A Compilation of Airborne Surveys

Conducted on the

Toodoogone Joint Venture

During 1997

Toodoggone River Area, B.C.

Antares Mining and Exploration Coporation
&
AGC Americas Gold Corporation

July 15, 1998.

This report covers the claims listed in Table 1 within the report with an area of 31,309.70 hectaces (73,656.70 Acres) currently held either by AGC Americas Gold Corporation or Cheni Resources Inc. currently being explored by Joint Venture made up of AGC Americas Gold Corporation and Antares Mining and Exploration Corporation centred on 57° 25' N 127° 15' W.

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Report #98-065-03

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1.0 Introduction

In July 1997, Antares Mining and Exploration Corporation (ANZ) requested Paul A. Hawkins & Associates Ltd. (PAH) to supervise and prepare assessment reports on airborne surveys by Aerodat and the GSC conducted over the JD, Moose, Lawyers and AL properties which collectively with other claims make up the Toodoggone JV. Previous to this, PAH had been retained by AGC Americas Gold Corporation to manage exploration on AGC's properties in the area and had prepared several summary reports on these properties. In 1989 PAH had completed a due diligence review on the Cheni Gold Mine in support of an IPO and is thus familiar with the property area and economic geology.

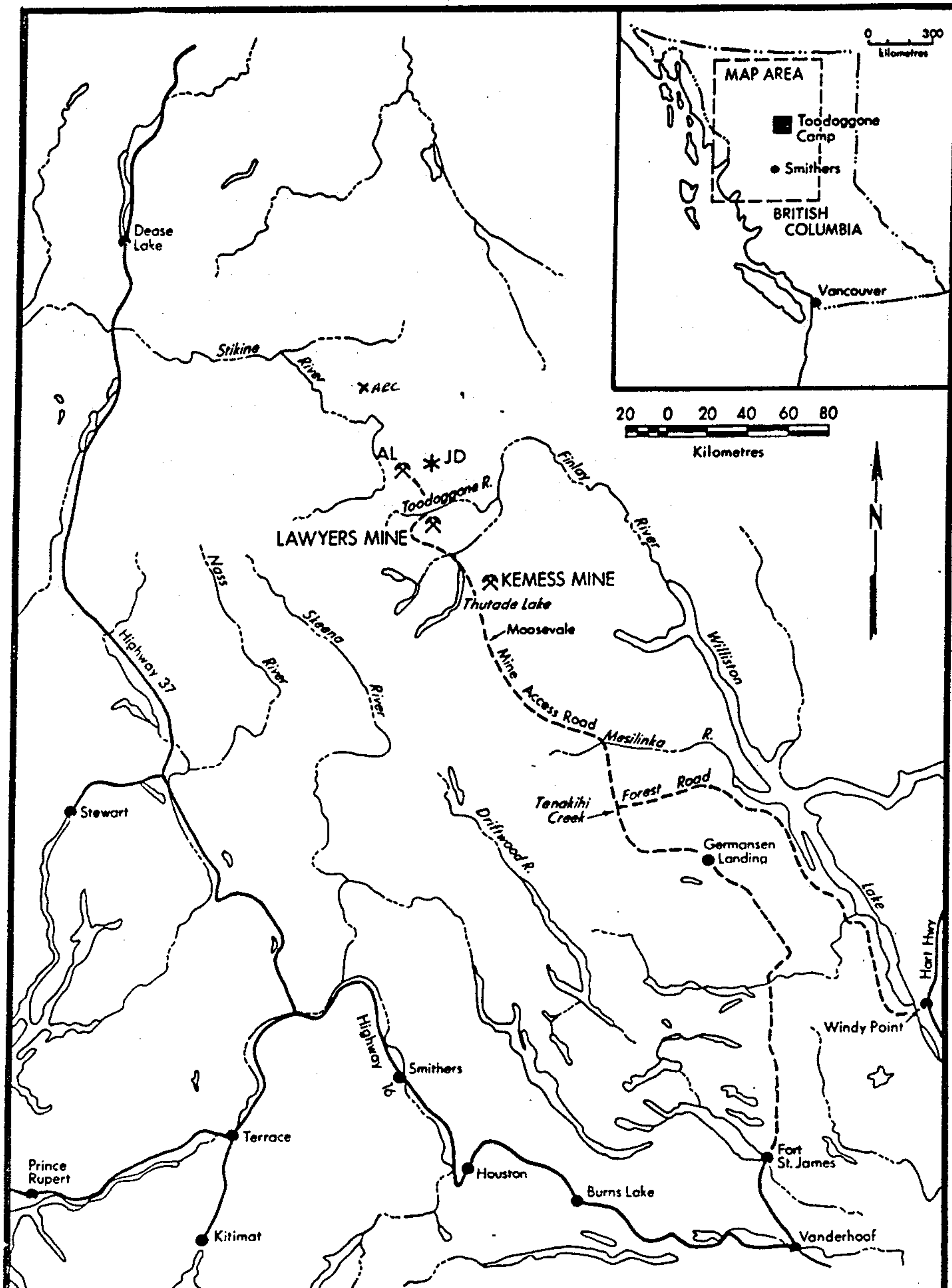
The report covers Regional Aeromagnetic coverage flown by the Geological Survey of Canada for which the Joint Venture was an industry partner. The GSC survey consisted of 33,300 line km. of high level regional aeromagnetics in NTS 94E and 94F. The GSC flying was conducted during July and August of 1997 concurrent with a more detailed helicopter survey flown by Aerodat over the JD, AL, Moose and Lawyers blocks. The JV contributed $25,000 towards the completion of the GSC survey.

This report summarizes results of both airborne surveys and interpretation of results on the subject properties by ANZ. Both the Lawyers and AL are past gold producers which have been fully decommissioned with all milling and mining equipment removed from the property but still host significant potential for bulk tonnage type gold deposits.

1.1 Location and Access

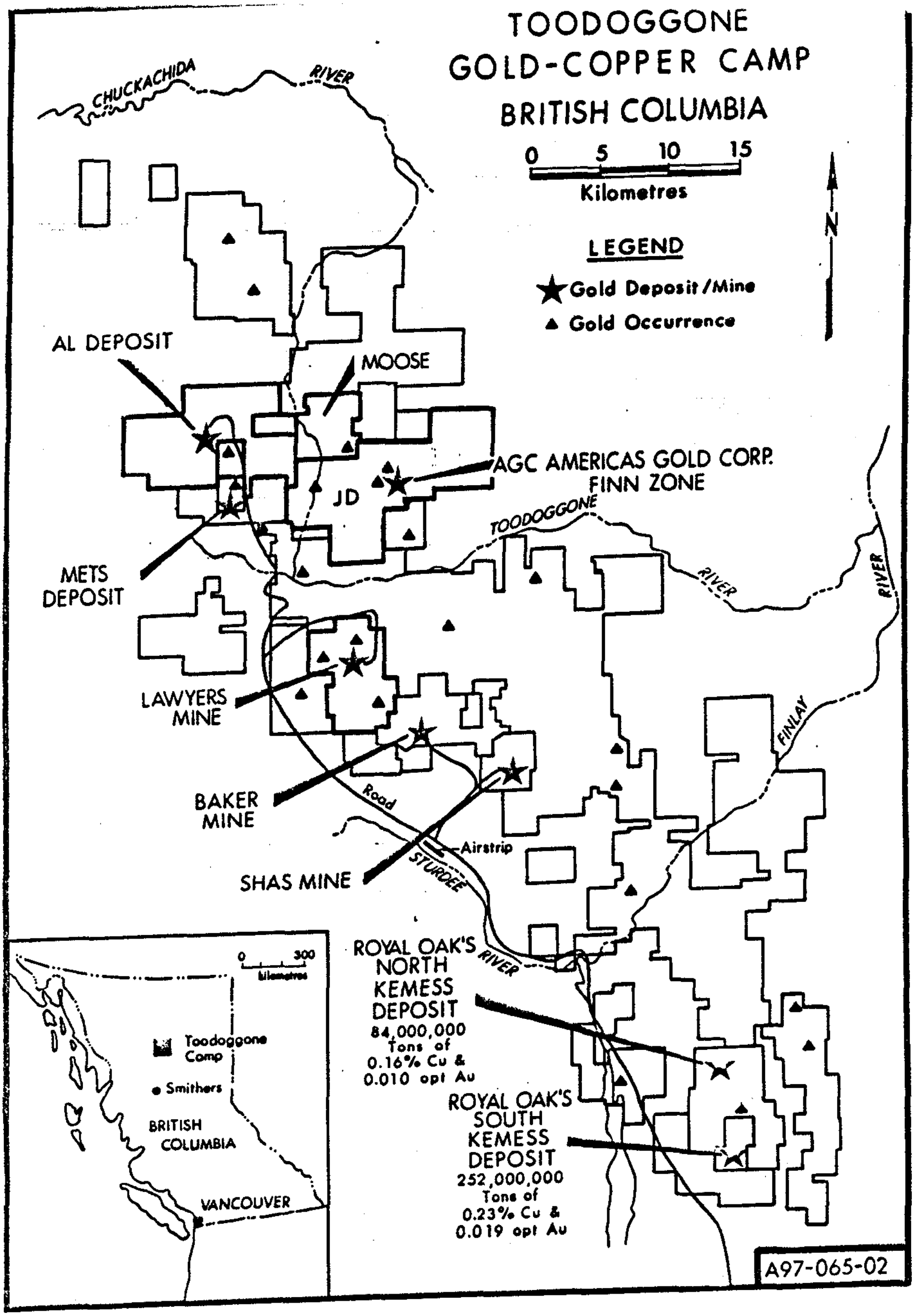
The JV lands are made up of four original claims blocks (JD, AL, Moose and Lawyers) which are now contiguous based on recent staking. The JD block which has been the most recent focus of exploration consists of 408 units covering 10,200 hectares (25,204 acres) which lie north of the Toodoggone River and east of Moosehorn Creek. The AL property adjoins the JD to the west and consists of a single claim block of 239 units and one Mining Lease covering 7,000 hectares (17,297 acres) north of the Toodoggone River and west of Moosehorn Creek. The Moose property is located on the upper reaches of Moosehorn Creek between the AL and JD properties and consists of 103 units covering 2,575 hectares (6362.70 acres). The Lawyers property which lies south of the Toodoggone River consists of a single claim block of 131 units and two mining leases covering 4,134.7 hectares (10,215 acres).

All of the claims are located in the Toodoggone area of the Omineca Mining District of north-central British Columbia, approximately 180 miles north of the town of Smithers as shown on Drawing A97-065-01. The property lies within the Omineca Mountains in N.T.S. 94E/06 and is centred on 57° 25' N 127° 15' W. The JV controls an total of 29,809.7 hectares (73,656.7 acres) on claim blocks as shown on Drawing A97-065-02.



PROJECT LOCATION

A97-065-1



TOODOGGONE
GOLD-COPPER CAMP
BRITISH COLUMBIA
0 5 10 15
Kilometres
N
LEGEND
Gold Deposit/Mine
Gold Occurrence
CHUCKACHIDA
RIVER
AL DEPOSIT
MOOSE
AGC AMERICAS GOLD CORP.
FINN ZONE
JD
TOODOGGONE
RIVER
METS
DEPOSIT
LAWYERS
MINE
BAKER
MINE
Road
FINLAY
RIVER
Airstrip
SHAS MINE
STURDEE
RIVER
ROYAL OAK'S
NORTH
KEMESS
DEPOSIT
84,000,000
Tons of
0.16% Cu &
0.010 opt Au
ROYAL OAK'S
SOUTH
KEMESS
DEPOSIT
252,000,000
Tons of
0.23% Cu &
0.019 opt Au
0 300
kilometres
Toodoggone
Camp
Smithers
BRITISH
COLUMBIA
VANCOUVER
A97-065-02

All properties are accessible off the northern end of the Omineca Resource Access Road (ORAR). The ORAR terminates at the Lawyers Mine site while the AL claims are accessible off a spur (Metsantan Extension) off the ORAR just before the Mine. The JD and Moose properties are accessible from a cat track off of the Metsantan Extension down Antoine Louis Creek and across Moosehorn Creek. The property area during the summer of 1997 was serviced by twice weekly fixed wing aircraft out of Smithers or Prince George using the nearby 5,300 ft. Sturdee gravel strip which is capable of handling aircraft up to the size of a Hercules. The Kemess Mine site located 40 miles to the south is serviced by several daily scheduled flights out of Prince George and Smithers. Typically fuel and heavy equipment are trucked in from Fort St. James to the end of the road, while weekly supplies were flown in from Smithers.

The JD, Moose, Lawyers and AL properties are located in previously disturbed areas at an elevation of 4300 - 6500 ft. which is largely above tree line. The area consists of rounded hills with steep talus and overburden covered slopes. Some permanent ice is present on the property. The use of Helicopters and ATV limits terrain disturbance in areas outside of the past disturbances. AGC operations in the area were based out of a 16 men camp on the J.D. property which is located in an alpine meadow just at tree line and is equipped with a satellite telephone and Fax modem.

The Toodoggone area has over the last two decades been one of the most actively explored areas of B.C. for Gold-Silver Deposits. Deposits present in the area range from gold-rich porphyry-style deposits, to deep-seated precious and base metal bearing stockwork and veins, to near-surface replacement type gold mineralization. The district contains several past producers including the Lawyers Mine as well as smaller scale Shasta and Baker mines. Several other gold deposits have drill-indicated resources and await further exploration and production decisions. Another major development in the area is Royal Oak's Kemess Deposit which is located 40 miles to the south. The Kemess Mine is now in production and should be reaching its design capacity milling rate of 50,000 tons per day shortly.

1.2 Land Status and Environmental Concerns

The J.D. property consists of 33 minerals claims held 100% by AGC under the terms of the Mineral Tenure Act Regulations. The original claims were acquired from Energex Minerals Ltd. in 1993 with additional claims being added in the summer of 1995 and fall of 1996 and 1997. AGC has by various agreements acquired a 100% interest in the properties subject to a 1% NSR to the original vendor, a small annual royalty payment to Energex Resources and to Kinross Gold Corporation et al an aggregate 15% NPR. The exact terms of these option agreements are beyond the scope of this report.

