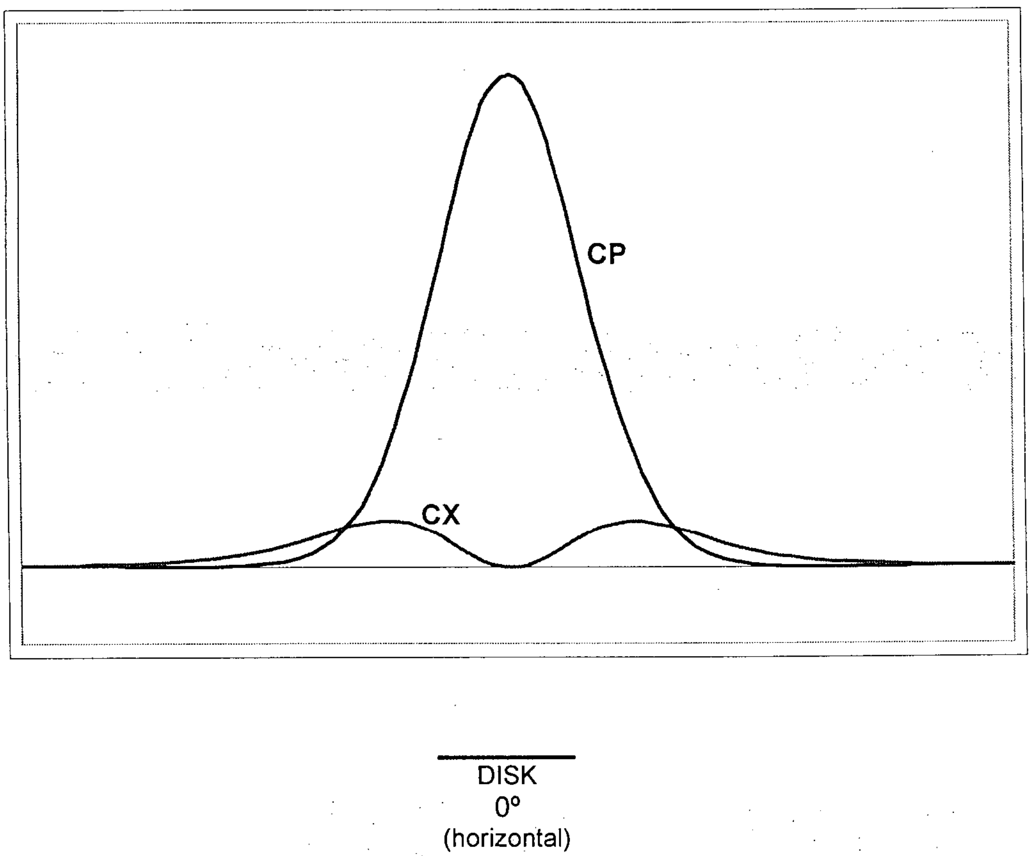
The preferential weathering of kimberlitic material, relative to the surrounding country rock, often results in topographic depressions that form small, circular lakes. In many cases, the shapes of these lakes closely resemble the shapes of the resistivity and/or magnetic anomalies.

The geophysical signature over a weathered pipe generally comprises a circular to elliptical conductivity response that is often coincident with a similarly shaped magnetic anomaly. The primary source of the magnetic response is the lower, unweathered portion of the pipe, while the primary source for the conductive response is the upper, weathered portion. Weathered tops will generally produce a stronger conductivity response while unweathered portions will produce a stronger magnetic response. A typical EM response over a horizontal disk (clay-weathered top) is given in Figure 7-1.

The weakly conductive lake-bottom material underlying the lakes, gives rise to resistivity values that are generally less than 5000 ohm-m. As weathered kimberlites often yield resistivities in the 500 ohm-m to 3000 ohm-m range, the contrasts within the lake areas may be subtle. In some cases, the lake-bottom material may be thick enough to mask some of the weaker, underlying bedrock sources.

Figure 6-1

Response from a horizontal disk



From: Greinwald, S., Fraser, D.C., Report on Model Studies with Numerical Dipole Models, December 31, 1974.

The differences in the geophysical response shapes from lake-bottom sediments and the clay-weathered tops of pipes are also very subtle, and can be difficult to resolve, particularly when the surface area of the pipe becomes large enough or thick enough to approach a halfspace model. In such cases, there may be no "discrete" EM anomaly on the coaxial parameter, although the maximum coupled coplanar response should yield an anomalous resistivity low. The differentiation of kimberlite responses from lake-bottom material is based on 6 main criteria:

- the conductivity (resistivity) of the anomalous feature;
- the EM response characteristics;
- the apparent depth (and extent) of the causative source;
- the plan shape and dimensions of the resistivity low;
- the coincidence of either a positive or negative magnetic anomaly; and
- the proximity to dykes or other structural features.

The geophysical detection of pipes requires a measurable physical contrast with the surrounding material. Since pipes can be emplaced in virtually any kind of rock, the contrast depends on both the pipe and host rock lithologies as well as the overburden material. Kimberlite pipes will dominate the geophysical response in resistive, magnetically inactive host rocks, whereas they can be virtually indistinguishable in conductive, magnetically active areas.

7. PRODUCTS

This section lists the final maps and products that have been provided under the terms of the survey agreement. Other products can be prepared from the existing dataset, if requested. These include magnetic enhancements or derivatives, percent magnetite, resistivities corrected for magnetic permeability and/or dielectric permittivity, digital terrain, resistivity-depth sections, inversions, and overburden thickness.

Base Maps

Base maps of the survey area were produced by scanning published topographic maps to a bitmap (.bmp) format. This process provides a relatively accurate, distortion free base that facilitates correlation of the navigation data to the map coordinate system. The topographic files were combined with geophysical data for plotting the final maps. All maps were created using the following parameters:

Projection Description:

Datum:	NAD 27
Ellipsoid:	Clarke 1866
DX,DY,ZY shift	7, -162, -188
Projection:	UTM (Zone: 12)
Central Meridian:	111° West
False Northing:	0
False Easting:	500000
Scale Factor:	0.9996

The following parameters are presented on 1 map sheet for each target, at a scale of 1:10,000. All maps include flight lines and topography. Preliminary products are not listed.

Final Products

Colour Maps (2 copies) at 1:10000

Total Magnetic Field maps
Differential Resistivity 400 Hz
Differential Resistivity 1500 Hz
Differential Resistivity 6200 Hz
Differential Resistivity 25,000 Hz
Differential Resistivity 115,000 Hz

Additional Products

Differential Depth Sections	2 sets
Digital Archive on CD-ROM	2 copies
Survey Report	2 copies
Analog Chart Records	All flights
Flight Path Video (VHS)	1 video cassette

8. CONCLUSIONS AND RECOMMENDATIONS

This report provides a description of the equipment, data processing procedures and logistics of the survey.

The various maps included with this report display the magnetic and conductive properties of the survey area. It is recommended that a complete assessment and detailed evaluation of the survey results be carried out, in conjunction with all available geophysical, geological and geochemical information.

It is also recommended that image processing of existing geophysical data be considered, in order to extract the maximum amount of information from the survey results. Current software and imaging techniques often provide valuable information on structure and lithology, which may not be clearly evident on the contour and colour maps. These techniques can yield images that define subtle, but significant, structural details.

Respectfully submitted,

FUGRO AIRBORNE SURVEYS CORP.

Michael Cain
Geophysicist

APPENDIX A
LIST OF PERSONNEL

The following personnel were involved in the acquisition, processing, interpretation and presentation of data, relating to a RESOLVE airborne geophysical survey carried out for 977554 Alberta Ltd., over the Ft McMurray area, Alberta

David Miles	Manager, Helicopter Operations
Emily Farquhar	Manager, Data Processing and Interpretation
Michael Cain	Project Geophysicist
Will Marr	Geophysical Operator
Igor Sram	Field Geophysicist
Michel Plourde	Pilot (Questral Helicopters Ltd.)
Lyn Vanderstarren	Drafting Supervisor
Albina Tonello	Secretary/Expeditor

The survey consisted of 83 km of coverage, flown on December 31, 2003.

All personnel are employees of Fugro Airborne Surveys, except for the pilot who is an employee of Questral Helicopters Ltd.

APPENDIX B
OPTIONAL PRODUCTS

Digital Terrain

The radar altimeter values (ALTR – aircraft to ground clearance) are subtracted from the differentially corrected and de-spiked GPS-Z values to produce profiles of the height above the ellipsoid along the survey lines. These values are gridded to produce contour maps showing approximate elevations within the survey area. The calculated digital terrain data are then tie-line leveled and adjusted to mean sea level. Any remaining subtle line-to-line discrepancies are manually removed. After the manual corrections are applied, the digital terrain data are filtered with a microleveling algorithm.