The Lawyer and Al properties consist of two claim blocks held by Cheni Resources Ltd. et al under the terms of the Mineral Tenure Act Regulations. AGC has an option to acquire a 100% interest in the properties subject to: for the Lawyers a 2% NSR to Cheni et al and for the AL to the original vendor a 7% initial production royalty and 0.50% NSR in respect of tons milled in excess of 250,000 tons; to Kinross Gold Corporation et al an aggregate 15% NPR; a 1.5% NSR to Cheni.

The Moose property consists of 21 mineral claims held by AGC Americas Gold Corp. under terms of the Mineral Tenure Regulations. AGC acquired a 100% interest in the property from Energex Minerals in 1996 subject to a 1% net smelter return to each of two original vendors of the property.

In June 1997 AGC entered into an agreement with Toronto based Antares Mining and Exploration Corporation (ANZ) to farm into all of AGC's properties in the area including the JD, Moose, Lawyers and AL. The joint venture agreement calls for ANZ to spend $5,000,000 on the AGC property to earn a 55% interest. A further 5% may be purchased for $4,500,000.

Most of the claims appear in good standing into the of fall 1998 or beyond. Annual rentals on the mining Leases are also due yearly. Exact details of claim status is beyond the scope of this report but we believe they are in good order. The claims covered by this report are listed in Table 1 - A to 1 - F and shown on Drawing X97-065-95

Much of the project area and current camp site is located in alpine areas which are Environmentally Sensitive. Access to the properties is from the Sturdee Airstrip on the Omineca Resource Access Road. The Omineca Resource Access Road originally called the Omineca Mining Access Road was built by Cheni Gold Mines with the assistance of the Province of B.C. The close proximity of the property to Spatsizi Wilderness Park and the Alpine Environment in which the property is located will require careful concern for the environment.

Table 1 - A

J. D. Property Claims

Claim Name	Record #	Units	Staking Date	Expiry Date	Area	
JM	238126	20		June 12, 2006	500	*
JD	238127	20		June 12, 2006	500	*
JR	238295	6		July 18, 2006.	150	*
McClair 1	238316	4		Sept 03, 2007	100	*
JK Fraction	238326	1		Sept 03, 2006	25	
JC Fraction	238327	1		Sept 03, 2006	25	
JU Fraction	238328	1		Sept 03, 2006	25	
JB	238333	20		Sept 03, 2006	500	
Antoine Louis	238474	10		Aug 13, 2006	250	
GAS-1	238675	20		Sept 08, 2006	500	
Spur	357274	16	1997	June 26, 2001	400	*
Mill	357271	16	1997	June 25, 2001	400	*
WAS-1	239025	8		Aug 29, 2003.	200	*
WAS-2	239026	8		Aug 29, 2003.	200	*
New Moose 2A	303799	1		Aug 23, 2006.	25	
New Moose 2B	303800	1		Aug 23, 2006.	25	
New Moose 2C	303801	1		Aug 23, 2006	25	
New Moose 2D	303802	1		Aug 23, 2006	25	
New Moose 5	303824	9		Aug 31, 2006	225	
KAD 1	325956	20		May 26, 2006	500	
KAD 2	325957	20		May 26, 2006	500	
MH-1	360363	18	1997	Oct 31, 1998.	450	
MH-2	360364	18	1997	Oct 31, 1998.	450	
MH-3	360365	20	1997	Oct 30, 1998	500	
MH-4	360366	6	1997	Oct 30, 1998	150	
MH-5	360367	14	1997	Oct 30, 1998	350	
MH-6	360368	8	1997	Oct 31, 1998	200	
Ordon-1	360373	20	1997	Oct 27, 1998	500	
Ordon-2	360374	20	1997	Oct 27, 1998	500	
Ordon-3	360375	20	1997	Oct 27, 1998	500	
Ordon-4	360376	20	1997	Oct 27, 1999	500	*
Ordon-5	360377	20	1997	Oct 27, 1999	500	*
Ordon-6	360378	20	1997	Oct 27, 1998	500	
		408 units		Total Area=	10,200 hectares	
				=	25,204 acres	

* Denotes work filing pending

Table 1 - B.

Moose Property Claims

Claim Name	Record #	Units	Staking Year	Expiry Date	Area	
Scree 1	238329	10		Sept 3, 2000	250	
Scree 2	238330	6		Sept 3, 2000	150	
Scree 3	238331	6		Sept 3, 2000	150	
Moose 1	238123	20		June 12, 2001	500	*
Moose 2	238124	4		June 12, 2000	100	*
Moose 3	238125	12		June 12, 2001	300	*
Gas 2	238676	6		Sept 8, 2000.	150	
Bull Moose	238414	6		Apr 16, 2000.	150	
New Moose 1C	331425	1		Oct 5, 2000.	25	
New Moose 1D	331426	1		Oct 5, 2000.	25	
New Moose 1E	331427	1		Oct 5, 2000.	25	
New Moose 1F	331428	1		Oct 5, 2000.	25	
New Moose 1G	331429	1		Oct 5, 2000.	25	
New Moose 1H	331430	1		Oct 5, 2000.	25	
New Moose 1I	331431	1		Oct 5, 2000.	25	
New Moose 1J	331432	1		Oct 5, 2000.	25	
New Moose 1K	331433	1		Oct 5, 2000.	25	
New Moose 1L	331434	1		Oct 5, 2000.	25	
Horn 2 Fr.	238325	1		Sept 3, 2001.	25	*
New-1	357273	2	1997	July 2, 2003.	50	*
TH-5	360390	20	1997	Oct 21, 1999.	500	*
		103 units		Total Area =	2,575 hectatres	
				=	6,362.7 acres	

* Denotes work filing pending

Table 1 - C

Lawyers Property Claims

Claim Name	Record #	Units	Staking Year	Expiry Date	Area
Mining Lease #33	243452			Dec 9, 1998	584.7
Mining Lease #34	243453			Dec 9, 1998	275.0
Tor Fraction	238340	1	1980	Sept 22, 2000	25
Law #1	238049	20	1978	Sept 28, 2000	500
Law #2	238050	12	1978	Sept 28, 2000	300
Law #3	238051	8	1978	Sept 28, 2002	200
Attorney 2	238143	4	1979	July 31, 2000	100
Breeze	238172	10	1979	Oct 12, 2001	250
GTW 2	238269	8	1980	June 6, 2002	200
GTW 3	238270	8	1980	June 6, 2002	200
Road I	238310	10	1980	Aug 22, 2000	250
Road II	238311	15	1980	Aug 22, 2000	375
Road III	238312	6	1980	Aug 22, 2000	150
New Lawyers GTW	238552	1	1982	May 26, 2000	25
Lawyers Law Breeze	238553	1	1982	May 26, 2000	25
Lawyer's No.1	239555	8	1987	Aug 4, 2002	200
Lawyer's No. 2	239556	2	1987	July 23, 2002	50
Lawyer's No. 5	239557	3	1987	July 26, 2002	75
Lawyer's No. 8	239558	4	1987	Aug 4, 2002	100
Lawyer's No. 9	239559	10	1987	Aug 4, 2002	250
		131 units		Total Area=	4134.7 hectares
				=	10,215 acres

Table 1 - D

AL Property Claims

Claim Name	Record #	Units	Staking Year	Expiry Date	Area	
Mining Lease #473	306619			June 1, 1999	1025	
AL 1	221814	20	1979	June 12, 2000	500	*
AL 5	221994	10	1979	July 18, 2000	250	*
AL 6	221995	10	1980	July 18, 2000	250	*
AL 7	222088	16	1981	Apr 21, 2000	400	*
AL 8	222089	16	1981	Apr 21, 2000	400	*
AL 42	302923	20	1991	Aug 1, 1999	500	
New-2	357276	6	1997	July 2, 2000	150	*
Hyuk 1 Fraction	222360	1	1983	July 11, 2000	25	*
Hyuk 3 Fraction	222362	1	1983	July 11, 2000	25	*
Bull	222123	20	1981	Aug 13, 1998	500	
Ernie	222124	20	1981	Aug 13. 1998	500	
Bert	222125	20	1981	Aug 13. 1998	500	
Tinkle Fraction	238472	1	1981	Aug 13, 2002	25	
Wankle	238473	31	1981	Aug 13, 2002	75	
Gerome	238475	15	1981	Aug 13, 2001	375	
Surprise	238476	20	1981	Aug 13, 2001	500	
Winkle	360389	20	1997	Oct 21, 1998	500	
J.O. Fraction	238512	1	1981	Sept 8, 2005	25	
R. J. Fraction	238513	1	1981	Sept 8, 2005	25	
Chute	357275	18	1997	June 24, 2001	450	
		239 units		Total Area =	7,000 hectares	
				=	17,297 acres	

* denotes work report pending, submission required by July 20, 1998.

Table 1 - E

Kodah Property Claims

June 30, 1998
(acquired from Cheni Gold Mines)

Claim Name	Record #	Units	Staking Year	Expiry Date	Area
Kodah-1	357272	15	1997	Jun 25, 2003.	375
Kodah-2	238569	2	1982	Sep 13, 2002.	50
		17 units		Total Area=	425 hectares
				=	1050 acres

Table 1 - F

Outside Property Claims
(claims acquired fee simple by staking)

Claim Name	Record #	Units	Staking Year	Expiry Date	Area
Mets-1	360359	20	1997	Oct 28, 1998.	500
Mets-5	357277	8	1997	Jun 24, 2002.	250
MH-7	360369	20	1997	Oct 31, 1998.	500
MH-8	360370	20	1997	Oct 31, 1998.	500
MH-9	360371	12	1997	Oct 31, 1998.	300
MH-10	360372	4	1997	Oct 31, 1999.	100
TH-6	360360	16	1997	Oct 27, 1998.	400
TH-7	360361	20	1997	Oct 26, 1998.	500
TH-8	360362	20	1997	Oct 23, 1998.	500
MC-1	361539	5	1998	Feb 27, 2000.	125
MC-2	361540	12	1998	Feb 27, 2000.	300
MC-3	361541	18	1998	Mar 2, 1999.	450
MC-4	361542	18	1998	Mar 2, 1999.	450
MC-5	361543	18	1998	Mar 2, 1999.	450
MC-6	361544	8	1998	Mar 2, 1999.	200
		221 units		Total Area=	5,525 hectares
				=	13,652 acres

1.3 History of the Property Area

The Toodoggone is a well recognized major precious metal mining camp with a poorly deserved bad reputation. Prior to 1966, the camp had a limited history of small scale placer and lode operations with the usual romance of big discoveries and failed dreams. In the late 1960's porphyry copper exploration in the area utilizing modern techniques of geochemical exploration (stream sediments) led to the discovery of several precious metal prospects including the Chappelle (Baker Mine), Shas and Lawyers (Cheni) shown on Drawing X97-065-96. Several other porphyry prospects were discovered including what was to become Royal Oak's Kemess Deposit.

Gold was discovered in quartz veins on the Chappelle prospect in 1969. The property which is located 4 miles south-east of the old Cheni Mill site was placed into production by Du Pont as a 120 ton per day high grade underground operation between 1981-83 producing 34,000 oz. Au and 673,000 oz. Ag from 85,000 tons. Exploration had failed to prove up additional reserves to extend the life of the mine. Operations ceased in 1983 as reserves were exhausted. Further later drilling resulted in the definition of two zones:

"A" zone with 10,000 tons @ 0.247 oz. Au / ton
"B" zone with 50,000 tons @ 0.570 oz. Au / ton

These new zones although interesting were not significant to re-open the mine in the mid 1980's. Some further exploration has been undertaken recently, and a small amount of carbonate ore was run through the mill during late summer 1996 to cap the tailing pond. Overburden removal in the area to be mined revealed additional ore and further work was planned for 1997 and 1998. The Baker Mill is now controlled by Sable Resources.

The Shas property located 8 miles south-east of the old Cheni mill site was explored between 1973 and 1988 and hosts 2,500,000 tons @ 0.055 oz. Au/ ton (GCNL, 1988b) in a quartz stockwork. Between 1989 and 1991 108,000 tons at a calculated average grade of 0.143 oz. Au / ton and 7.9 oz. Ag / ton were mined returning 15,500 oz. Au and 854,424 oz. Ag. The nearby Baker Mill was used to mill this material. Mineralization consisting of native gold and silver, electrum and argentite occur with sparse fine disseminated pyrite, sphalerite, galena and trace amounts of chalcopyrite which is hosted in anastomosing quartz-calcite breccia systems that pinch and swell (Diakow et al, 1993). Both the Chappelle and Shas properties are now controlled by Sable Resources.

In 1969, Gold was discovered on the Lawyers prospect by Kennecott while exploring the area for porphyry copper deposits. Serem acquired an option on the property in 1978. Later that year a joint venture was formed between Serem, Kennecott and Agnico-Eagle. In 1979 Kennecott dropped out of the joint venture exploring the Lawyers prospect. In 1982 Agnico-Eagle's interest was bought out giving Serem a 100% interest. Serem changed its name to Cheni and went public in May 1987.

Three zones were defined on the Lawyers property by 1989 when the property was put into production as a 550 ton per day underground operation with a projected life of ten years. Proven and probable reserves at opening were 1,037,600 tons @ 0.209 oz. Au / ton and 7.57 oz. Ag / ton. Mineralization is hosted in a quartz vein stockwork and breccia zones. Between 1989 and 1992 The Cheni mine produced 171,177 oz. Au and 3,548,459 oz. Ag as shown in Table 2 . Capital costs for the project were $C57.4 million.

The Lawyers Mine was accessed by horizontal adits on five levels. The main haulage was on the lowest level by rail using a battery locomotive with diesel back-up. Mining methods were blasthole and shrinkage stoping. After crushing and grinding ore was processed through a thickener in four vat leach tanks to a filter before the pregnant solution is introduced to the Merril- Crowe zinc precipitation circuit. Overall recoveries for Au were 93.5% and 73.5% for Ag.