The accuracy of the elevation calculation is directly dependent on the accuracy of the two input parameters, ALTR and GPS-Z. The ALTR value may be erroneous in areas of heavy tree cover, where the altimeter reflects the distance to the tree canopy rather than the ground. The GPS-Z value is primarily dependent on the number of available satellites. Although post-processing of GPS data will yield X and Y accuracies in the order of 1-2 metres, the accuracy of the Z value is usually much less, sometimes in the ±10 metre range. Further inaccuracies may be introduced during the interpolation and gridding process.

Because of the inherent inaccuracies of this method, no guarantee is made or implied that the information displayed is a true representation of the height above sea level. Although this product may be of some use as a general reference, THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.

Dielectric Permittivity and Magnetic Permeability Corrections[5]

In resistive areas having magnetic rocks, the magnetic and dielectric effects will both generally be present in high-frequency EM data, whereas only the magnetic effect will exist in low-frequency data.

The magnetic permeability is first obtained from the EM data at the lowest frequency (385 Hz) because the ratio of the magnetic response to conductive response is maximized and because displacement currents are negligible. The homogeneous half-space model is used. The computed magnetic permeability is then used along with the inphase and quadrature response at the highest frequency to obtain the relative dielectric permittivity, again using the homogeneous half-space model. The highest frequency is used because the ratio of dielectric response to conductive response is maximized. The resistivity can then be determined from the measured inphase and quadrature components of each frequency, given the relative magnetic permeability and relative dielectric permittivity.

Horizontal Gradient Enhanced Total Magnetic Field

Bidirectional gridding with the cross-line gradient should produce a surface that correctly renders both the measured data and the measured horizontal gradient at each survey line. This can be an advantage when gridding data that include features approaching the line separation in size and also for rendering features that are not perpendicular to the line direction, particularly those which are sub-parallel to the line direction. Direct results of the application of Horizontal Gradient Enhanced (HGE) gridding are:

- Increased resolution and continuity of magnetic features parallel or sub-parallel to the flight line direction.
- Correct spatial positioning of finite source magnetic bodies between lines.
- Improved resolution of analytical signal and enhanced analytic signal products.

Calculated Vertical Magnetic Gradient

The horizontal gradient enhanced total magnetic field data were subjected to a processing algorithm that enhances the response of magnetic bodies in the upper 500 m and attenuates the response of deeper bodies. The resulting vertical gradient map provides better definition and resolution of near-surface magnetic units. It also identifies weak magnetic features that may not be evident on the total field map. However, regional magnetic variations and changes in lithology may be better defined on the total magnetic field map.

Multi-channel Stacked Profiles

Distance-based profiles of the digitally recorded geophysical data can be generated and plotted at an appropriate scale. These profiles also contain the calculated parameters that

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[5] Huang, H. and Fraser, D.C., 2001 Mapping of the Resistivity, Susceptibility, and Permittivity of

are used in the interpretation process. These are produced as worksheets prior to interpretation, and are also presented in the final corrected form after interpretation.

EM Magnetite

The apparent percent magnetite by weight is computed wherever magnetite produces a negative in-phase EM response. This calculation is more meaningful in resistive areas.

Magnetic Derivatives

The total magnetic field data can be subjected to a variety of filtering techniques to yield maps or images of the following:

enhanced magnetics

second vertical derivative

reduction to the pole/equator

magnetic susceptibility with reduction to the pole

upward/downward continuations

analytic signal

All of these filtering techniques improve the recognition of near-surface magnetic bodies, with the exception of upward continuation. Any of these parameters can be produced on request.

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- Appendix B.5 -

APPENDIX C
BACKGROUND INFORMATION

Electromagnetics

Fugro electromagnetic responses fall into two general classes, discrete and broad. The discrete class consists of sharp, well-defined anomalies from discrete conductors such as sulphide lenses and steeply dipping sheets of graphite and sulphides. The broad class consists of wide anomalies from conductors having a large horizontal surface such as flatly dipping graphite or sulphide sheets, saline water-saturated sedimentary formations, conductive overburden and rock, kimberlite pipes and geothermal zones. A vertical conductive slab with a width of 200 m would straddle these two classes.

The vertical sheet (half plane) is the most common model used for the analysis of discrete conductors. All anomalies plotted on the geophysical maps are analyzed according to this model. The following section entitled **Discrete Conductor Analysis** describes this model in detail, including the effect of using it on anomalies caused by broad conductors such as conductive overburden.

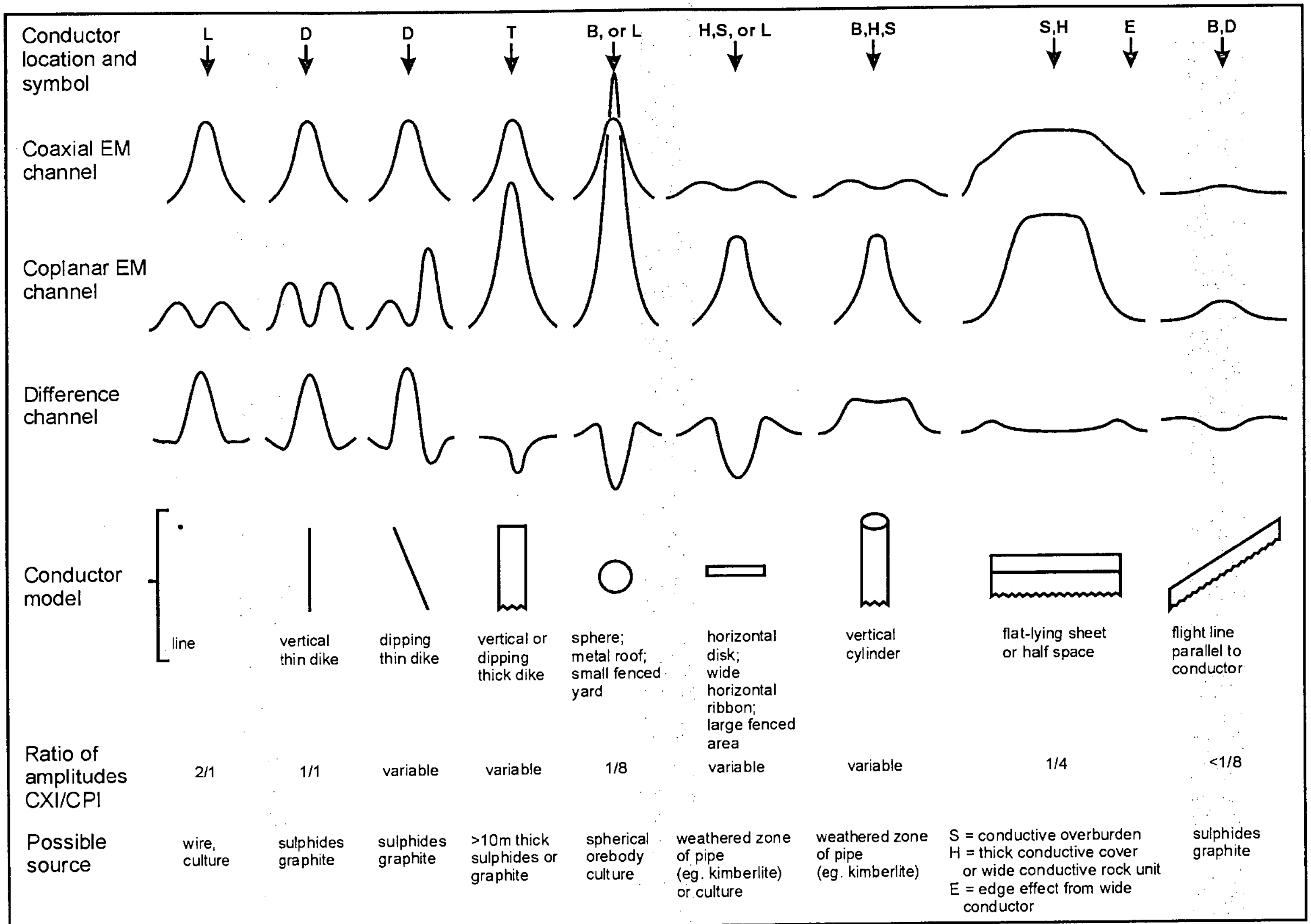
The conductive earth (half-space) model is suitable for broad conductors. Resistivity contour maps result from the use of this model. A later section entitled **Resistivity Mapping** describes the method further, including the effect of using it on anomalies caused by discrete conductors such as sulphide bodies.

Geometric Interpretation

The geophysical interpreter attempts to determine the geometric shape and dip of the conductor. Figure C-1 shows typical HEM anomaly shapes which are used to guide the geometric interpretation.

Discrete Conductor Analysis

The EM anomalies appearing on the electromagnetic map are analyzed by computer to give the conductance (i.e., conductivity-thickness product) in siemens (mhos) of a vertical sheet model. This is done regardless of the interpreted geometric shape of the conductor. This is not an unreasonable procedure, because the computed conductance increases as the electrical quality of the conductor increases, regardless of its true shape. DIGHEM anomalies are divided into seven grades of conductance, as shown in Table C-1. The conductance in siemens (mhos) is the reciprocal of resistance in ohms.



Typical DIGHEM anomaly shapes

Figure C-1

The conductance value is a geological parameter because it is a characteristic of the conductor alone. It generally is independent of frequency, flying height or depth of burial, apart from the averaging over a greater portion of the conductor as height increases. Small anomalies from deeply buried strong conductors are not confused with small anomalies from shallow weak conductors because the former will have larger conductance values.

Table C-1. EM Anomaly Grades

Anomaly Grade	Siemens
7	> 100
6	50 - 100
5	20 - 50
4	10 - 20
3	5 - 10
2	1 - 5
1	< 1

Conductive overburden generally produces broad EM responses which may not be shown as anomalies on the geophysical maps. However, patchy conductive overburden in otherwise resistive areas can yield discrete anomalies with a conductance grade (cf. Table C-1) of 1, 2 or even 3 for conducting clays which have resistivities as low as 50 ohm-m. In areas where ground resistivities are below 10 ohm-m, anomalies caused by weathering variations and similar causes can have any conductance grade. The anomaly shapes from the multiple coils often allow such conductors to be recognized, and these are indicated by the letters S, H, and sometimes E on the geophysical maps (see EM legend on maps).

For bedrock conductors, the higher anomaly grades indicate increasingly higher conductances. Examples: the New Insco copper discovery (Noranda, Canada) yielded a grade 5 anomaly, as did the neighbouring copper-zinc Magusi River ore body; Mattabi (copper-zinc, Sturgeon Lake, Canada) and Whistle (nickel, Sudbury, Canada) gave grade 6; and the Montcalm nickel-copper discovery (Timmins, Canada) yielded a grade 7 anomaly. Graphite and sulphides can span all grades but, in any particular survey area, field work may show that the different grades indicate different types of conductors.

Strong conductors (i.e., grades 6 and 7) are characteristic of massive sulphides or graphite. Moderate conductors (grades 4 and 5) typically reflect graphite or sulphides of a less massive character, while weak bedrock conductors (grades 1 to 3) can signify poorly connected graphite or heavily disseminated sulphides. Grades 1 and 2 conductors may not respond to ground EM equipment using frequencies less than 2000 Hz.

The presence of sphalerite or gangue can result in ore deposits having weak to moderate conductances. As an example, the three million ton lead-zinc deposit of Restigouche Mining Corporation near Bathurst, Canada, yielded a well-defined grade 2 conductor. The 10 percent by volume of sphalerite occurs as a coating around the fine grained massive pyrite, thereby inhibiting electrical conduction. Faults, fractures and shear zones may produce anomalies that typically have low conductances (e.g., grades 1 to 3). Conductive rock formations can yield anomalies of any conductance grade. The conductive materials in such rock formations can be salt water, weathered products such as clays, original depositional clays, and carbonaceous material.

For each interpreted electromagnetic anomaly on the geophysical maps, a letter identifier and an interpretive symbol are plotted beside the EM grade symbol. The horizontal rows of dots, under the interpretive symbol, indicate the anomaly amplitude on the flight record. The vertical column of dots, under the anomaly letter, gives the estimated depth. In areas where anomalies are crowded, the letter identifiers, interpretive symbols and dots may be obliterated. The EM grade symbols, however, will always be discernible, and the obliterated information can be obtained from the anomaly listing appended to this report.

The purpose of indicating the anomaly amplitude by dots is to provide an estimate of the reliability of the conductance calculation. Thus, a conductance value obtained from a large ppm anomaly (3 or 4 dots) will tend to be accurate whereas one obtained from a small ppm anomaly (no dots) could be quite inaccurate. The absence of amplitude dots indicates that the anomaly from the coaxial coil-pair is 5 ppm or less on both the in-phase and quadrature channels. Such small anomalies could reflect a weak conductor at the surface or a stronger conductor at depth. The conductance grade and depth estimate illustrates which of these possibilities fits the recorded data best.

The conductance measurement is considered more reliable than the depth estimate. There are a number of factors that can produce an error in the depth estimate, including the averaging of topographic variations by the altimeter, overlying conductive overburden, and the location and attitude of the conductor relative to the flight line. Conductor location and attitude can provide an erroneous depth estimate because the stronger part of the conductor may be deeper or to one side of the flight line, or because it has a shallow dip. A heavy tree cover can also produce errors in depth estimates. This is because the depth estimate is computed as the distance of bird from conductor, minus the altimeter reading. The altimeter can lock onto the top of a dense forest canopy. This situation yields an erroneously large depth estimate but does not affect the conductance estimate.

Dip symbols are used to indicate the direction of dip of conductors. These symbols are used only when the anomaly shapes are unambiguous, which usually requires a fairly resistive environment.

A further interpretation is presented on the EM map by means of the line-to-line correlation of bedrock anomalies, which is based on a comparison of anomaly shapes on adjacent lines. This provides conductor axes that may define the geological structure over portions of the survey area. The absence of conductor axes in an area implies that anomalies could not be correlated from line to line with reasonable confidence.

The electromagnetic anomalies are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a follow-up program. The actual conductance values are printed in the attached anomaly list for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of conductors in terms of length, strike and dip, geometric shape, conductance, depth, and thickness. The accuracy is comparable to an interpretation from a high quality ground EM survey having the same line spacing.

The appended EM anomaly list provides a tabulation of anomalies in ppm, conductance, and depth for the vertical sheet model. No conductance or depth estimates are shown for weak anomalous responses that are not of sufficient amplitude to yield reliable calculations.

Since discrete bodies normally are the targets of EM surveys, local base (or zero) levels are used to compute local anomaly amplitudes. This contrasts with the use of true zero levels which are used to compute true EM amplitudes. Local anomaly amplitudes are shown in the EM anomaly list and these are used to compute the vertical sheet parameters of conductance and depth.

Questionable Anomalies

The EM maps may contain anomalous responses that are displayed as asterisks (*). These responses denote weak anomalies of indeterminate conductance, which may reflect one of the following: a weak conductor near the surface, a strong conductor at depth (e.g., 100 to 120 m below surface) or to one side of the flight line, or aerodynamic noise. Those responses that have the appearance of valid bedrock anomalies on the flight profiles are indicated by appropriate interpretive symbols (see EM legend on maps). The others probably do not warrant further investigation unless their locations are of considerable geological interest.

The Thickness Parameter

A comparison of coaxial and coplanar shapes can provide an indication of the thickness of a steeply dipping conductor. The amplitude of the coplanar anomaly (e.g., CPI channel) increases relative to the coaxial anomaly (e.g., CXI) as the apparent thickness increases, i.e., the thickness in the horizontal plane. (The thickness is equal to the conductor width if the conductor dips at 90 degrees and strikes at right angles to the flight line.) This report refers to a conductor as thin when the thickness is likely to be less than 3 m, and thick when in excess of 10 m. Thick conductors are indicated on the EM map by parentheses "( )". For base metal exploration in steeply dipping geology, thick conductors can be high priority targets because many massive sulphide ore bodies are thick. The system cannot sense the thickness when the strike of the conductor is subparallel to the flight line, when the conductor has a shallow dip, when the anomaly amplitudes are small, or when the resistivity of the environment is below 100 ohm-m.

Resistivity Mapping

Resistivity mapping is useful in areas where broad or flat lying conductive units are of interest. One example of this is the clay alteration which is associated with Carlin-type deposits in the south west United States. The resistivity parameter was able to identify the clay alteration zone over the Cove deposit. The alteration zone appeared as a strong resistivity low on the 900 Hz resistivity parameter. The 7,200 Hz and 56,000 Hz resistivities showed more detail in the covering sediments, and delineated a range front fault. This is typical in many areas of the south west United States, where conductive near surface sediments, which may sometimes be alkalic, attenuate the higher frequencies.