Table 2

Cheni Gold Mine Production

Year	Gold (Au oz.)	Silver (Ag oz.)	Operating Cost ($US) per oz. gold equivalent
1989	48,500	918,000	215
1990	52,630	1,160,426	230
1991	38,530	720,706	348
1992	31,517	749,327	393
Total	171,177	3,548,459	

In 1991, metal prices were at historical lows and a strong Canadian dollar forced the increase of the then cut off grade to 0.20 oz. per ton of gold equivalent. This change resulted in over a 50% reduction in Ore Reserves. The zones were still there but were considered uneconomic. Cash operating costs in 1991 were $US98 per ton with a production cost of $US348 per oz. Au. High operating costs forced the closure of the mine in 1992 with the exhaustion of economic underground reserves. Exhaustion of reserves is believed to be partly due to the increase in the cut off grade which resulted in the elimination of the bulk of the contained gold in the deposits. The Cheni Mill Site was decommissioned in 1996 and mill equipment moved to South America. Royal Oak acquired the camp and moved it to Kemess.

Royal Oak's Kemess Project, located 25 miles to the south of the old Cheni mill site, is currently under construction. The property hosts several porphyry copper-gold mineralized zones, the best of which is the Kemess South with mineable reserves of 221,000,000 tons @ 0.018 oz. Au / ton and 0.224 % Cu which translates into 4.1 million oz. of gold and 990 million pounds of copper. The mine is planned as a large open pit operation at a rate of 40,000 tons per day with a 15 year life. The project has a projected capital cost of $350 million. A further $50 million is expected from the Province of B.C. for infrastructure improvements. Royal Oak acquired the property from El Condor Resources Ltd. and St. Phillips Resources Inc. for $67.6 million plus 20.9 million shares of Royal Oak in mid 1995.

The Mets deposit located 9 miles north-west of the old Cheni mill site property was found by Golden Rule Resources Ltd. in 1980. The property hosts several quartz barite breccia zones characteristic of epithermal systems. Golden Rule defined between 1985-88 a geological resource of 158,500 tons @ 0.330 oz. Au / ton. Cheni Gold Mines optioned the property in 1992, and in the closing months of its operation mined 53, 518 tons @ 0.339 oz. Au / ton from the property. Ore was trucked to the Cheni mill. The property was subsequently returned to Golden Rule.

The AL property is located 10 miles north-west of the old Cheni mill site and was once part of Energex's large holdings in the Toodoggone which included the J.D. Energex had acquired the AL property in 1979 as a result of increased exploration activity in the area due to developments by Du Pont at the Baker Mine. By 1986, Energex exploration work had defined 19 surface gold showing by trenching and stripping. Mineralization appeared to be localized along three main structural features associated with volcanic resurgent domes and collapsed calderas. In 1986 Energex conducted 40,000 ft. of diamond drilling with an additional 25,000 ft. completed in 1987 principally on the Bonanza structure. In 1988 a further 22,300 ft, was completed on the Bingo, Bonanza west, Thesis and Ridge zones. The Bingo zone returned low grade Cu-Au mineralization

In August, 1986 Energex conducted pilot plant operations on high grade ore from the Thesis III deposit at a rate of about 6 tons per day. Energex had defined a geological resource on the property of 1,900,000 tons at 0.16 oz. Au / ton including 374, 680 tons @ 0.28 oz. Au / ton (uncut, undiluted, 0.12 oz. Au / ton cut-off). In 1987-88 the company carried out feasibility and heap leach tests funded largely by flow through shares with the aim of self-financing development. With the end of the tax driven nature of flow through shares in 1988 the company fell on hard times. By 1989 Energex had spent a total of $C11.0 million on exploration in the Toodoggone. In 1990 Cheni Gold Mines Inc. optioned the property and competed the Metsantan Road as an extension to the Omineca Mining Access Road providing road access onto the property. In 1991 Cheni mined high grade from two small open pits of about 38,000 tons @ 0.300 oz. Au / ton during the closing months of its operations as underground reserves were exhausted at the Lawyers Mine. Cheni trucked the ore about 40 km. to the Cheni mill. Cheni mined only high grade material that was very close to surface.

The J.D. property located 8 miles north of the old Cheni mill site was previously explored by Energex Minerals and Kidd Creek Mines Ltd. under option between 1974-1988. Kidd Creek returned the property back to Energex, after a corporate restructuring relating to the take-over of Texasgulf by a Crown Corporation. The J.D. property was one of three claim groups held by Energex and received only modest exploration consisting of prospecting, geological mapping, soil and rock sampling, trenching and 16 diamond drill holes totalling 6,000 ft. Results although interesting, were not sufficient to enable project funding given the end of the tax driven nature Flow Through Shares in 1988. With the closing of the nearby Cheni Mine in 1992 and other factors, Energex sold the J.D. property to AGC Americas Gold Corporation in 1993.

In 1994 AGC carried out detailed geological mapping, soil and rock sampling, Induced Polarization surveys and 32 diamond drill holes totalling 6,800 ft. (Krause, 1994). This program resulted in the discovery of the Epithermal Gold-Silver Finn zone. Seventeen holes partially outlined a tabular, shallow-dipping body with an average width of 45 ft. Markedly higher grades were present in both the hangingwall and footwall of the zone.

In 1995 AGC carried out a program of geological mapping, Induced Polarization surveys and 104 diamond drill holes totalling 27,000 ft. (Krause, 1996) The program principally focused on defining the Finn Zone, with additional exploration work on the EOS, Wolf and Creek zones. This program led to the definition of a geological resource of 369,000 oz. Au. Four holes were drilled on the Wolf zone with limited success. In 1996 AGC conducted a further 20,000 ft. of diamond drilling on the property focusing on delineation drilling of the Finn Zone (Hawkins, 1997). In 1997 AGC / ANZ conducted an aggressive exploration program on the JD and AL properties completing 34, 884 ft of diamond drilling in 76 holes. Drilling was principally focussed on the Bonanza and Thesis zones on the Al property and the Finn and Creek zones on the JD property. Compilation of this work is ongoing at this time.

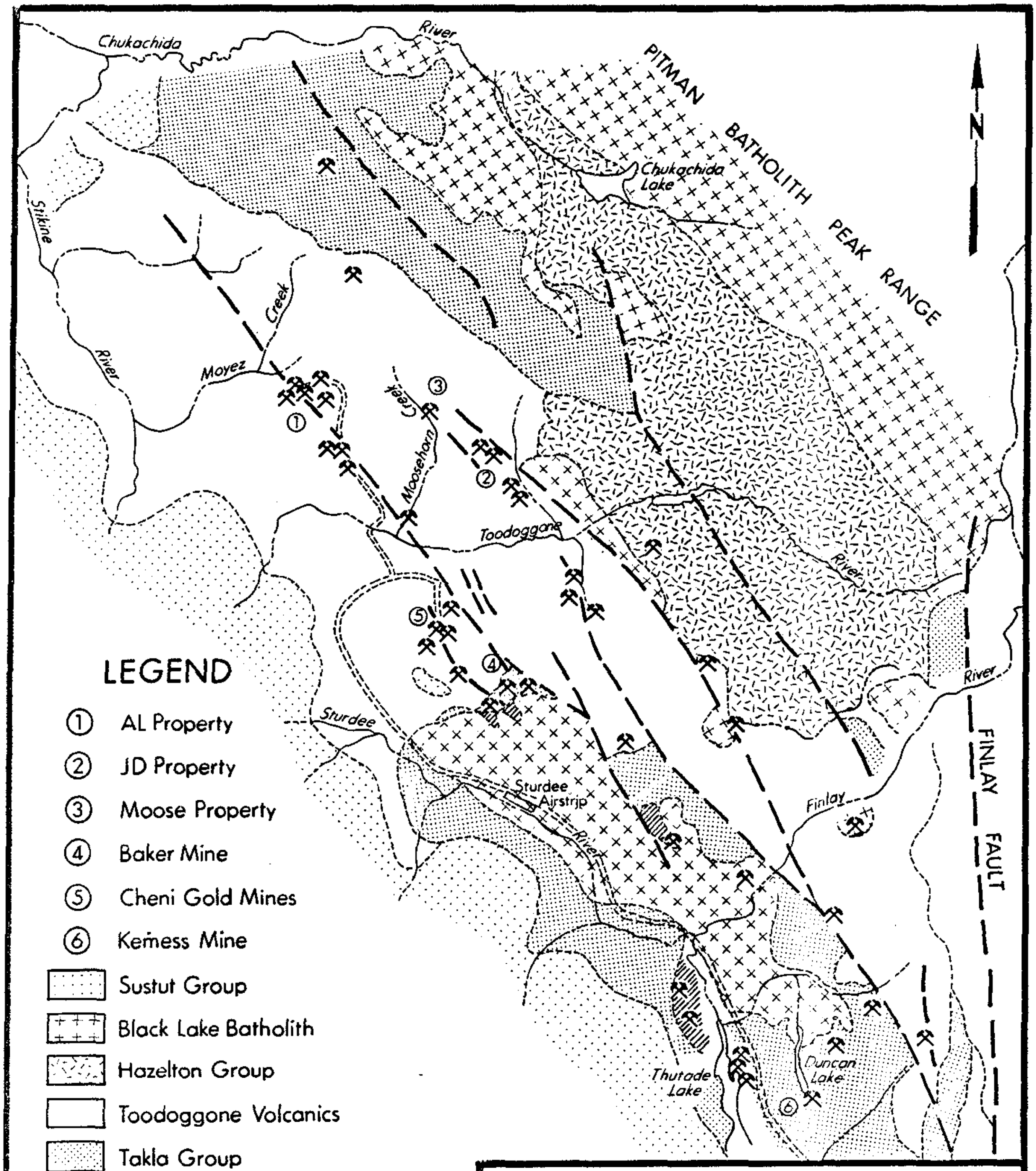
1.4 Regional Geology

The properties are located in the central part of a northwest-trending, 50 x 20 mile belt of early Jurassic volcanic rocks known as the Toodoggone Formation (Carter, 1972) . The regional geology is best described in B.C. Geological Survey Branch Bulletin #86 (Diakow et al, 1993). Regional geology is compiled on Drawing A97-065-05. The Toodoggone Formation is a sub-aerial pyroclastic assemblage of andesitic to dacite composition which hosts a number of gold-silver deposits. These deposits occur as fissure veins, quartz stockwork, breccia zones and zones of silicification. Principal ore minerals include argentite, electrum, native gold and silver and lesser chalcopyrite, galena and sphalerite.

The claim groups lie within the Omineca Mountain Range, and are comprised of a series of northwest southeast trending lower to middle Jurassic rocks; the older Black Lake Batholith to the east, and the overlying Toodoggone Formation (in particular the Metsantan Member) to the west. Two distinct mappable sequences of the Toodoggone volcanics, consisting of an older pyroclastic quartz andesite crystal tuff sequence (Adoogacho Member) and a younger trachyandesite sequence (Metsantan Member), are present both at the Lawyers mine and on the AL property.

The property is dominantly underlain by rocks from the Metsantan Member, which consist mainly of massive porphyritic andesitic flows and tuff breccias, with minor interbeds of ash to lapilli tuffs, and locally important metre thick beds of reworked volcaniclastics and pyroclastics.

To the east and south of the properties along a north northwest to south southeast trending fault contact is the Black Lake Stock, a medium to coarse grained granodiorite to quartz monzonite. The Black Lake Stock is part of the Black Lake Batholith.



AGC Americas Gold Corp.

TOODOGGONE AREA
REGIONAL GEOLOGY

MARCH, 1997	1:500,000		A97-065-05

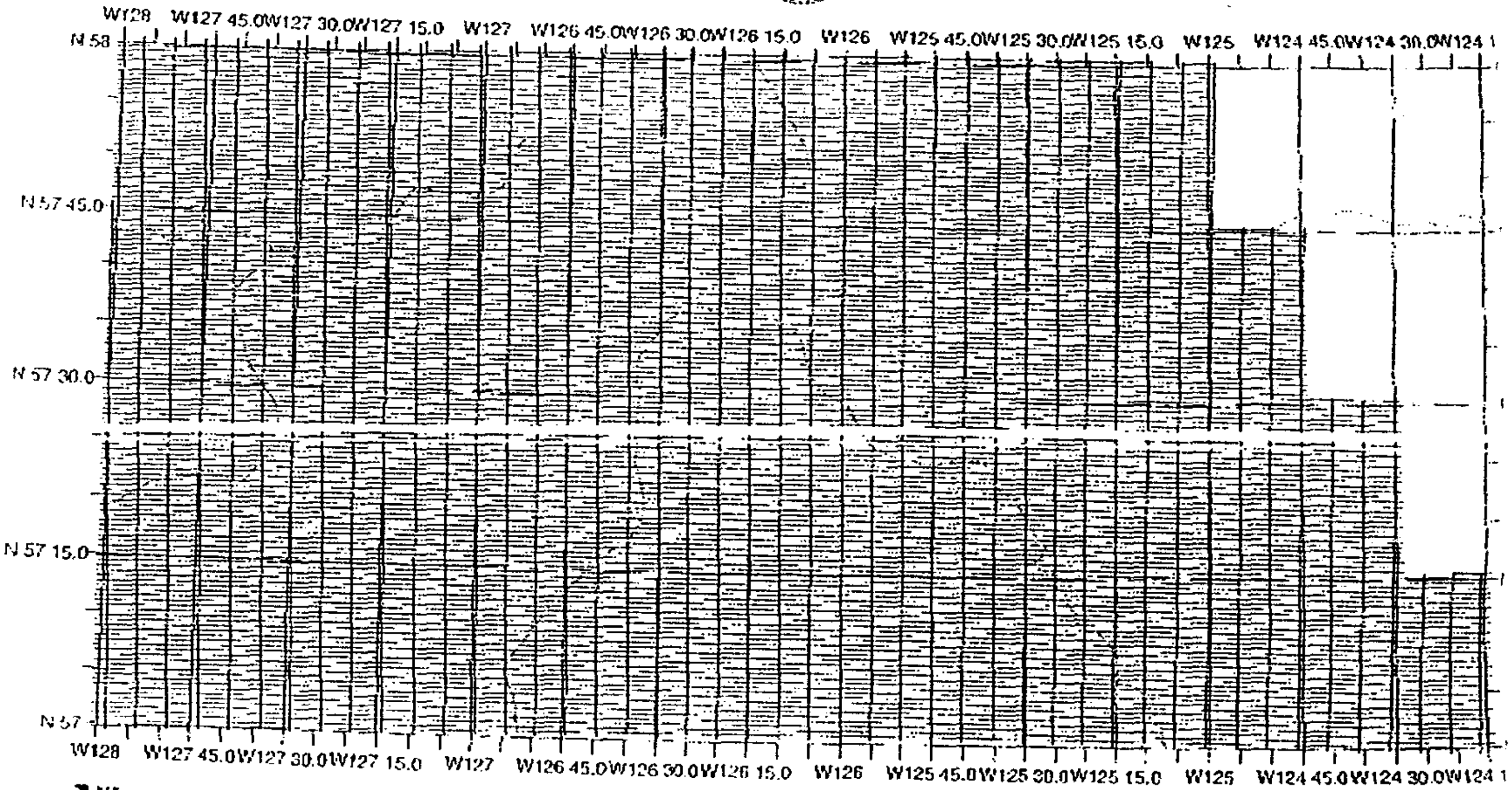
1.5 Airborne Surveys

The report covers Regional Aeromagnetic coverage flown by the Geological Survey of Canada for which the Joint Venture was an industry partner. The GSC flying was conducted during July and August of 1997 concurrent with a more detailed helicopter survey flown by Aerodat over the JD, AL, Moose and Lawyers blocks. The GSC survey consisted of 33,300 line km. of high level regional aeromagnetics in NTS 94E and 94F. The JV contributed $25,000 to towards the completion of this survey. The survey flight lines are shown on Drawing A98-065-92. Data looks of excellent quality.