Resistivity mapping has proven successful for locating diatremes in diamond exploration. Weathering products from relatively soft kimberlite pipes produce a resistivity contrast with the unaltered host rock. In many cases weathered kimberlite pipes were associated with thick conductive layers that contrasted with overlying or adjacent relatively thin layers of lake bottom sediments or overburden.

Areas of widespread conductivity are commonly encountered during surveys. These conductive zones may reflect alteration zones, shallow-dipping sulphide or graphite-rich units, saline ground water, or conductive overburden. In such areas, EM amplitude changes can be generated by decreases of only 5 m in survey altitude, as well as by increases in conductivity. The typical flight record in conductive areas is characterized by in-phase and quadrature channels that are continuously active. Local EM peaks reflect either increases in conductivity of the earth or decreases in survey altitude. For such conductive areas, apparent resistivity profiles and contour maps are necessary for the correct interpretation of the airborne data. The advantage of the resistivity parameter is that anomalies caused by altitude changes are virtually eliminated, so the resistivity data reflect only those anomalies caused by conductivity changes. The resistivity analysis also helps the interpreter to differentiate between conductive bedrock and conductive overburden. For example, discrete conductors will generally appear as narrow lows on the contour map and broad conductors (e.g., overburden) will appear as wide lows.

The apparent resistivity is calculated using the pseudo-layer (or buried) half-space model defined by Fraser (1978)[6]. This model consists of a resistive layer overlying a conductive half-space. The depth channels give the apparent depth below surface of the conductive material. The apparent depth is simply the apparent thickness of the overlying resistive layer. The apparent depth (or thickness) parameter will be positive when the upper layer is more resistive than the underlying material, in which case the apparent depth may be quite close to the true depth.

The apparent depth will be negative when the upper layer is more conductive than the underlying material, and will be zero when a homogeneous half-space exists. The apparent depth parameter must be interpreted cautiously because it will contain any errors that might exist in the measured altitude of the EM bird (e.g., as caused by a dense tree cover). The inputs to the resistivity algorithm are the in-phase and quadrature components of the coplanar coil-pair. The outputs are the apparent resistivity of the conductive half-space (the

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6 Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p.144-172

source) and the sensor-source distance. The flying height is not an input variable, and the output resistivity and sensor-source distance are independent of the flying height when the conductivity of the measured material is sufficient to yield significant in-phase as well as quadrature responses. The apparent depth, discussed above, is simply the sensor-source distance minus the measured altitude or flying height. Consequently, errors in the measured altitude will affect the apparent depth parameter but not the apparent resistivity parameter.

The apparent depth parameter is a useful indicator of simple layering in areas lacking a heavy tree cover. Depth information has been used for permafrost mapping, where positive apparent depths were used as a measure of permafrost thickness. However, little quantitative use has been made of negative apparent depths because the absolute value of the negative depth is not a measure of the thickness of the conductive upper layer and, therefore, is not meaningful physically. Qualitatively, a negative apparent depth estimate usually shows that the EM anomaly is caused by conductive overburden. Consequently, the apparent depth channel can be of significant help in distinguishing between overburden and bedrock conductors.

Interpretation in Conductive Environments

Environments having low background resistivities (e.g., below 30 ohm-m for a 900 Hz system) yield very large responses from the conductive ground. This usually prohibits the recognition of discrete bedrock conductors. However, Fugro data processing techniques produce three parameters that contribute significantly to the recognition of bedrock conductors in conductive environments. These are the in-phase and quadrature difference channels (DIFI and DIFQ, which are available only on systems with “common” frequencies on orthogonal coil pairs), and the resistivity and depth channels (RES and DEP) for each coplanar frequency.

The EM difference channels (DIFI and DIFQ) eliminate most of the responses from conductive ground, leaving responses from bedrock conductors, cultural features (e.g., telephone lines, fences, etc.) and edge effects. Edge effects often occur near the perimeter of broad conductive zones. This can be a source of geologic noise. While edge effects yield anomalies on the EM difference channels, they do not produce resistivity anomalies. Consequently, the resistivity channel aids in eliminating anomalies due to edge effects. On the other hand, resistivity anomalies will coincide with the most highly conductive sections of conductive ground, and this is another source of geologic noise. The recognition of a bedrock conductor in a conductive environment therefore is based on the anomalous responses of the two difference channels (DIFI and DIFQ) and the resistivity channels (RES). The most favourable situation is where anomalies coincide on all channels.

The DEP channels, which give the apparent depth to the conductive material, also help to determine whether a conductive response arises from surficial material or from a conductive zone in the bedrock. When these channels ride above the zero level on the depth profiles (i.e., depth is negative), it implies that the EM and resistivity profiles are responding primarily to a conductive upper layer, i.e., conductive overburden. If the DEP channels are below the zero level, it indicates that a resistive upper layer exists, and this usually implies the existence of a bedrock conductor. If the low frequency DEP channel is below the zero level and the high frequency DEP is above, this suggests that a bedrock conductor occurs beneath conductive cover.

Reduction of Geologic Noise

Geologic noise refers to unwanted geophysical responses. For purposes of airborne EM surveying, geologic noise refers to EM responses caused by conductive overburden and magnetic permeability. It was mentioned previously that the EM difference channels (i.e., channel DIFI for in-phase and DIFQ for quadrature) tend to eliminate the response of conductive overburden.

Magnetite produces a form of geological noise on the in-phase channels. Rocks containing less than 1% magnetite can yield negative in-phase anomalies caused by magnetic permeability. When magnetite is widely distributed throughout a survey area, the in-phase EM channels may continuously rise and fall, reflecting variations in the magnetite percentage, flying height, and overburden thickness. This can lead to difficulties in recognizing deeply buried bedrock conductors, particularly if conductive overburden also exists. However, the response of broadly distributed magnetite generally vanishes on the in-phase difference channel DIFI. This feature can be a significant aid in the recognition of conductors that occur in rocks containing accessory magnetite.

EM Magnetite Mapping

The information content of HEM data consists of a combination of conductive eddy current responses and magnetic permeability responses. The secondary field resulting from conductive eddy current flow is frequency-dependent and consists of both in-phase and quadrature components, which are positive in sign. On the other hand, the secondary field resulting from magnetic permeability is independent of frequency and consists of only an in-phase component that is negative in sign. When magnetic permeability manifests itself by decreasing the measured amount of positive in-phase, its presence may be difficult to recognize. However, when it manifests itself by yielding a negative in-phase anomaly (e.g., in the absence of eddy current flow), its presence is assured. In this latter case, the negative component can be used to estimate the percent magnetite content.

A magnetite mapping technique, based on the low frequency coplanar data, can be complementary to magnetometer mapping in certain cases. Compared to magnetometry, it is far less sensitive but is more able to resolve closely spaced magnetite zones, as well as providing an estimate of the amount of magnetite in the rock. The method is sensitive to 1/4% magnetite by weight when the EM sensor is at a height of 30 m above a magnetitic half-space. It can individually resolve steep dipping narrow magnetite-rich bands which are separated by 60 m. Unlike magnetometry, the EM magnetite method is unaffected by remanent magnetism or magnetic latitude.

The EM magnetite mapping technique provides estimates of magnetite content which are usually correct within a factor of 2 when the magnetite is fairly uniformly distributed. EM magnetite maps can be generated when magnetic permeability is evident as negative in-phase responses on the data profiles.

Like magnetometry, the EM magnetite method maps only bedrock features, provided that the overburden is characterized by a general lack of magnetite. This contrasts with resistivity mapping which portrays the combined effect of bedrock and overburden.

The Susceptibility Effect

When the host rock is conductive, the positive conductivity response will usually dominate the secondary field, and the susceptibility effect[7] will appear as a reduction in the in-phase, rather than as a negative value. The in-phase response will be lower than would be predicted by a model using zero susceptibility. At higher frequencies the in-phase conductivity response also gets larger, so a negative magnetite effect observed on the low frequency might not be observable on the higher frequencies, over the same body. The susceptibility effect is most obvious over discrete magnetite-rich zones, but also occurs over uniform geology such as a homogeneous half-space.

High magnetic susceptibility will affect the calculated apparent resistivity, if only conductivity is considered. Standard apparent resistivity algorithms use a homogeneous half-space model, with zero susceptibility. For these algorithms, the reduced in-phase response will, in most cases, make the apparent resistivity higher than it should be. It is important to note that there is nothing wrong with the data, nor is there anything wrong with the processing algorithms. The apparent difference results from the fact that the simple geological model used in processing does not match the complex geology.

Measuring and Correcting the Magnetite Effect

Theoretically, it is possible to calculate (forward model) the combined effect of electrical conductivity and magnetic susceptibility on an EM response in all environments. The difficulty lies, however, in separating out the susceptibility effect from other geological effects when deriving resistivity and susceptibility from EM data.

Over a homogeneous half-space, there is a precise relationship between in-phase, quadrature, and altitude. These are often resolved as phase angle, amplitude, and altitude. Within a reasonable range, any two of these three parameters can be used to calculate the half space resistivity. If the rock has a positive magnetic susceptibility, the in-phase component will be reduced and this departure can be recognized by comparison to the other parameters.

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[7] Magnetic susceptibility and permeability are two measures of the same physical property. Permeability is generally given as relative permeability, μ_r, which is the permeability of the substance divided by the permeability of free space ($4 \pi \times 10^{-7}$). Magnetic susceptibility k is related to permeability by $k=\mu^r-1$. Susceptibility is a unitless measurement, and is usually reported in units of 10^{-6}. The typical range of susceptibilities is –1 for quartz, 130 for pyrite, and up to 5×10^5 for magnetite, in 10^{-6} units (Telford et al, 1986).

The algorithm used to calculate apparent susceptibility and apparent resistivity from HEM data, uses a homogeneous half-space geological model. Non half-space geology, such as horizontal layers or dipping sources, can also distort the perfect half-space relationship of the three data parameters. While it may be possible to use more complex models to calculate both rock parameters, this procedure becomes very complex and time-consuming. For basic HEM data processing, it is most practical to stick to the simplest geological model.

Magnetite reversals (reversed in-phase anomalies) have been used for many years to calculate an "FeO" or magnetite response from HEM data (Fraser, 1981). However, this technique could only be applied to data where the in-phase was observed to be negative, which happens when susceptibility is high and conductivity is low.

Applying Susceptibility Corrections

Resistivity calculations done with susceptibility correction may change the apparent resistivity. High-susceptibility conductors, that were previously masked by the susceptibility effect in standard resistivity algorithms, may become evident. In this case the susceptibility corrected apparent resistivity is a better measure of the actual resistivity of the earth. However, other geological variations, such as a deep resistive layer, can also reduce the in-phase by the same amount. In this case, susceptibility correction would not be the best method. Different geological models can apply in different areas of the same data set. The effects of susceptibility, and other effects that can create a similar response, must be considered when selecting the resistivity algorithm.

Susceptibility from EM vs Magnetic Field Data

The response of the EM system to magnetite may not match that from a magnetometer survey. First, HEM-derived susceptibility is a rock property measurement, like resistivity. Magnetic data show the total magnetic field, a measure of the potential field, not the rock property. Secondly, the shape of an anomaly depends on the shape and direction of the source magnetic field. The electromagnetic field of HEM is much different in shape from the earth's magnetic field. Total field magnetic anomalies are different at different magnetic latitudes; HEM susceptibility anomalies have the same shape regardless of their location on the earth.

In far northern latitudes, where the magnetic field is nearly vertical, the total magnetic field measurement over a thin vertical dike is very similar in shape to the anomaly from the HEM-derived susceptibility (a sharp peak over the body). The same vertical dike at the magnetic equator would yield a negative magnetic anomaly, but the HEM susceptibility anomaly would show a positive susceptibility peak.

Effects of Permeability and Dielectric Permittivity

Resistivity algorithms that assume free-space magnetic permeability and dielectric permittivity, do not yield reliable values in highly magnetic or highly resistive areas. Both magnetic polarization and displacement currents cause a decrease in the in-phase component, often resulting in negative values that yield erroneously high apparent resistivities. The effects of magnetite occur at all frequencies, but are most evident at the lowest frequency. Conversely, the negative effects of dielectric permittivity are most evident at the higher frequencies, in resistive areas.

The table below shows the effects of varying permittivity over a resistive (10,000 ohm-m) half space, at frequencies of 56,000 Hz (DIGHEM^V) and 102,000 Hz (RESOLVE).

Apparent Resistivity Calculations
Effects of Permittivity on In-phase/Quadrature/Resistivity

Freq (Hz)	Coil	Sep (m)	Thres (ppm)	Alt (m)	In Phase	Quad Phase	App Res	App Depth (m)	Permittivity
56,000	CP	6.3	0.1	30	7.3	35.3	10118	-1.0	1 Air
56,000	CP	6.3	0.1	30	3.6	36.6	19838	-13.2	5 Quartz
56,000	CP	6.3	0.1	30	-1.1	38.3	81832	-25.7	10 Epidote
56,000	CP	6.3	0.1	30	-10.4	42.3	76620	-25.8	20 Granite
56,000	CP	6.3	0.1	30	-19.7	46.9	71550	-26.0	30 Diabase
56,000	CP	6.3	0.1	30	-28.7	52.0	66787	-26.1	40 Gabbro
102,000	CP	7.86	0.1	30	32.5	117.2	9409	-0.3	1 Air
102,000	CP	7.86	0.1	30	11.7	127.2	25956	-16.8	5 Quartz
102,000	CP	7.86	0.1	30	-14.0	141.6	97064	-26.5	10 Epidote
102,000	CP	7.86	0.1	30	-62.9	176.0	83995	-26.8	20 Granite
102,000	CP	7.86	0.1	30	-107.5	215.8	73320	-27.0	30 Diabase
102,000	CP	7.86	0.1	30	-147.1	259.2	64875	-27.2	40 Gabbro

Methods have been developed (Huang and Fraser, 2000, 2001) to correct apparent resistivities for the effects of permittivity and permeability. The corrected resistivities yield more credible values than if the effects of permittivity and permeability are disregarded.

Recognition of Culture

Cultural responses include all EM anomalies caused by man-made metallic objects. Such anomalies may be caused by inductive coupling or current gathering. The concern of the interpreter is to recognize when an EM response is due to culture. Points of consideration used by the interpreter, when coaxial and coplanar coil-pairs are operated at a common frequency, are as follows:

1. Channels CXPL and CPPL monitor 60 Hz radiation. An anomaly on these channels shows that the conductor is radiating power. Such an indication is normally a guarantee that the conductor is cultural. However, care must be taken to ensure that the conductor is not a geologic body that strikes across a power line, carrying leakage currents.

2. A flight that crosses a "line" (e.g., fence, telephone line, etc.) yields a centre-peaked coaxial anomaly and an m-shaped coplanar anomaly.[8] When the flight crosses the cultural line at a high angle of intersection, the amplitude ratio of coaxial/coplanar response is 2. Such an EM anomaly can only be caused by a line. The geologic body that yields anomalies most closely resembling a line is the vertically dipping thin dike. Such a body, however, yields an amplitude ratio of 1 rather than 2. Consequently, an m-shaped coplanar anomaly with a CXI/CPI amplitude ratio of 2 is virtually a guarantee that the source is a cultural line.

3. A flight that crosses a sphere or horizontal disk yields centre-peaked coaxial and coplanar anomalies with a CXI/CPI amplitude ratio (i.e., coaxial/coplanar) of 1/8. In the absence of geologic bodies of this geometry, the most likely conductor is a metal roof or small fenced yard.[9] Anomalies of this type are virtually certain to be cultural if they occur in an area of culture.

4. A flight that crosses a horizontal rectangular body or wide ribbon yields an m-shaped coaxial anomaly and a centre-peaked coplanar anomaly. In the absence of geologic bodies of this geometry, the most likely conductor is a large fenced area.[5] Anomalies of this type are virtually certain to be cultural if they occur in an area of culture.

5. EM anomalies that coincide with culture, as seen on the camera film or video display, are usually caused by culture. However, care is taken with such coincidences because a geologic conductor could occur beneath a fence, for example. In this example, the fence would be expected to yield an m-shaped coplanar anomaly as in case #2 above. If, instead, a centre-peaked coplanar anomaly occurred, there would be concern that a thick geologic conductor coincided with the cultural line.

6. The above description of anomaly shapes is valid when the culture is not conductively coupled to the environment. In this case, the anomalies arise from inductive coupling to the EM transmitter. However, when the environment is quite conductive (e.g., less than 100 ohm-m at 900 Hz), the cultural conductor may be conductively coupled to the environment. In this latter case, the anomaly shapes tend to be governed by current gathering. Current gathering can completely distort

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8 See Figure C-1 presented earlier.

9 It is a characteristic of EM that geometrically similar anomalies are obtained from: (1) a planar conductor, and (2) a wire which forms a loop having dimensions identical to the perimeter of the equivalent planar conductor.

the anomaly shapes, thereby complicating the identification of cultural anomalies. In such circumstances, the interpreter can only rely on the radiation channels and on the camera film or video records.