Part II of this report covers the more detailed helicopter-borne survey while Part III deals with the interpretation of the both the helicopter-borne survey and limited examination of the GSC survey.

SURVEY FLIGHT LINE PLAN

GEOLOGICAL SURVEY OF CANADA — COMMISSION GEOLOGIQUE DU CANADA



Canada

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A98-065-92

Certification

I, Paul A. Hawkins, of 72 Strathlorne Crescent S.W., in the City of Calgary, Province of Alberta, hereby certify:

1. That I am a member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta and the Association of Professional Engineers and Geoscientists of the Province of British Columbia.

2. That I am the Principal of the firm of Paul A. Hawkins & Associates Ltd. which holds Permit #P4521 to practice Engineering in Alberta and has a Business Address for service within the Province of British Columbia.

3. That I am a graduate of Queen's University with a Bachelor of Science degree in Geological Engineering and have worked continually as a practicing geological engineer for the past 21years.

4. That I have not received, nor do I expect to receive, any direct or indirect interest in the property of AGC Americas Gold Corporation or any of its associates or affiliates subject only to possible builders lien's which may be applied against the property to satisfy outstanding debt incurred for past Professional Services.

5. That I do not have any direct or indirect interest in, nor do I beneficially own directly or indirectly, any securities of AGC Americas Gold Corporation or any of its associates or affiliates.

6. That I have been granted employee stock option in Antares Mining and Exploration Corporation to purchase up to 60,000 shares at prices between $0.28 and $0.385.

7. That I have been retained by Antares Mining an Exploration Corporation on a fee for service basis under a contract of service and that I have conducted such Quality Assurance Programs as deemed required without restriction or limitation by the company.

8. That I have visited the subject property and supervised the 1996 and 1997 drill program on the J.D. property and have conducted other Due Diligence examinations on other properties (Cheni Mine in 1987) in the area.

9. That I am familiar with the Toodoggone Gold / Silver Camp and the area geology and mineral potential.

Dated at Calgary, Alberta this 15th day of July, 1998

Paul A. Hawkins, P.Eng

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — P. A. HAWKINS

PERMIT TO PRACTICE
PAUL A. HAWKINS & ASSOCIATES LTD.
Signature
Date 15 JUL 98
PERMIT NUMBER: P 4521
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

References

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AGC Americas Gold / Antares Mining and Exploration Corp.
Toodoggone JV Cost Break Down
Airborne Surveys

Description	Detail	Extension	Cost
Airborne Survey Costs			
	Aerodat Flying		$128,436.25
	GSC Flying	Prorated Cost	$20,000.00
Camp Support Costs			
	Subsistence	15 days x 5 poeple x $50	$3,750.00
	Fixed Wing Support	1 Aerocommander	$1,440.00
Report Preparation			
	Boniwell	07Oct97 #6839	$2,347.00
		11Nov97 #6843	$2,009.50
		17Feb98 #6849	$12,228.50
		26Feb98 #6850	$645.00
		07Apr98 #6852	$3,315.00
	Hawkins	1997 5 days @ $400	$2,000.00
		1998 8 days @ $475	$3,800.00
	Reproduction		$3,500.00
	Drafting	16 hours at $30	$480.00
		Sub-Total=	$183,951.25
Administration		10% on $180,096.25	$18,395.13
		Program Total=	$202,346.38
		Per unit cost (809 units)	$250.12

Paul A. Hawkins, P.Eng.
Project Manager
15-Apr-98

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — P. A. HAWKINS

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COMBINED HELICOPTER-BORNE
ELECTROMAGNETIC MAGNETIC
AND RADIOMETRIC SURVEY
AL-MOOSE-JD AND LAWYERS BLOCK
TOODOGGONE REGION
BRITISH COLUMBIA

1. INTRODUCTION

This is a report on an airborne geophysical survey carried out for Antares Mining and Exploration Corp. by Aerodat Inc. under a contract dated July 17, 1997. Principal geophysical sensors included a five frequency electromagnetic system, a high sensitivity cesium vapour magnetometer and a radiometric system. Ancillary equipment included a colour video tracking camera, Global Positioning System (GPS) navigation instrumentation, a radar altimeter, a power line monitor and a base station magnetometer.

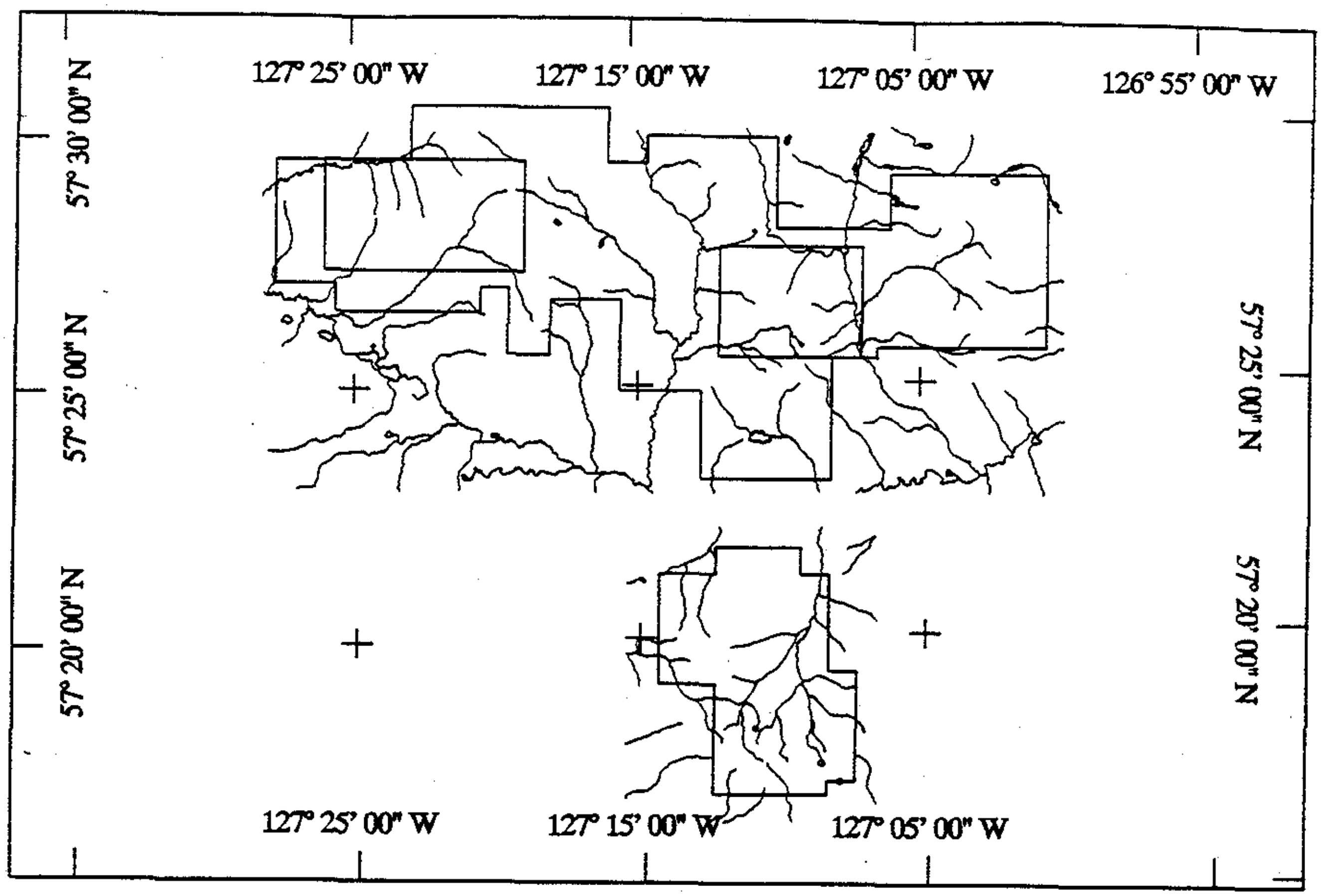
The survey covered two survey blocks totalling about 248 square kilometres located in northern British Columbia. Total survey coverage is approximately 1,585 line kilometres including 104 kilometres of tie lines. The Aerodat Job Number is J9778.

This report describes the survey, the data processing, data presentation and interpretation of the geophysical results. Identified electromagnetic anomalies appear on selected map products as anomaly symbols with interpreted source characteristics. The interpretation map indicates conductive and anomalous radiometric areas of possible interest. It also shows prominent structural features interpreted from the magnetic results. Significant anomalous radiometric, structural, conductive and/or magnetic associations are the basis for the selection of specific geophysical anomalies for further investigation.

2. SURVEY AREA

The survey areas are about 400 km. north of Prince George and 240 km northeast of Terrace. Topography is shown on the 1:50,000 scale NTS map sheets 94 E/6, E/11. Local relief is rugged. Elevations range from 1,200 m to over 2,100 m above mean sea level over the AL-Moose-JD block and from 1,300 to 1,925 m on the Lawyers block. The survey area is shown in the attached index map that includes local topography and latitude - longitude coordinates. This index map also appears on all map products. The flight line direction is north-south. Line spacing is 200 metres with two small blocks, the Bonanza and Finn within the Al-Moose-JD block, having lines at 100 metre intervals.

INDEX MAP


127° 25' 00" W
127° 15' 00" W
127° 05' 00" W
126° 55' 00" W
57° 30' 00" N
57° 25' 00" N
57° 25' 00" N
57° 20' 00" N
57° 20' 00" N
127° 25' 00" W
127° 15' 00" W
127° 05' 00" W

3. AIRCRAFT AND SURVEY EQUIPMENT

3.1 Aircraft

The survey aircraft was an Aerospatialle AS 315B helicopter, piloted by D. Rokosh, owned and operated by Turbowest Helicopters Ltd. G. Luus of Aerodat acted as navigator and equipment operator. Aerodat performed the installation of the geophysical and ancillary equipment. The survey aircraft is flown at a mean terrain clearance of 60 metres and speed of 60 knots.

3.2 Electromagnetic System

The Helicopter-borne ElectroMagnetic (HEM) system is an Aerodat multi-frequency configuration. Two vertical coaxial coil pairs operate at frequency ranges of 900 Hz and 4,500 Hz and two or three horizontal coplanar coil pairs at frequency ranges of 900, 4,500 Hz and 33 kHz. The actual frequencies used depend on the particular bird configuration. At the present time Aerodat has ten bird systems.

This survey utilized the Harrier bird with frequencies of 913 Hz and 4,427 Hz for the coaxial coil pairs and 858 Hz, 4,830 Hz and 32,550 Hz for the coplanar coil pairs. The transmitter-receiver separation is 6.4 metres. Inphase and quadrature signals are measured simultaneously for the five frequencies with a time constant of 0.1 seconds. The HEM bird is towed 30 metres below the helicopter.

3.3 Magnetometer

A Scintrex H8 cesium, optically pumped magnetometer sensor, measures the earth's magnetic field. The sensitivity of this instrument is 0.001 nanoTesla at a sampling rate of 0.2 second. The sensor is towed in a bird 15 metres below the helicopter 45 metres above the ground.

3.4 Gamma-Ray Spectrometer

An Exploranium GR-820 spectrometer coupled to 1,024 cubic inches of crystal sensor records four channels of radiometric data. Spectrum stabilization is based on the 662 KeV peak from Cesium sources planted on the crystals. A 256 cubic inch upward looking atmospheric detector is used to monitor background radiation.

The channels recorded and their energy windows are as follows:

AIRBORNE SPECTROMETER	SPECIFICATION
Channels	U, Th, K, Total Count, Cosmic, Upward Uranium
Windows	Potassium 1370 to 1570 keV Uranium 1660 to 1860 keV Thorium 2410 to 2810 keV Total Count 410 to 2810 keV Cosmic 3000 to ∞ keV Upward Uranium 1660 to 1860 keV
Energy per channel	12 keV linear
Detector - Terrestrial	NaI - 16.8 l downward
Detector - Atmospheric	NaI - 4.2 l upward
Resolution	< 10% FWHM @ 0.663 MeV (Cs-137)
Dead Time	measured electronically
Stabilization	Cs stabilization Self stabilization on a chosen isotope, usually K40 or Tl208 to within 1 channel
Sampling Time	1 second

The six channels of radiometric data record at a one second update rate (counts per second - cps). Digital recording resolution is one cps.

3.5 Ancillary Systems

Base Station Magnetometer

A Gem Systems, Inc. GSM19 magnetometer, or similar system, is set up at the base of operations to record diurnal variations of the earth's magnetic field. Synchronization of the clock of the base station with that of the airborne system is checked each day to insure diurnal corrections will be accurate. Recording resolution is 1 nT with an update rate of four seconds. Magnetic field variation data are plotted on a 3" wide gridded paper chart analog recorder. Each division of the grid (0.25") is equivalent to one minute (chart speed) or five nT (vertical sensitivity). The date, time and current total field magnetic value are automatically recorded every 10 minutes. The data is also saved to digital tape.

Radar Altimeter

A King KRA-10 radar altimeter records terrain clearance. The output from the instrument is a linear function of altitude. The radar altimeter is pre-calibrated by the manufacturer and is checked after installation using an internal calibration procedure.

Tracking Camera

A Panasonic colour video camera records the flight path on VHS video tape. The camera operates in continuous mode. The video tape also shows the flight number, 24 hour clock time (to .01 second), and manual fiducial number.

Global Positioning System (GPS)

Global Positioning Systems utilize at present 25 active satellites orbiting the earth. The orbital period for each satellite is approximately 12 hours with an altitude of approximately 12,600 miles (~ 20,000 km). Each satellite contains a very accurate cesium clock which is synchronized to a common clock by the ground control stations (operated by the U.S. Air Force).

The satellites radiate individually coded radio signals which are received by the user's GPS receiver. Along with timing information, each satellite transmits ephemeris (astronomical almanac or table) information which enables the receiver to compute the satellite's precise spatial position. The receiver decodes the timing signals from the satellites in view (4 or more for a three dimensional fix) and, knowing their respective locations from the ephemeris information, computes a latitude, longitude, and altitude for the user. This position fix process is continuous and can be updated once per second.

Differential GPS is employed to eliminate the problem of selective availability where the US Defence Department corrupts the satellite's timing signal. Differential GPS utilizes a GPS reference receiver which must be established within a few hundred miles from the survey aircraft. The GPS System computes differential corrections as a post-processing operation to achieve accuracies in the 2 to 5 metre range.

A Magnavox 9212 (12 channel) GPS receiver is used in the aircraft. Nortech differential GPS processing software is used to compute the differentially corrected GPS positions on a daily flight basis. The navigational unit in the aircraft supplies continuous information to the pilot and allows multiple way point entry.

The Picodas PNAV 2001 survey navigation system is utilized on the aircraft to provide a left/right indicator for the pilot. The single point GPS positions are logged onto the PICODAS or RMS digital acquisition systems along with the magnetometer data. The single point GPS accuracy is much better than 25 metres. The GPS positions are converted to NAD27 format for inclusion in the technical report and in the digital archive data.

Analog Recorder

An RMS dot matrix recorder displays the data during the survey. Record contents are as follows:

LABEL	PARAMETER	CHART SCALE
MAGF	Total Field Magnetics, Fine	2.5 nT/mm
MAGC	Total Field Magnetics, Coarse	25 nT/mm
L9XI	900 Hz, Coaxial, Inphase	2.5 ppm/mm
L9XQ	900 Hz,Coaxial,Quadrature	2.5 ppm/mm
M4XI	4,500 Hz, Coaxial, Inphase	2.5 ppm/mm
M4XQ	4,500 Hz, Coaxial, Quadrature	2.5 ppm/mm
L8PI	900 Hz, Coplanar, Inphase	10 ppm/mm
L8PQ	900 Hz, Coplanar, Quadrature	10 ppm/mm
M4PI	4,500 Hz, Coplanar, Inphase	10 ppm/mm
M4PQ	4,500 Hz, Coplanar, Quadrature	10 ppm/mm
H3PI	33,000 Hz, Coplanar, Inphase	20 ppm/mm
H3PQ	33,000 Hz, Coplanar, Quadrature	20 ppm/mm
TC	Radiometric - Total Count	50 counts/mm
K	Radiometric - Potassium	5 counts/mm
U	Radiometric - Uranium	2.5 counts/mm
TH	Radiometric - Thorium	2.5 counts/mm
BALT	Barometer	50 ft/mm
RALT	Radar Altimeter	10 ft/mm
PWRL	50/60 Hz Power Line Monitor	-

Data is recorded with positive - up, negative - down. The analog zero of the radar altimeter is 5 cm from the top of the analog record. A helicopter terrain clearance of 60 m should therefore be seen some 3 cm from the top of the analog record.

Chart speed is 2 mm/second. The 24-hour clock time is printed every 20 seconds. The total magnetic field value is printed every 30 seconds. The ranges from the radar navigation system are printed every minute.

Vertical lines crossing the record are manual fiducial markers activated by the operator. The start of any survey line is identified by two closely spaced manual fiducials. The end of any survey line is identified by three closely spaced manual fiducials. Manual fiducials are numbered in order. Every tenth manual fiducial is indicated by its number, printed at the bottom of the record.

Calibration sequences are located at the start and end of each flight and at intermediate times where needed.

Digital Recorder

A DGR-33 data system records the digital survey data on magnetic media. Contents and update rates are as follows:

DATA TYPE	RECORDING INTERVAL	RECORDING RESOLUTION
Magnetometer	0.1 second	0.001 nT
HEM, (8 or 10 Channels)	0.1 second	
HEM, coaxial- 900 Hz/4,500 Hz		0.03 ppm
HEM, coplanar- 900 Hz/4,500 Hz		0.06 ppm
HEM, coplanar- 33,000 Hz		0.125 ppm
Radiometer	1 second	1 cps
Position (2 Channels)	0.2 second	0.1 m
Altimeter	0.2 second	0.05 m
Power Line Monitor	0.2 second	
Manual Fiducial		
Clock Time		

4. SURVEY LOGISTICS AND CALIBRATION

4.1 Survey

The survey was completed in the period August 17 to 31, 1997. Principal personnel are listed in Appendix I. A total of 28 survey flights was required to complete the project. Aircraft ground speed is maintained at approximately 60 knots (30 metres per second) and mean terrain clearance of 60 metres consistent with the safety of the aircraft and crew.

4.2 Navigation

A global positioning system (GPS) consisting of a Magnavox MX 9212 operated in differential mode guides aircraft navigation and flight line control. Field processing of the differential GPS data in the field utilizes a PC using software supplied by the manufacturer. One system is installed in the survey helicopter. This involves mounting the receiver antenna on the casing ("bird") containing the magnetometer sensor. A second system acts as the base station.

The published NTS maps provide the Universal Transverse Mercator (UTM) coordinates of the survey area corners. These coordinates program the navigation system. A test flight confirms if area coverage is correct. Thereafter the navigation system guides the pilot along the survey traverse lines marked on the topographic map. The operator also enters manual fiducials over prominent topographic features. Survey lines showing excessive deviation are re-flown.

The operator calibrates the geophysical systems at the start, middle (if required) and end of every survey flight. During calibration the aircraft is flown away from ground effects to record electromagnetic zero levels.

4.3 Calibration and Data Verification

The operator calibrates the geophysical systems including the barometric altimeter at the start, middle (if required) and end of every survey flight. Immediately after takeoff and before landing the altimeter values are compared with the 30 m separation between the helicopter and EM sensor. The geophysical systems are calibrated and monitored as follows:

Electromagnetics

The system is nulled and phased according to Aerodat's standard procedures. Any discrepancies from previous surveys require an external Q coil calibration. The External Calibration Procedure is done at the start of every survey and every week thereafter until the survey has been completed. There are four parts to the External Calibration Procedure. After system has warmed up, they are:

1.) Null each frequency
2.) Phase each frequency
3.) Set the gain for each frequency
4.) Note the response of the internal Cal-coil

The phasing is done with a ferrite bar. The gain calibration is done using a calibration coil which is mounted at a pre-set location off the end of the bird.

The phasing and calibration is checked with the internal Q coil. The internal Q coil is activated prior to and at the end of each flight with the system flying out of ground effect (250 m or higher) to assure correct EM calibration. Analog trace locations are corrected for all channels when the system is out of ground effect. If excessive drift is present on the EM system the preceding procedures are repeated as required.

Magnetics

The airborne magnetic data is monitored in the aircraft by means of a 4th difference of the data which is calculated and presented on the airborne analog recorder. Should the 4th difference exceed the allowable specification, the portion of the flight line thereby affected is reflown.

The fourth difference is defined as:

$$FD_i = X_{i+2} - 4x_{i+1} + 6x_i - 4x_{i-1} + X_{i-2}$$

where X_i is the i^{th} total field sample. The fourth difference in this form has units of nT. High frequency noise should be such that the fourth differences divided by 16 are generally less than ± 0.1 nT The fourth difference is displayed on analog at scales of 0.20 nT/cm.

Radiometrics

The spectrometer calibrations and tests to be performed during the survey conform to those detailed in the International Atomic Energy Agency's Technical Series Report number 323. The details of certain of these calibrations are given below:

Daily checks before and after each survey flight are performed as described below

i) Background radiation check where at least 60 seconds of spectrometer readings are taken with no radioactive sources in the vicinity of the detectors (at least 30 metres away). This is done before and after the detector gain checks described in ii) below.

ii) Detector gain checks using uranium and thorium sources where records are taken for a sufficiently long time so as to obtain over 1,000 counts in each channel.

iii) Spectral stability checks using the Cs - 137 source spectrum.

The results are analyzed throughout the survey and checked for consistency and are available for inspection during the survey. Mandatory logs are completed and the results are in digital format as part of the deliverable products.

Flight checks utilizing radioactive samples are carried out at the beginning and end of each flight to monitor the proper functioning of the spectrometer. A selected line about 5 km in length on the way to the survey area is repeated at the start of each day to monitor changes in natural signal level that may be caused by rainfall. Background readings are taken outside of ground effect at the beginning and end of each flight.

Calibration flights to establish the factors for atmospheric and cosmic background correction are conducted at the start of the field work and are repeated monthly during survey operations. These tests are conducted over the ocean at heights ranging from 1,500 to 3,000 metres above sea level in intervals of 250 metres. In addition, the aircraft background is verified weekly by a flight at a height of 2,000 metres above ground level. If the variation of any of these measurements from the value predicted from all previous values exceeds 5% then the measurements over the ocean at 250 metres between 1,500 and 3,000 metres are repeated.

The amount of rain which falls within the survey area is monitored and flying is discontinued for a period of twenty four hours after a rainfall in excess of 250 mm.

Altimeters

The radar altimeter test is carried out before and after the survey and if any of the altitude equipment is changed. The radar altimeter reading is determined when flying at barometric altitudes of 60, 120, 180 and 240 meters above the base airstrip. Also, the barometric altimeter is calibrated pre-flight and post-flight using the radar altimeter to determine the drift and this drift is applied to the data in the subsequent data processing.

Video Flight Path Verification

The record from the video camera is monitored continuously in flight. The video tape is reviewed immediately after each flight to ensure that the quality is acceptable. Selective flight path verification is performed as necessary.

Lag Tests

Before survey production commences and when any major survey equipment modification or replacement occurs, a lag test is performed to determine the time difference between the magnetometer reading, the electronic navigation reading and the operation of the positioning equipment. These tests are flown at the survey flight altitude in two (2) directions across a distinct magnetic anomaly and a recognizable feature whose exact location is known.

5. DATA PROCESSING AND PRESENTATION

5.1 Base Map

The base map is taken from a photographic enlargement of the NTS topographic maps. A UTM reference grid (grid lines usually every kilometre) and the survey area boundaries are added. After registration of the flight path to the topographic base map, some topographic detail and the survey boundary are added digitally. This digital image forms the base for the colour, shadow and ternary maps.

5.2 Flight Path Map

Global Positioning System

The GPS receiver takes in coded data from satellites in view and there after calculates the range to each satellite. The coded data must therefore include the instantaneous position of the satellite relative to some agreed earth-fixed coordinate system.

A further calculation using ranges to several satellites gives the position of the receiver in that coordinate system (eg. UTM, lat/long.). The elevation of the receiver is given with respect to a model ellipsoidal earth.

Normally the receiver must see four satellites for a full positional determination (three space coordinates and time). If the elevation is known in advance, only three satellites are needed. These are termed 3D and 2D solutions.

The position of the receiver is updated every tenth of a second. The accuracy of any one position determination is described by the Circular Error Probability (CEP). Ninety-five percent of all position determinations will fall within a circle of a certain radius. If the horizontal position accuracy is 25 m CEP, for example, 95% of all trials will fall within a circle of 25 m radius centred on the mean. The system may be degraded for civilian use and the autonomous accuracy is then 100 m CEP. This situation is called selective availability (SA). Much of this error (due principally to satellite position/time errors and atmospheric delays) can be removed using two GPS receivers operating simultaneously. One receiver acting as the base station, is at a known position. The second remote receiver is in the unknown position. Differential corrections determined for the base station may then be applied to the remote station. Differential positions are accurate to five m CEP (for a one second sample). Averaging will reduce this error further.

Flight Path

The flight path is drawn using linear interpolation between x,y positions from the navigation system. These positions are updated every second (or about 1.5 mm at a scale of 1:20,000). Occasional dropouts occur when the optimum number of satellites are not available for the GPS to make accurate positional determinations. Interpolation is used to cover short flight path gaps. The navigator's flight path and/or the flight path recovered from the video tape may be stitched in to cover larger gaps. Such gaps may be recognized by the distinct straight line character of the flight path.

The manual fiducials are shown as a small circle and labelled by fiducial number. The 24-hour clock time is shown as a small square, plotted every 30 seconds. Small tick marks are plotted every two seconds. Larger tick marks are plotted every 10 seconds. The line and flight numbers are given at the start and end of each survey line.

The aircraft position is expressed in geographic latitude and longitude coordinates, using the **N**orth **A**merican **D**atum NAD27 based on the Clarke 1866 ellipsoid. Any particular survey area located on the globe has a specific reference ellipsoid or projection zone. A further refinement for a better fit to the earth's surface at the survey location is applied by adding or subtracting slight x, y and/or z datum shifts (a few metres to hundreds of metres) to the origin of the ellipsoid. The geographic coordinates are converted to fit this ellipsoid before calculating the UTM coordinates. The UTM coordinates are expressed as UTM eastings (x) and UTM northings (y).

The flight path map is merged with the base map by matching UTM coordinates from the base maps and the flight path record. The match is confirmed by checking the position of prominent topographic features as recorded by manual fiducial marks or as seen on the flight path video record.

5.3 Electromagnetic Survey Data

The electromagnetic data are recorded digitally at a sample rate of 10 per second with a time constant of 0.1 seconds. A two stage digital filtering process rejects major sferic events and reduces system noise. Local sferic activity can produce sharp, large amplitude events that cannot be removed by conventional filtering procedures. Smoothing or stacking will reduce their amplitude but leave a broader residual response that can be confused with geological phenomena. To avoid this possibility, a computer algorithm searches out and rejects the major sferic events. This is referred to as a "surgical mute" in signal processing terms. The signal to noise ratio is further enhanced by the application of a low pass digital filter. This filter has zero phase shift that prevents any lag or peak displacement from occurring, and it suppresses only variations with a wavelength less than about 0.25 seconds. This low effective time constant gives minimal profile distortion.