Magnetic Responses

The measured total magnetic field provides information on the magnetic properties of the earth materials in the survey area. The information can be used to locate magnetic bodies of direct interest for exploration, and for structural and lithological mapping.

The total magnetic field response reflects the abundance of magnetic material in the source. Magnetite is the most common magnetic mineral. Other minerals such as ilmenite, pyrrhotite, franklinite, chromite, hematite, arsenopyrite, limonite and pyrite are also magnetic, but to a lesser extent than magnetite on average.

In some geological environments, an EM anomaly with magnetic correlation has a greater likelihood of being produced by sulphides than one which is non-magnetic. However, sulphide ore bodies may be non-magnetic (e.g., the Kidd Creek deposit near Timmins, Canada) as well as magnetic (e.g., the Mattabi deposit near Sturgeon Lake, Canada).

Iron ore deposits will be anomalously magnetic in comparison to surrounding rock due to the concentration of iron minerals such as magnetite, ilmenite and hematite.

Changes in magnetic susceptibility often allow rock units to be differentiated based on the total field magnetic response. Geophysical classifications may differ from geological classifications if various magnetite levels exist within one general geological classification. Geometric considerations of the source such as shape, dip and depth, inclination of the earth's field and remanent magnetization will complicate such an analysis.

In general, mafic lithologies contain more magnetite and are therefore more magnetic than many sediments which tend to be weakly magnetic. Metamorphism and alteration can also increase or decrease the magnetization of a rock unit.

Textural differences on a total field magnetic contour, colour or shadow map due to the frequency of activity of the magnetic parameter resulting from inhomogeneities in the distribution of magnetite within the rock, may define certain lithologies. For example, near surface volcanics may display highly complex contour patterns with little line-to-line correlation.

Rock units may be differentiated based on the plan shapes of their total field magnetic responses. Mafic intrusive plugs can appear as isolated "bulls-eye" anomalies. Granitic intrusives appear as sub-circular zones, and may have contrasting rings due to contact metamorphism. Generally, granitic terrain will lack a pronounced strike direction, although granite gneiss may display strike.

Linear north-south units are theoretically not well-defined on total field magnetic maps in equatorial regions due to the low inclination of the earth's magnetic field. However, most stratigraphic units will have variations in composition along strike that will cause the units to appear as a series of alternating magnetic highs and lows.

Faults and shear zones may be characterized by alteration that causes destruction of magnetite (e.g., weathering) that produces a contrast with surrounding rock. Structural breaks may be filled by magnetite-rich, fracture filling material as is the case with diabase dikes, or by non-magnetic felsic material.

Faulting can also be identified by patterns in the magnetic total field contours or colours. Faults and dikes tend to appear as lineaments and often have strike lengths of several kilometres. Offsets in narrow, magnetic, stratigraphic trends also delineate structure. Sharp contrasts in magnetic lithologies may arise due to large displacements along strike-slip or dip-slip faults.

APPENDIX D

DATA ARCHIVE DESCRIPTION

This CD-ROM contains final data archives of an airborne survey conducted by Fugro Airborne Surveys on behalf of 977554 Alberta Ltd. The survey was flown on December 31, 2003.

Fugro Job #03094

CD Archive number: CCD01990

1. LineData: XYZ data in Geosoft format, along with format description.
   SEGY files

2. Grids: Grids in Photon format for the following parameters:
   1. Magnetic Total Field
   2. Differential Resistivity 400 Hz Coplanar
   3. Differential Resistivity 1500 Hz Coplanar
   4. Differential Resistivity 6200 Hz Coplanar
   5. Differential Resistivity 25 kHz Coplanar
   6. Differential Resistivity 100 kHz Coplanar

4. Report in MS-Word 2000.

Projection Description:

Datum:	NAD27 (Alberta and BC)
Ellipsoid:	Clarke 1866
Projection:	UTM (Zone:11N)
Central Meridian:	117° W
False Northing:	0
False Easting:	500000
Scale Factor:	0.9996
WGS84 to Local Conversion:	Molodensky
Datum Shifts (DX, DY, DZ):	7, -162, -188

Geosoft XYZ ARCHIVE SUMMARY

JOB #	:03094
TYPE OF SURVEY	:EM, MAGNETICS, RESISTIVITY
AREA	:Ft McMurray Area, AB
CLIENT	:977554 Alberta Ltd.

****

CHANNEL NAME	DESCRIPTION
LINE	line number
FLIGHT	flight number
X	UTM Easting NAD27 Zone11N
Y	UTM Northing NAD27 Zone11N
Z	GPS Z component
FID	fiducial counter
ALTIMETER	bird height above ground
TOPO	digital topography
CPI115K	coplanainphase 115 kHz
CPI1500	coplanainphase 1500 Hz
CPI25K	coplanainphase 25 kHz
CPI400	coplanainphase 400 Hz
CPI6200	coplanainphase 6200 Hz
CPQ115K	coplanaquadratur115 kHz
CPQ1500	coplanaquadratur1500 Hz
CPQ25K	coplanaquadratur25 kHz
CPQ400	coplanaquadratur400 Hz
CPQ6200	coplanaquadratur6200 Hz
CXI3300	coaxialinphase 3300 Hz
CXQ3300	coaxialquadratur3300 Hz
CEN115k	centroid depth 115 kHz
CEN1500	centroid depth 1500 Hz
CEN25k	centroid depth 25 kHz
CEN400	centroid depth 400 Hz
CEN6200	centroid depth 6200 Hz
DDEP115K	differential dep115 kHz
DDEP1500	differential dep1500 Hz
DDEP25K	differential dep25 kHz
DDEP400	differential dep400 Hz
DDEP6200	differential dep6200 Hz
DRES115K	differential res115 kHz
DRES1500	differential res1500 Hz
DRES25K	differential res25 kHz
DRES400	differential res400 Hz
DRES6200	differential res6200 Hz
RES115K	apparent resisti115 kHz
RES6200	apparent resisti6200 Hz
RES1500	apparent resisti1500 Hz
RES25K	apparent resisti25 kHz
RES3300	apparent resisti3300 Hz
RES400	apparent resisti400 Hz
RES00M	differential resistivity d0 metres
RES01M	differential resistivity d1metres
RES02M	differential resistivity d2metres
RES05M	differential resistivity d5 metres
RES10M	differential resistivity d10 metres
RES15M	differential resistivity d15 metres
RES20M	differential resistivity d20 metres
RES25M	differential resistivity d25 metres
RES30M	differential resistivity d30 metres
RES35M	differential resistivity d35 metres
RES40M	differential resistivity d40 metres
RES45M	differential resistivity d45 metres
RES50M	differential resistivity d50 metres

RES55M	differential resistivity d55 metres
RES60M	differential resistivity d60 metres
RES65M	differential resistivity d65 metres
RES70M	differential resistivity d70 metres
RES75M	differential resistivity d75 metres
RES80M	differential resistivity d80 metres
RES85M	differential resistivity d85 metres
RES90M	differential resistivity d90 metres
MAG	total magnetic field

==

ISSUE DATE :January 19, 2003
FOR WHOM :977554 Alberta Ltd.

BY WHOM :FUGRO AIRBORNE SURVEYS CORP.
2270 ARGENTIA ROAD
MISSISSAUGA, ONTARIO,
CANADA L5N 6A6
TEL. (905) 812-0212
FAX (905) 812-1504

SEGY ARCHIVE

CHANNEL NAME	DESCRIPTION	
FID		
X	m	UTME-NAD27(ZONE-11)
Y	m	UTMN-NAD27
CPI400	400	INPHASE
CPQ400	400	QUAD
CPI1500	1500	INPHASE
CPQ1500	1500	QUAD
CXI3300	3300	INPHASE
CXQ3300	3300	QUAD
CPI6200	6200	INPHASE
CPQ6200	6200	QUAD
CPI25K	25K	INPHASE
CPQ25K	25K	QUAD
CPI115K	115K	INPHASE
CPQ115K	115K	QUAD
ALTIMETER	m	BIRD HEIGHT
MAG	nT	TOTAL MAGNETIC
TOPO	m	SURFACE TOPOGRAPHY
RES00M	RESISTIVITY AT 01 METRES	
RES02M	RESISTIVITY AT 02 METRES	
RES05M	RESISTIVITY AT 05 METRES	
RES10M	RESISTIVITY AT 10 METRES	
RES15M	RESISTIVITY AT 15 METRES	
RES20M	RESISTIVITY AT 20 METRES	
RES25M	RESISTIVITY AT 25 METRES	
RES30M	RESISTIVITY AT 30 METRES	
RES35M	RESISTIVITY AT 35 METRES	
RES40M	RESISTIVITY AT 40 METRES	
RES45M	RESISTIVITY AT 45 METRES	
RES50M	RESISTIVITY AT 50 METRES	
RES55M	RESISTIVITY AT 55 METRES	
RES60M	RESISTIVITY AT 60 METRES	
RES65M	RESISTIVITY AT 65 METRES	
RES70M	RESISTIVITY AT 70 METRES	
RES75M	RESISTIVITY AT 75 METRES	
RES80M	RESISTIVITY AT 80 METRES	
RES85M	RESISTIVITY AT 85 METRES	
RES90M	RESISTIVITY AT 90 METRES	

APPENDIX 4

977554 Alberta Ltd.

ASSESSMENT REPORT

LIEGE PROSPECT

APPENDIX 4

Diamond Drilling

Bob Ryziuk
Geolink Exploration Ltd.
10961 University Avenue
Edmonton, Alberta T6G 1Y1

977554 Alberta Ltd.
4700 - 888 3rd Street SW
Calgary, Alberta T2P 5C5

REPORT ON DIAMOND DRILLING
March 2004
LIEGE PROSPECT
Northern Alberta

Two holes were drilled between March 5th and March 7th, 2004. The holes were located to test airborne EM anomalies consistent with kimberlite signatures. The drill hole locations are listed below.

DIAMOND DRILL HOLE LOCATIONS

LIEGE PROSPECT

UTM Zone 12 NAD27

Hole Number	Easting	Northing	NTS Map	Total Depth (metres)
DDH04-5	337886	6304239	84A/13	103.6
DDH04-6	338220	6304263	84A/13	103.6

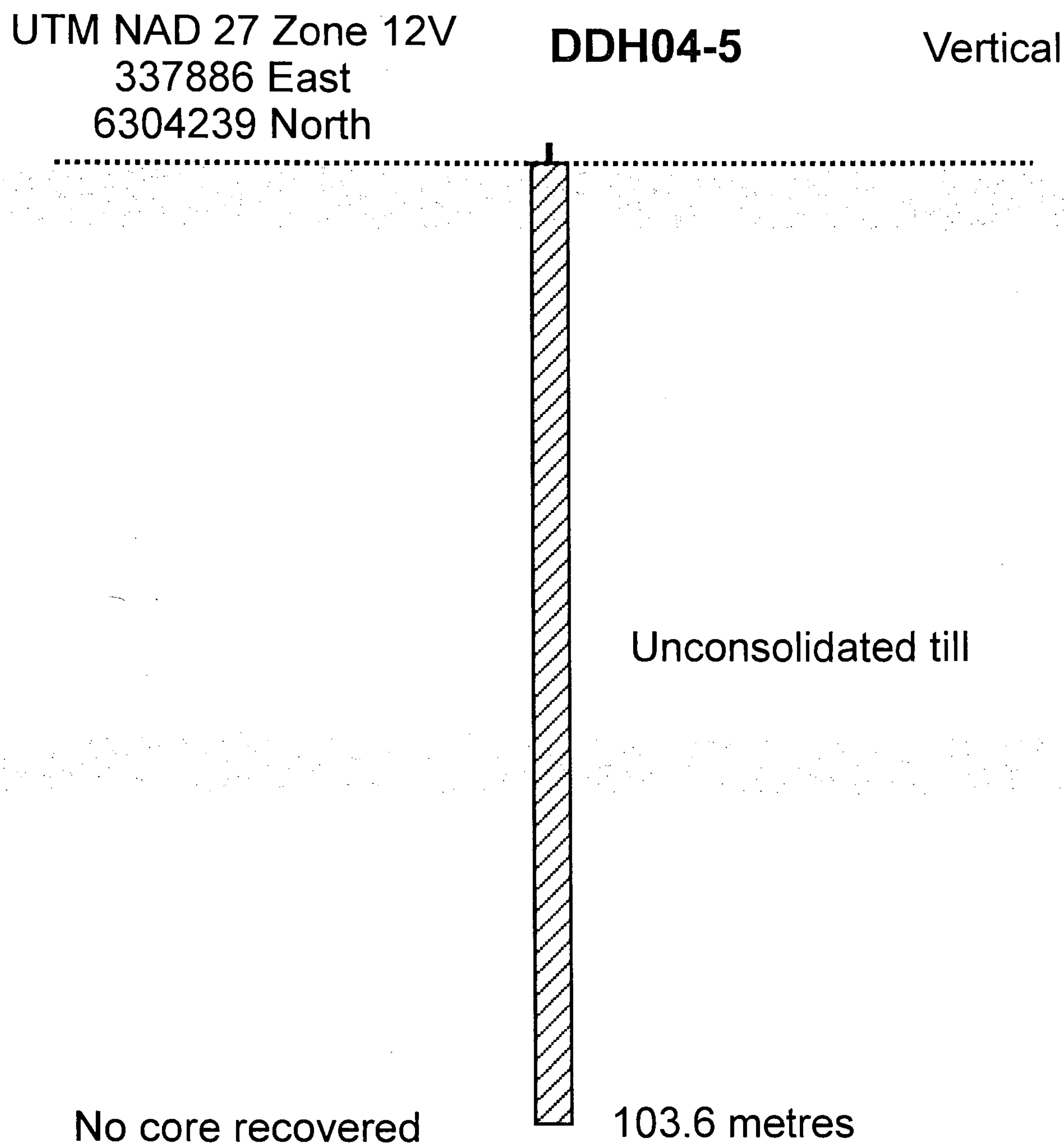
All holes were accessed by existing cut line cleared of snow. Hole DDH04-5 required 100 metres of new road to be built through 2" to 6" mixed poplar, spruce and birch trees. Hole DDH04-6 was located on a cut line.

None of the holes encountered kimberlite and no core was recovered. Each hole was drilled with a tri-cone bit and drill cuttings were observed but not sampled. All holes bottomed in what appeared to be unconsolidated glacial till.

Aggressive Diamond Drilling Ltd. of Kelowna, B.C. was contracted to drill the targets. A unitized skid-mounted Boyles 25-A drill was used to drill NQ-2 core. All holes were vertical.

A water truck was hired from Fort McMurray and a D4 Cat was used to build drill pads and move the drill.

Figures 1 and 2 summarize each hole.



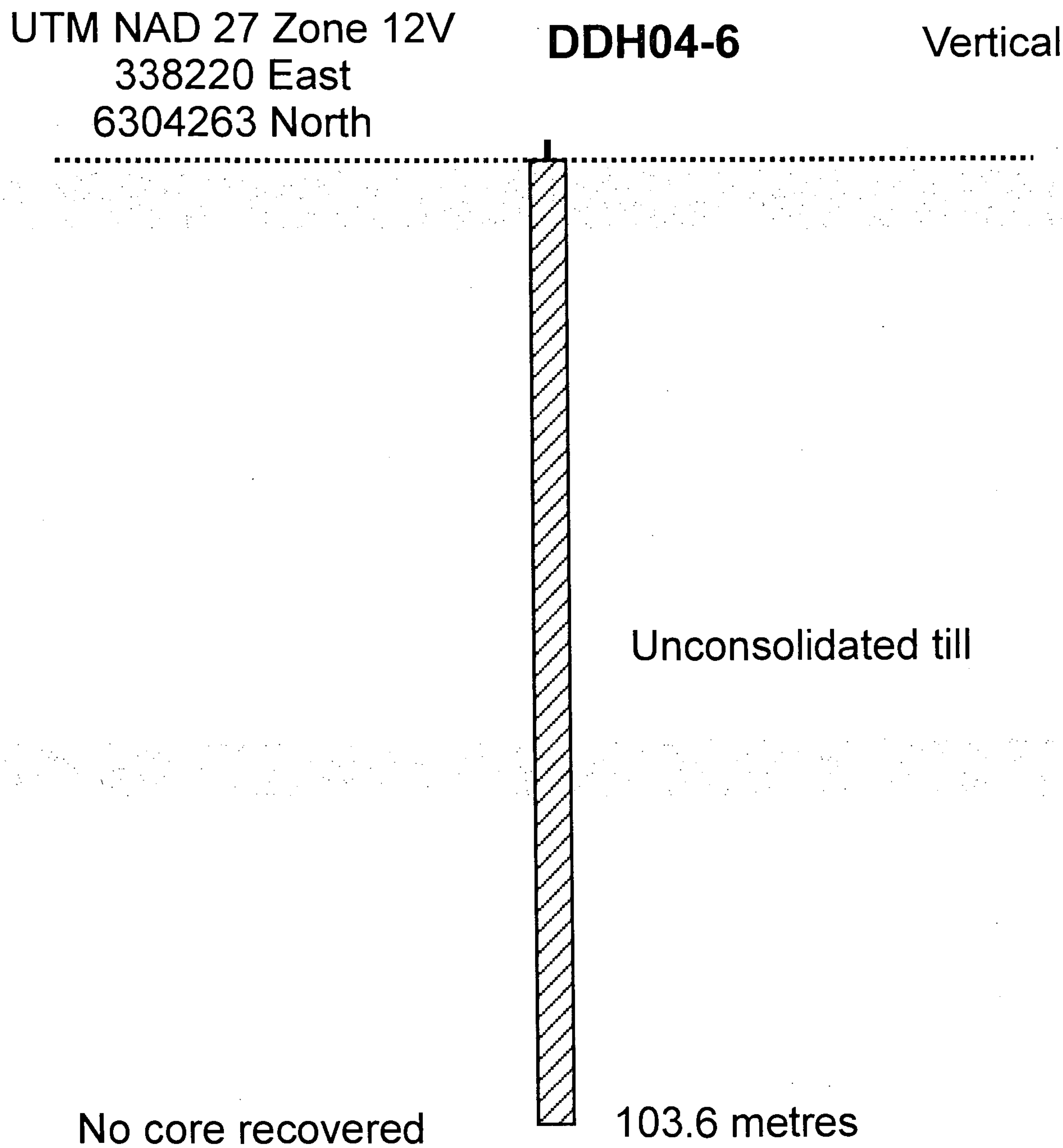
977554 ALBERTA LTD.