Following the filtering process, a base level correction is made using electromagnetic zero levels determined during high altitude calibration sequences. The correction applied is a linear function of time that ensures the corrected amplitude of the various inphase and quadrature components is zero when no conductive or permeable source is present. The filtered and levelled data are the basis for the determination of apparent resistivity (see following section). The inphase and quadrature responses along the flight line are presented in profile form offset along the flight lines. Differentiation of the various profiles is achieved using two colours (coaxial and coplanar) and two line weights (inphase and quadrature). For interpretation purposes the coaxial and coplanar data sets for a similar frequency range are presented together on one map (900 Hz or 4,500 Hz)

5.4 Total Field Magnetics

The aeromagnetic data are corrected for diurnal variations by adjustment with the recorded base station magnetic values. If required, depending on the size of the survey area and magnetic amplitudes, the International Geomagnetic Reference Field (IGRF) is subtracted from the diurnally corrected data. The corrected profile data are interpolated on to a regular square grid using an Akima spline technique. The grid provides the basis for threading the presented contours. The minimum contour interval is 2 nT with a grid cell size of 25 m. On the colour maps magnetic high areas are assigned warm colours (orange/red) while magnetic low areas show as cool colours (blue).

5.5 Calculated Vertical Magnetic Gradient

The vertical magnetic gradient is calculated from the gridded total field magnetic data. The calculation is based on a 17 x 17 point convolution in the space domain or FFT processing which involves using a two dimensional Fourier Transform, applying a vertical derivative operator and transforming the filtered data back into the space domain. The results are contoured using a minimum contour interval of 0.025 nT/m. Grid cell sizes are the same as those used in processing the total field data. The high and low amplitude responses are give the same colour representation as the total field contours.

5.6 Colour Relief or Shadow Map of Total Field Magnetics

A useful manipulation of the magnetic data is the production of a colour shadow map. It is an aid in the interpretation and presentation of the magnetic information. The shadow map displays two independent variables simultaneously on the same map. The two variables are the amplitude and the gradient of the quantity measured over the mapping region. At every point or grid cell on the map the hue represents the amplitude of the magnetic value and the lightness/darkness of the hue is varied according to the slope or gradient of the data at the cell location. The gradient is translated into a reflectance parameter with respect to a chosen illumination direction. Subtle magnetic structures having a specific trend are enhanced or attenuated depending on the position and angle to the horizon of the light source relative to the trend. If the light source is orthogonal to the trend there will be maximum shadow effect. Regional discontinuities representing fault structures are easily recognized with shadow enhancement.

5.7 Apparent Resistivity

The apparent resistivity is calculated by assuming a 200 metre thick conductive layer over resistive bedrock. The computer determines the resistivity that would be consistent with the sensor elevation and recorded inphase and quadrature response amplitudes at the selected frequency. The apparent resistivity profile data is re-interpolated onto a regular grid at a 25 metres true scale interval using an Akima spline technique and contoured using logarithmically arranged contour intervals. The minimum contour interval depends on the selected frequency and is in units of log(ohm.m) in logarithmic intervals of 0.1, 0.5, 1.0, 5.0 etc. The colour presentation assigns warmer colours (reds) to low resistivity or very conductive responses and cooler colours (blues) to high resistivity or poor conductivity responses.

The highest measurable resistivity is approximately equal to the transmitter frequency. The lower limit on apparent resistivity is rarely reached.

5.8 Radiometric Data

The four channels of radiometric data are subject to a number of corrections and filters:

The stages are:

- livetime correction
- background removal (cosmic and radon)
- terrain clearance correction
- compton scattering correction
- low pass profile filter (seven point Hanning)
- low pass grid filter (5X5 point Hanning)

The Compton stripping factors are:

ALPHA	0.235	Th into U
BETA	0.407	Th into K
GAMMA	0.762	U into K
A	0.044	U into Th
B	0.000	K into Th
G	0.007	K into U

where alpha, beta and gamma are the forward stripping coefficients and a, b, g are the backward stripping coefficients. These coefficients are taken in part from the sample checks done at the start of each flight.

The altitude attenuation coefficients are TC: 0.0046; K: 0.0104; U: 0.0090; and Th: 0.0073. The units are metres $^{-1}$. These coefficients are taken from GSC publications for similar radiometric systems. Radiometric data are corrected to a mean terrain clearance of 60 m.

The corrected data are interpolated on a square grid (cell size 25 m) using an Akima spline technique. The grids provided the basis for threading the presented contours. The minimum contour intervals are TC = 25 cps, K = 5 cps, Th = U = 1 cps.

5.9 Ternary Map of Radiometric Channels

The relative amplitude of the three radioelement concentrations measured is often an important parameter. High potassium with relatively no thorium or high thorium with relatively no potassium often indicates a specific alteration environment or rock type. The presence or absence of an uranium response is also often diagnostic. In order to readily recognize and display these signatures a ternary map is generated. It is obtained by assigning each radioelement a primary colour and intensity relative to amplitude. The three primary colour intensities are mixed to give unique colour hues for various radioelement signatures. The Aerodat assignments are potassium = magenta, thorium = yellow and uranium = cyan.

6. DELIVERABLES

The report on the results of the survey is presented in three copies. The report includes folded white print copies of all black line maps. Three copies of the colour, shadow and ternary maps are in accompanying map tube(s).

The black line maps show topography, UTM grid coordinates and the survey boundary. The survey data are presented in sets of numbered maps in the following format:

I BLACK LINE MAPS: (Scale 1:20,000 and 1:10,000 for 100 metre fill-in blocks)

Map No. Description

1. BASE MAP; screened topographic base map plus survey area boundary, and UTM grid.

2. COMPILATION / INTERPRETATION MAP; with base map, flight path map and HEM anomaly symbols with interpretation .

3. TOTAL FIELD MAGNETIC CONTOURS; with base map HEM anomaly symbols and flight lines.

4. VERTICAL MAGNETIC GRADIENT CONTOURS; with base map HEM anomaly symbols and flight lines.

5A. APPARENT RESISTIVITY CONTOURS; apparent resistivity calculated for the coplanar 900 Hz data, with base map HEM anomalies and flight lines.

5B. APPARENT RESISTIVITY CONTOURS; apparent resistivity calculated for the coplanar 4,500 Hz data, with base map HEM anomalies and flight lines.

II COLOUR MAPS: (Scale 1:20,000 and 1:10,000 for 100 metre fill-in blocks)

1. TOTAL FIELD MAGNETICS; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

2. VERTICAL MAGNETIC GRADIENT; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

3A. HEM OFFSET PROFILES; coplanar 900 Hz and coaxial 900 Hz data with flight lines, topographic features and HEM anomaly symbols.

3B. HEM OFFSET PROFILES; coplanar 4,500 Hz and coaxial 4,500 Hz data with flight lines, topographic features and HEM anomaly symbols.

3C. HEM OFFSET PROFILES; coplanar 33,000 Hz data with flight lines, topographic features and HEM anomaly symbols.

4A. APPARENT RESISTIVITY; calculated for the coplanar 900 Hz data with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

4B. APPARENT RESISTIVITY; calculated for the coplanar 4,500 Hz data with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

5A. TOTAL COUNT RADIOMETRIC; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

5B. POTASSIUM COUNT RADIOMETRIC; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

5C. URANIUM COUNT RADIOMETRIC; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

5D. THORIUM COUNT RADIOMETRIC; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

5E THORIUM TO POTASSIUM RATIO; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

III SHADOW DERIVATIVE: (Scale 1:20,000)

1. TOTAL FIELD MAGNETICS SHADOW MAP; with suitable sun angle

2. TERNARY MAP; of Uranium, Thorium and Potassium

The processed digital data, including both the profile and the gridded data, is on CD ROM'S (ISO 9660). Profile data is written as columnar ASCII records and the gridded data as standard Geosoft PC grids. A full description of the format is included with the package. All gridded data can be displayed on IBM compatible microcomputers using the Aerodat AXIS (Aerodat Extended Imaging System) or RTI (Real Time Imaging) software package. The complete data package includes all analog records, base station magnetometer records, flight path video tape and original map cronaflexes.

7. INTERPRETATION

7.1 Area Geology

Regional geology comprises Triassic and Jurassic age intermediate to mafic volcanic rocks overlain by Cretaceous to Tertiary age arenaceous and argillitic sedimentary rocks. Stratigraphy is generally gently dipping. Gold mineralization is associated with alteration areas related to tectonic and intrusive activity. Geological, geochemical and geophysical exploration work carried out by previous interests in past years, having property in the area, is presently being assessed and compiled.

The Kemess deposits of Royal Oak Mines Inc. are located about 50 km to the south-southwest. These are gold-copper low grade high tonnage deposits totalling more than 400 million tons (Canadian Mines Handbook, 1997-98)

7.2 Magnetic Interpretation

The total field magnetic responses reflect major changes in the magnetite content of the underlying rock units. The amplitude of the magnetic responses relative to the regional background help to assist in identifying specific magnetic and nonmagnetic units related to, for example, mafic flows or tuffs, mafic to ultramafic intrusives, felsic intrusives, felsic volcanics and/or sediments etc. Obviously, several geological sources can produce the same magnetic response. These ambiguities can be reduced considerably if basic geological information on the area is available to the geophysical interpreter.

In addition to amplitude variations, magnetic patterns related to the geometry of the particular rock unit also help in determining the probable source of the magnetic response. For instance, long narrow magnetic linears usually reflect mafic tuff/flow horizons or mafic intrusive dyke structures while semi-circular features with complex magnetic amplitudes may be produced by local plug-like intrusive sources such as pegmatites, carbonatites or kimberlites.

The calculated vertical magnetic gradient assists considerably in mapping weaker magnetic linears that are partially masked by nearby higher amplitude magnetic features. The broad zones of higher magnetic amplitude, however, are severely attenuated in the vertical magnetic gradient results. These higher amplitude zones reflect rock units having magnetic susceptibility signatures. For this reason both the total and gradient magnetic data sets must be evaluated.

Theoretically the magnetic gradient zero contour line marks the contacts or limits of large magnetic sources. This applies to wide sources, greater than 50 metres, having simple slab geometries and shallow depth.(See discussion in Appendix II) Thus the gradient map also aids in the more accurate delineation of contacts between differing magnetic rock units.

The cross cutting structures, shown on the interpretation map as faults, are based on interruptions and discontinuities in the magnetic trends. Generally, sharp folding of magnetic units will produce a magnetic pattern indistinguishable from a fault break. Thus, if anomaly displacements are small such fault structures, where they mark an anomaly interruption, may actually represent a deformation node rather than faulting.

7.3 Magnetic Survey Results and Conclusions

To facilitate the following discussion of the magnetic results it is suggested the interpretation map be compared with the total field and vertical gradient magnetic colour contour maps either as overlays or side by side.

On the interpretation maps the relatively higher amplitude magnetic horizons and trends are indicated with thick lines while lower amplitude more subtle linears are shown with thinner lines. These linears and trends probably reflect the lower Mesozoic mafic intrusive and extrusive rocks related to mafic volcanic units, sills or dyke structures. Note, in some instances the actual trend direction can be ambiguous. On the AL-Moose-JD Block there are two very high amplitude magnetic centres unique to the area which are outlined and cross hatched with horizontal lines. These are thought to reflect major mafic to ultramafic intrusive sources. Below background non-magnetic zones are outlined with thick dashed lines and triangular depression symbols. Such zones usually map felsic or sedimentary rocks. Local smaller negative zones can also indicate possible alteration effects, felsic intrusives or diatremes. A discussion of the results for each block follows:

AL-Moose-JD Block

The magnetic background is interpreted to be approximately 58,250 nanoTesla (nT). Amplitudes range from about 450 nT below background to 2,250 nT above background. Anomaly trend patterns are generally contorted and sinuous with sharp folding in some areas. There is a general east-west to northwest striking grain to the magnetic trends. The most contorted and complex anomaly signatures occur within the Bonanza detail block and to the north and northeast of the block indicating a possible past intense tectonic period of activity. Part of the contorted anomaly patterns are probably explained by the fact stratigraphy is gently dipping and this combined with rugged topography would produce such anomaly patterns.

The major below background non-magnetic areas occupy the central part of the survey block as well as the south part of the Bonanza detail area and south survey boundary block. These zones probably map younger Cretaceous and Tertiary sedimentary stratigraphy.

The highest magnetic amplitudes are present within the magnetic centres described in the introduction to this section. One is present in the northwest part of the survey area, at location A, and covers the north boundary extending northward off the area. Only the south and east periphery of the other anomaly, in the east arm of the survey block at location B, is mapped by the survey. Other high amplitude magnetic trends are present in the northwest flanking the south and southeast part of the major magnetic centre at A, in the extreme south leg of the block at location C as well as two small areas in the east arm of the block at locations D and E. These higher amplitude responses are either intrusive or extrusive in origin but probably reflect mainly lower Mesozoic age mafic volcanic units whereas lower amplitude linear features map the intermediate volcanics.

A few northwest to northeast striking fault structures are strategically located to explain major trend interruptions and apparent anomaly displacements. Some of these structures are probably mapping contacts where there is an abrupt change in magnetic amplitude levels. A good example is the north-south fault to the west and northwest of the Finn detail area. It marks the boundary between high amplitude responses to the west and a zone of below background non-magnetic levels to the east.

Of interest, however, are the north-south faults present within the detail blocks. The two north-south faults in the Finn detail block cut a radiometric anomaly while the two western north-south faults within the Bonanza detail block are associated with more localized radiometric anomalies. More discussion on these radiometric features is contained in a following section.

Lawyers Block

The background is interpreted to be approximately 58,200 nanoTesla (nT). Amplitudes vary from about 950 nT below background to 1,350 nT above background. The magnetic anomaly patterns are much the same as on the previous block. Anomaly trends are contorted and folded with a regional northwest to north strike direction. High amplitude responses are present in the east and northeast part of the block, areas A and B, reflecting probable mafic volcanic rocks while to the west lower amplitude levels suggest an intermediate volcanic environment.