LIEGE PROSPECT

Target B

Diamond Drill Hole - DDH04-5

Geolink Exploration Ltd.	April 2004	NTS: 84A/13	Figure 1



977554 ALBERTA LTD.

LIEGE PROSPECT
Target B
Diamond Drill Hole - DDH04-6

Geolink Exploration Ltd.	April 2004	NTS: 84A/13	Figure 2

APPENDIX 5

977554 Alberta Ltd.

ASSESSMENT REPORT

LIEGE PROSPECT

APPENDIX 5

Statement of Expenditures

Bob Ryziuk
Geolink Exploration Ltd.
10961 University Avenue
Edmonton, Alberta T6G 1Y1

977554 Alberta Ltd.
4700 - 888 3rd Street SW
Calgary, Alberta T2P 5C5

LIEGE PROSPECT

Statement of Expenditures

Description	Amount
Subcontracting Services	
Orequest Consultants Ltd.	$3,045.38
Qualifying Report	
Fugro Airborne Surveys	$18,358.33
Airborne Geophysics	
Aggressive Diamond Drilling Ltd.	$66,210.01
Two diamond drill holes with associated costs	
Geolink Exploration Ltd.	$11,515.22
Project supervision, field work and report writing	
Sub-total	$99,128.94
Administration expense (10%)	$9,912.89
TOTAL	**$109,041.83**

WITNESS

R.M. FULTON
Notary Public in and for the Province of Alberta.
My commission is unlimited as to time

GEOLINK EXPLORATION LTD

Per: [redacted]

President

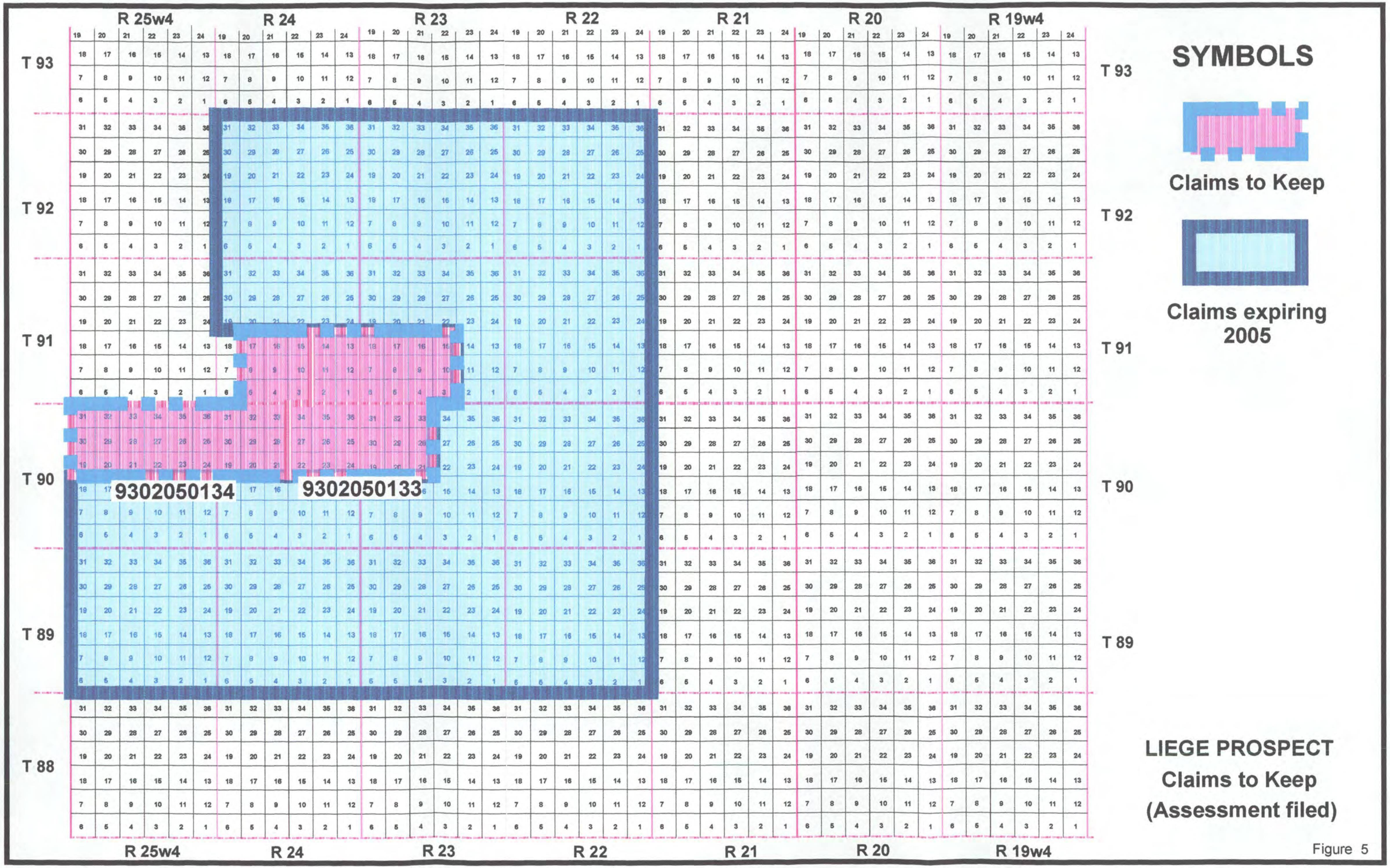
LIEGE PROSPECT
COST ALLOCATION

MAIM Permit Number	Permit Area (ha)	Permit Commencement Date	Assessment Work Requirement ($/ha)	Assessment Amount Due	Exploration Expenditures ($)	Assigned Assessment Amount ($)
9302050133	9,216	May 24, 2002	$5.00	$46,080.00	$62,961.83	$62,961.83
9302050134	9,216	May 24, 2002	$5.00	$46,080.00	$46,080.00	$46,080.00
				Total	**$109,041.83**	**$109,041.83**

LIEGE PROSPECT

Assessment Applied To:

Permit Number	Township	Range	Meridian		Sections	Number of Sections
9302050133	90	23	W4		19,20,21,28,29,30,31,32,33	9
	91	23	W4		3,4,5,6,7,8,9,10,15,16,17,18	12
	90	24	W4		22,23,24,25,26,27,34,35,36	9
	91	24	W4		1,2,11,12,13,14	6
					Sub-total	36
9302050134	90	24	W4		19,20,21,28,29,30,31,32,33	9
	91	24	W4		3,4,5,8,9,10,15,16,17	9
	90	25	W4		19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36	18
					Sub-total	36
					Total	**72**
						2 Townships


R 25w4
R 24
R 23
R 22
R 21
R 20
R 19w4
T 93
T 92
T 91
T 90
T 89
T 88
9302050134
9302050133
SYMBOLS
Claims to Keep
Claims expiring 2005
LIEGE PROSPECT
Claims to Keep
(Assessment filed)
Figure 5

977554 Alberta Ltd.

LIEGE PROSPECT - Targets A and B

Indicator Sampling, Geophysics and Diamond Drill Hole Locations

Geolink Exploration Ltd.	April 2004	NTS: 84A / 13	Figure: 4