The below background zones in the central part of the area have considerably negative amplitudes on their eastern flanks immediately west of the high amplitude responses. This effect is partly related to the geometry of the positive source anomalies and topography. The southern negative zone occupies the south half of a deeply incised valley and the magnetic sensor would be flying below the positive source anomalies within this valley. The northern negative zone, however, has no significant topographic expression. Both non-magnetic zones are thought to be mapping sediments.

Note the north-south fault structure cutting the centre of the block. It is associated with a radiometric anomaly, a similar signature to that seen within the detail blocks on the AL-Moose-JD property. Further discussion of this radiometric anomaly is in a following section.

7.4 HEM Anomaly Selection/Interpretation

Vertical to Near Vertical Tabular Conductive Sources

Usually two sets of stacked colour coded profile maps of one coaxial and one coplanar inphase and quadrature responses are used to select conductive anomalies of interest. These HEM intercepts are automatically plotted on the various map products listed previously. Selection of HEM anomaly intercepts is based on conductivity as indicated by the inphase to quadrature ratios of the 900 Hz and/or 4,500 Hz coaxial data, anomaly shape, and anomaly profile characteristics relative to coaxial and corresponding coplanar responses. The peak of the coaxial responses is picked for digitizing as that defines the position of any near vertical to dipping tabular source.

These response shapes are illustrated in Appendix II, in the figure entitled "HEM Response Profile Shapes .....". Profile A illustrates the coaxial and coplanar signature of a vertical source while profiles B and C show the effect of dip on the coplanar and coaxial profiles. For a gently dipping source the small up-dip tail of the coplanar profiles B and C is not present and there is just a shift of the coplanar peak down dip from the coaxial peak.

Flat Lying Conductive Sources

Flat lying responses are characterized by identically shaped coaxial and coplanar response profiles. Profile I, Appendix II, illustrates a flat source response. Variations in the conductivity and thickness of flat lying sources produces peaks and valleys in the profile data. Ordinarily the anomaly peaks from flat lying sources are not selected for plotting as HEM intercepts. Their locations have little meaning if the source is flat lying. A much better presentation of conductive flat lying sources is achieved by the resistivity calculations and map plots. Comparison of the resistivity data with geological information can then ascertain if the source of the responses are of possible geological interest.

It is difficult to differentiate between responses associated with the edge effects of flat lying conductors and actual poor conductivity bedrock conductors on the edge of or overlain by flat lying conductors. Extensive flat lying to gently dipping conductors often have an "edge effect" anomaly which is a coaxial peak on the flank of the coplanar responses similar to one side of profile E, G or H, Appendix II. Often only one edge can be seen if the source is dipping. Such edge effect anomalies are often seen marking the perimeter of lakes or swamps containing conductive material.

Poor conductivity bedrock conductors having low dips will also exhibit responses that may be interpreted as surficial overburden conductors. In such cases, where the source of the conductive response appears to be ambiguous, the coaxial peak of the anomaly is still selected for plotting. In some situations the conductive response has line to line continuity and some magnetic association thus providing possible evidence that the response is related to an actual bedrock source.

Flat lying limited width ribbon type conductive responses with some strike length are sometimes also present. These responses are characterized by a "M" shaped coaxial anomaly with a single peaked coplanar anomaly centred in the trough between the two coaxial peaks. This is illustrated in Appendix II in the same figure as previously mentioned (see profile shape E or G). The actual geometry of the source of these ribbon type responses is difficult to determine. They could represent a synclinal structure such as would be produced by combining dipping profiles C and B.

Negative Inphase Responses

In some areas the inphase profile component exhibits a negative anomaly response usually over obvious magnetic areas. This is produced by local concentrations of magnetite and usually occurs when the sensor is flying close to the ground surface. If only magnetite is present there will be no quadrature response associated with the negative inphase response. If conductive material is present, however, such as graphite or sulphides, a positive quadrature response will be evident with the negative inphase response. In this case the anomaly is selected for plotting and evaluation and designated as a magnetic/conductive response.

Depth and Conductivity Calculation

The calculation of the depth to the conductive source and its conductivity is based on the 4,500 Hz coaxial data assuming a thin vertical sheet model. The amplitude of the inphase and quadrature responses are used for the calculations which are automatically determined by computer. These data are listed in Appendix III and the depth and conductivity values are shown with each plotted anomaly. Further detailed discussion and illustration of the determination of these values is contained in Appendix II. Note the depth calculation for those conductors having a gently dipping to flat lying profile signature will not be accurate although the conductivity value will have some relative meaning.

The selected HEM intercepts are automatically categorized according to their conductivity and amplitude. The calculation of the conductivity of low amplitude anomalies can be very inaccurate. Therefore, anomalies having amplitudes below a certain level and/or low conductivity value are given a zero rating with the category increasing for increasing conductivity values that are statistically reliable.

7.5 Electromagnetic Survey Results and Conclusions

The HEM intercepts do not have significant amplitude or conductivity and tend to be scattered haphazardly throughout the survey areas. Some of the intercepts are related to edge effects from weakly conductive flat lying sources. Others are thought to be produced by aircraft altitude effects in slightly conductive rugged topographic areas. Clusters of intercepts are usually present in low resistivity areas associated with conductive flat lying to gently dipping material. There is a definite correlation between low resistivity and topographically low areas along drainage gulleys and on the flanks of hills especially for the coplanar mid frequency resistivity results. This is often encountered and is related usually to conductive alluvial or talus. This effect is not as pronounced for the coplanar low frequency results which are not as susceptible to poor conductivity surficial material.

For the AL-Moose-JD block comparison of the low frequency resistivity data with topography indicates three zones where low resistivity responses do not correlate with low lying areas or drainage gulleys. These anomalies are designated with numbers and the 125 ohm metre contour line is outlined with short dashed lines and tick mark depression symbols. Two of the anomalous zones occur along the south boundary of the Bonanza detail area. Zone 1 is made up of two relatively small areas while zone 2 extends over a large area south of the detail block. Both have a spatial association with north-south fault structures and radiometric anomalies. The third zone is not as conductive as 1 and 2 and is not outlined as the lowest contour is 158 ohm metre. Its centre is indicated by the number 3 located within a long narrow non-magnetic zone in the south central part of the block. All three zones require evaluation on a second priority basis.

On the Lawyers Block there are two main conductive features. Number 1, in the north central part of the area, consists of a sharp spike-like anomaly. It is typical of a cultural effect produced by radio transmission towers, metal buildings or similar structures. The anomaly correlates with a deeply incised gulley not the usual location for a tower. This anomaly area is recommended for investigation on a low priority basis.

The second feature is a large low resistivity zone in the extreme southwest corner of the block. It covers a topographic high and encircles a small circular non-magnetic zone. The source of this large anomaly may be related to stratigraphy, such as overlying conductive sediments or possibly alteration. There are no significant radiometric anomalies associated with the zone other than a very small thorium anomaly on the west side of the zone. Thus the resistivity anomaly may be only reflecting stratigraphy. Checking of the area on a second priority basis is suggested.

7.6 Radiometric Interpretation

The ability to detect natural occurring radiation, whether on the ground or from an airborne platform, depends on a number of factors listed as follows:

Count Time

Measurements or count rate statistics are more reliable the longer the detector is in position over a particular location. Therefore in airborne surveying, traverse speed is an important factor in detecting radiation sources. For this reason STOL aircraft and helicopters are a favoured platform for radiometric surveys.

Detector size

The detector crystal volume and thickness determine the sensitivity of the radiometric system to radiation. For accurate measurement and differentiation of higher energy levels of radiation, a large crystal volume is a pre-requisite.

Distance from Source (Altitude)

The attenuation or absorption of radiation in air, although not a significant factor in ground surveys, is a factor in airborne surveys. Normalization of the radiation amplitude data for altitude variations of the aircraft during the survey is necessary. The attenuation is not significant for large areal sources of radiation but is quite severe for localized point sources.

Overburden Cover

Radiation can be completely masked by about 30 cm of rock or a metre of unconsolidated overburden.

Source Geometry

A large exposed outcrop of slightly radioactive material, such as granite which usually has a high potassium count, will be easily detectable from the air. A small outcrop of highly radioactive material, containing an appreciable amount of pitchblende for instance, may not be detectable unless the sensor passes directly over the outcrop and/or is quite close to it.

Source Characteristics

The type and percentage concentration of radioactive minerals present in the rock will determine radiation amplitudes and therefore the ability of the sensor to measure the radiation.

The above factors must be taken into consideration when evaluating and interpreting radiometric surveys. Variations in radiation amplitudes may only be a factor of overburden cover. As a result, an outcrop map of the survey area is very useful for initial evaluation of radioactive element concentrations.

Shales and felsic intrusives tend to have high potassium and thorium levels. Mafic intrusives, sandstone and especially limestone have concentrations of one half to one tenth of the highest levels. Specific intrusives types, such as pegmatites, can have levels of potassium, uranium and thorium, in the order of three to four times the amounts normally present. Uranium ore can contain concentrations of radioactive minerals one to four orders of magnitude greater than normally encountered.

Thus, interpretation of the source of radioactive anomalies, even when the uranium, thorium and potassium thresholds are separated, can be difficult and ambiguous. In some geological environments, specific rock units have higher or lower potassium/thorium, potassium/uranium or thorium/uranium ratios. Additional diagnostic information is sometimes available when such ratio maps are generated and compared to known geological parameters.

7.7 Radiometric Survey Results and Conclusions

The potassium channel results are of most interest as high potassium usually reflects the presence of felsic intrusives such as granite type rocks as well as the presence of potassium associated with alteration processes. The additional absence or presence of thorium or uranium is also an important signature correlation for specific ore-model targets.

Anomalous responses are considered to be those having levels equal or greater than twice background. More subtle lower amplitude anomalies may be also important but until more specific geological information is known only the higher amplitude responses can be assessed. On the interpretation maps anomalous potassium channel levels, greater than about 200 cps, are shown with diagonal northeast/southwest lines. Anomalous thorium channel responses, greater than 25 cps, are shown with diagonal lines orthogonal to the potassium hatching. Some anomalous uranium channel responses are associated with both the potassium and thorium responses but are not indicated on the interpretation maps to avoid confusion with the other radiometric signatures.

There are several different combinations of radiometric signatures. There are potassium anomalies with little thorium or uranium responses. Similarly, thorium anomalies are often present with no potassium. Anomalous uranium is intermittently present with the potassium and thorium anomalies. The most significant signature indicative of alteration processes is a high potassium channel anomaly with low or minimal thorium channel response. In order to sample a representative suite of the different radiometric signatures the more interesting anomalous responses are designated by a number and a "R" letter prefix for further investigation in order to differentiate them from other designated geophysical anomalies. Numbering is from west to east. Discussion of the results on each block follows:

AL-Moose-JD Block

There are fourteen anomaly locations designated on the interpretation map. Anomalies R1, R2 and R3 are within the Bonanza detail area. They are rather small features but of particular interest because of their proximity to north-south fault structures mentioned in a previous section on the magnetic results. R1 is mainly a thorium channel anomaly with little potassium response while R2, just to the south, is the reverse with anomalous potassium and low thorium. Anomaly R3 is just below anomalous potassium channel threshold levels, as a result no hatched anomaly area is shown in this location. R3 was selected because of its lack of significant thorium response and its association with a north-south fault structure. It is an obvious feature on the thorium/potassium ratio map.

Anomaly R4 to the southeast of the detail area is similar in extent as the previous anomalies and is mainly a potassium channel anomaly. R5 further to the southeast, in a small southern block extension, is more extensive extending northwest and southeast off the survey area. It contains both potassium and thorium channel components with dominate potassium levels. Directly north, near the north boundary area, anomaly R6 is part of a large complex of potassium dominate and thorium channel responses. R7 further to the east is a similar large complex of potassium and thorium anomalies. A cautionary note is required, however, for authenticity of anomalies R5, R6 and R7. These anomalies flank topographic highs with very steep gradients. Steep topographic gradients make it very difficult for drape flying even with a helicopter survey platform. As a result, the altitude coefficient corrections, designed to adjust amplitude levels to a common datum, over compensate when terrain clearance exceeds a certain level. Therefore all three components are affected. Thus the validity of these three anomaly areas is in question.

Anomalies R8, R9 and R10 within or bounding the Finn detail area are of significance for their high potassium levels and lack of significant thorium channel response. The most prospective are probably R8 and R9 with their north-south fault associations. R10 a large anomaly, similar in size to R8, contains only background levels of thorium. It has no significant fault associations but of possible importance are the two north-northwest striking magnetic linears bisecting the anomaly. As the regional magnetic trend directions in the area are all generally east-west the north-south magnetic linears could reflect mafic dyke structures associated with fault activity. This probable structural association enhances anomaly R10 to the level of R8.

The remaining designated anomaly zones R11, R12, R13 and R14 in the east arm of the survey block are part of very large complexes covering most of the area east of R10. The area contains relatively high levels of all three radiometric components and is very rugged topographically. Anomaly R11 is mainly a thorium channel response flanking the west side of high potassium channel anomaly R12. R12 covers the high amplitude magnetic complex, designated E, containing a north-south linear with three linear east-west arms extending to the east. The topographic positions of R11 and R12 suggest they may be produced by over correction of the altitude coefficients as explained previously and some caution is advised in this respect. R13 is a potassium and thorium anomaly with dominant potassium while R14 is the reverse with dominate thorium. R12 is considered to have the most potential for mineralization because of the structural associations suggested by the magnetics. This association could be fortuitous, however, and all four anomalies in this eastern zone may be only reflecting stratigraphy. Note, the anomaly complexes cover an area of high resistivity associated with the very rugged elevated topography.

Lawyers Block

The main feature in this block is the large potassium channel anomaly complex covering the north central part of the area. This anomaly, centred on R2, has minor thorium and uranium channel components and is cut by a north-south fault interpreted from the magnetic anomaly patterns. It has similar attributes to the large anomalies R8 and R10 in the AL-Moose-JD block and is considered a first priority exploration target.

Anomaly R1, a small feature near the west boundary of the block, is a potassium and thorium anomaly response. It is a questionable anomaly because it occurs on the steep flank of a topographic high and over correction of the altitude coefficients is suspected.

8. RECOMMENDATIONS

Selection of geophysical anomalies for further investigation is based on the structural, magnetic, conductive and radiometric attributes of the various anomalies as discussed in the body of this report. Interrelationships of the various anomaly types is also an important consideration. Significant radiometric anomalies having specific signatures and/or magnetic associations are the main exploration targets of interest on this property. Prior to any ground follow-up, the following priority categories should be reviewed with respect to the geological target model being sought and known geology and mineralization in the area.

The designated anomalies are prioritized as first, second or third priority investigation targets. Magnetic anomaly E on the AL-Moose-JD block is related to radiometric anomaly R12 and may have some important relationship to mineralization. The other designated anomalies A to D, and A and B on the Lawyers block, are not considered to be important exploration targets probably reflecting mafic volcanic rocks. If they are related to intrusive events they be important loci for mineralization. Unfortunately there are no other significant geophysical indicators associated with these anomalies. The priority ratings of the conductive and radiometric anomalies are tabulated following:

Block	First Priority	Second Priority	Third Priority
AL-Moose-JD	R8, R10	1, 2, 3, R2, R3, R4, R9, R12, R13	R1, R5, R6, R7, R11, R14
Lawyers	R2	2	1, R1

The conductive and radiometric anomalies recommended for investigation represent a first phase exploration program. Additional work will be contingent on the results of this program. More detailed geological information used in conjunction with geophysics may help to direct further exploration efforts.

Respectfully submitted,

REGISTERED PROFESSIONAL ENGINEER
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PROVINCE OF ONTARIO

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for

AERODAT INC.

J9778

October 6, 1997

APPENDIX I

PERSONNEL

FIELD

Flown	August 16 to 19, 1997
Pilot(s)	D. Rokosh
Operator(s)	G. Luus

OFFICE

Processing	Darcy McGill George McDonald
Report	R. W. Woolham

APPENDIX II

GENERAL INTERPRETIVE CONSIDERATIONS

APPENDIX III

ANOMALY LISTINGS

ANTARES MINING AND EXPLORATION CORP. -- AL-MOOSE-JD BLOCK

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
6	10070	A/	0	13.5	26.9	0.4	0	41	593503.5	6369659.5
6	10070	B/	0	15.6	21.5	0.7	0	45	593499.3	6370006.5
6	10070	C/	0	13.5	20.6	0.6	0	47	593490.2	6370648.0
6	10070	D/	0	18.1	36.0	0.5	0	40	593502.3	6371010.5
6	10070	E/	0	9.1	27.0	0.2	0	43	593487.3	6371797.0
6	10070	F/	1	39.4	56.7	1.0	0	35	593500.8	6372271.5
6	10070	G/	0	18.3	37.1	0.4	0	43	593497.8	6372535.5
6	10081	A/	0	27.2	48.6	0.6	0	36	593736.8	6370617.0
6	10081	B/	0	14.9	26.9	0.5	0	37	593727.9	6370185.0
6	10081	C/	0	10.4	26.0	0.2	0	39	593743.6	6369911.0
10	10092	A/	1	60.2	86.8	1.2	0	33	593889.6	6372396.5
10	10092	B/	1	44.1	54.9	1.3	0	37	593904.3	6372592.5
10	10101	A/	0	24.3	44.7	0.6	0	39	594094.9	6369804.5
10	10112	A/	0	15.3	36.3	0.3	0	39	594262.8	6369832.5
10	10112	B/	0	11.8	28.8	0.3	0	40	594277.0	6370461.0
10	10112	C/	0	7.3	33.2	0.1	0	37	594284.6	6371867.5
10	10112	D/	1	85.0	111.3	1.5	0	30	594268.6	6372649.5
10	10121	A/	0	14.5	26.2	0.5	0	50	594530.1	6372320.5
10	10121	B/	0	8.3	26.6	0.1	0	38	594525.9	6371950.5
10	10121	C/	0	17.2	54.5	0.2	0	27	594505.3	6370519.0
10	10121	D/	0	19.3	48.4	0.3	0	30	594502.5	6370435.0
10	10131	A/	0	12.8	36.7	0.2	0	37	594693.8	6371884.5
10	10131	B/	0	19.5	72.5	0.2	0	27	594704.1	6372916.0
10	10141	A/	0	12.3	34.6	0.2	0	39	594872.9	6370137.5
10	10141	B/	0	26.3	54.8	0.5	0	32	594882.7	6368614.0
10	10151	A/	0	4.7	17.4	0.1	0	43	595088.9	6371507.5
10	10161	A/	0	2.5	20.5	0.0	0	28	595297.8	6371635.0
10	10161	B/	0	8.6	28.0	0.1	0	30	595326.2	6371077.5
10	10161	C/	0	12.5	34.7	0.2	0	40	595291.3	6370257.5
10	10161	D/	0	12.5	28.3	0.3	0	46	595302.6	6370090.0
10	10161	E/	0	16.0	25.4	0.6	0	48	595293.8	6369406.5
10	10161	F/	0	19.0	33.7	0.6	0	39	595294.9	6369186.5
10	10171	A/	0	24.2	38.7	0.7	0	43	595465.3	6369490.0
10	10171	B/	0	12.9	24.1	0.4	0	51	595458.9	6369751.5

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ANTARES MINING AND EXPLORATION CORP. -- AL-MOOSE-JD BLOCK

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
10	10171	C/	0	9.2	24.7	0.2	0	33	595472.5	6371084.5
10	10181	A/	0	11.9	26.0	0.3	0	45	595663.3	6372784.5
10	10181	B/	0	22.0	36.9	0.6	0	38	595695.2	6372648.5
10	10181	C/	0	26.0	79.3	0.3	0	25	595696.7	6370697.5
10	10181	D/	0	10.1	40.6	0.1	2	20	595702.6	6370541.0
10	10181	E/	0	13.2	37.2	0.2	0	32	595707.8	6369743.5
10	10181	F/	0	14.2	24.8	0.5	0	46	595699.8	6369435.0
10	10181	G/	0	11.8	23.3	0.4	0	45	595700.3	6369081.0
10	10181	H/	0	21.4	44.0	0.5	0	36	595701.9	6367965.0
11	10193	A/	0	13.5	30.6	0.3	0	42	595893.5	6368597.0
11	10193	B/	0	11.9	22.6	0.4	0	49	595899.6	6369322.5
11	10193	C/	0	18.6	39.5	0.4	0	41	595904.8	6369522.0
11	10193	D/	0	19.0	48.6	0.3	0	32	595913.6	6369767.5
11	10193	E/	0	14.3	40.2	0.2	0	32	595912.8	6369858.5
11	10193	F/	0	14.6	35.9	0.3	0	35	595889.4	6370993.0
11	10193	G/	0	10.7	22.6	0.3	0	51	595897.3	6371433.0
11	10193	H/	0	10.6	24.7	0.3	0	41	595895.2	6371904.0
11	10193	J/	0	26.4	45.3	0.7	0	38	595880.4	6372764.5
11	10203	A/	0	14.6	30.1	0.4	0	54	596086.3	6372815.0
11	10203	B/	0	4.6	37.5	0.0	0	25	596110.0	6370979.0
11	10203	C/	0	1.4	48.0	0.0	0	23	596104.8	6370858.5
11	10203	D/	0	12.1	46.5	0.1	0	30	596103.6	6370495.5
11	10203	E/	0	10.7	56.8	0.1	0	30	596101.2	6370358.5
11	10203	F/	0	12.6	34.3	0.2	0	35	596107.1	6369718.0
11	10203	G/	0	15.9	41.4	0.3	0	42	596106.0	6369492.5
11	10203	H/	0	11.6	33.2	0.2	0	41	596113.4	6368012.5
11	10211	A/	0	7.9	29.1	0.1	0	28	596309.9	6369486.5
11	10211	B/	0	14.6	54.3	0.2	0	29	596319.3	6369768.0
11	10211	C/	0	1.6	30.4	0.0	0	32	596317.5	6370193.5
11	10211	D/	0	5.0	26.3	0.0	0	42	596303.7	6370764.0
11	10211	E/	0	5.0	27.6	0.0	0	38	596297.1	6370872.5
11	10211	F/	0	4.3	21.6	0.0	0	37	596293.6	6371097.0
11	10211	G/	0	5.7	23.8	0.1	0	38	596282.9	6371516.0
11	10211	H/	0	25.1	63.8	0.4	0	33	596297.1	6372839.0
11	10221	A/	0	-1.3	52.0	0.0	0	29	596505.4	6370662.5
11	10221	B/	0	7.8	31.4	0.1	0	40	596508.6	6369509.0
11	10231	A/	0	4.1	38.1	0.0	0	30	596712.3	6370689.5
11	10231	B/	0	18.1	51.7	0.3	0	35	596703.3	6370987.0
11	10231	C/	0	11.2	33.9	0.2	0	36	596687.6	6371868.0

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ANTARES MINING AND EXPLORATION CORP. -- AL-MOOSE-JD BLOCK

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
11	10241	A/	0	11.8	33.3	0.2	0	37	596894.9	6371487.5
11	10241	B/	0	17.2	52.7	0.2	0	33	596914.1	6369715.0
11	10241	C/	0	17.5	48.6	0.3	0	35	596913.3	6369586.0
11	10241	D/	0	21.7	45.0	0.5	0	38	596920.4	6369261.0
11	10241	E/	0	19.8	40.6	0.5	0	43	596915.9	6369137.5
11	10241	F/	0	22.5	43.7	0.5	0	39	596906.1	6369003.0
11	10251	A/	0	16.3	29.6	0.5	0	50	597137.0	6369336.0
11	10251	B/	0	25.0	61.7	0.4	0	37	597128.6	6369859.5
11	10251	C/	0	19.8	59.2	0.3	0	23	597097.8	6370322.5
11	10251	D/	0	30.5	71.5	0.5	0	31	597104.8	6370520.0
11	10251	E/	0	20.9	68.4	0.2	0	26	597121.6	6370878.5
11	10251	F/	0	13.2	42.6	0.2	0	31	597143.5	6371689.5
11	10261	A/	0	13.4	60.7	0.1	0	20	597311.2	6371937.0
11	10261	B/	0	19.1	51.5	0.3	0	28	597303.3	6371344.5
11	10261	C/	0	21.3	65.4	0.3	0	27	597315.2	6370923.0
11	10261	D/	0	23.6	47.1	0.5	0	36	597310.8	6370450.5
11	10261	E/	0	37.2	83.7	0.5	0	34	597307.1	6370181.0
11	10261	F/	0	24.4	64.5	0.3	0	31	597319.2	6370005.5
11	10261	G/	0	36.8	102.7	0.4	0	27	597309.9	6369745.0
11	10261	H/	0	15.0	68.0	0.1	0	22	597311.3	6369649.0
11	10261	J/	0	10.5	48.8	0.1	0	22	597313.1	6369572.0
11	10261	K/	0	13.6	21.9	0.6	0	63	597325.3	6368576.5
11	10261	M/	0	23.6	48.4	0.5	0	39	597335.2	6368309.0
11	10261	N/	0	25.9	45.6	0.6	0	34	597332.4	6368027.5
11	10261	O/	0	28.1	44.7	0.8	0	39	597326.9	6367756.5
11	10271	A/	0	20.5	43.7	0.4	0	37	597495.4	6368848.0
11	10271	B/	0	31.5	60.5	0.6	0	36	597504.0	6370166.0
11	10271	C/	0	26.7	56.3	0.5	0	38	597494.9	6370272.0
11	10271	D/	0	18.1	65.6	0.2	0	23	597486.3	6370632.5
11	10271	E/	0	18.2	51.2	0.3	0	32	597491.3	6371677.5
11	10271	F/	0	17.6	68.1	0.2	0	28	597490.4	6372694.5
11	10271	G/	0	9.8	59.1	0.0	0	23	597473.2	6374681.0
11	10281	A/	0	9.3	55.0	0.0	0	26	597690.9	6374536.0
11	10281	B/	0	14.9	57.9	0.1	0	22	597702.1	6372025.5
11	10281	C/	0	17.0	49.8	0.2	0	29	597728.4	6371594.0
11	10281	D/	0	17.0	54.6	0.2	0	29	597726.9	6371334.0
11	10281	E/	0	25.0	62.5	0.4	0	33	597726.9	6369309.0
11	10281	F/	0	23.8	50.6	0.5	0	42	597728.0	6368899.5
11	10281	G/	0	10.8	46.5	0.1	0	31	597719.3	6367795.5
11	10291	A/	0	25.4	50.7	0.5	0	39	597908.2	6369321.5

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FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
11	10291	B/	0	27.4	97.4	0.2	0	20	597909.4	6370490.0
11	10291	C/	0	10.3	67.8	0.0	0	25	597876.6	6374577.5
11	10301	A/	0	19.3	70.3	0.2	0	24	598085.4	6374200.0
11	10301	B/	0	18.6	68.3	0.2	0	25	598101.2	6374082.5
11	10301	C/	0	8.7	75.4	0.0	0	19	598100.4	6372818.5
11	10301	D/	0	7.8	43.1	0.0	0	29	598101.6	6370065.5
11	10301	E/	0	21.6	50.0	0.4	0	35	598096.9	6369281.5
11	10301	F/	0	18.7	43.3	0.4	0	37	598105.1	6369162.5
11	10301	G/	0	27.9	63.6	0.5	0	29	598096.8	6368671.0
11	10301	H/	0	6.0	40.4	0.0	0	27	598080.7	6368119.5
11	10311	A/	0	34.3	69.5	0.6	0	32	598246.6	6369446.5
11	10311	B/	0	15.4	46.3	0.2	0	41	598258.6	6369800.0
11	10321	A/	0	11.5	42.2	0.1	0	43	598478.1	6370596.0
11	10321	B/	0	26.5	55.6	0.5	0	32	598494.9	6368713.5
11	10321	C/	0	11.0	50.6	0.1	0	27	598498.9	6368233.0
11	10331	A/	0	3.9	22.5	0.0	0	35	598680.4	6368191.0
11	10331	B/	0	27.2	60.2	0.5	0	32	598679.5	6368537.0
11	10331	C/	1	36.7	53.7	1.0	0	36	598669.8	6369186.5
11	10331	D/	0	38.3	60.7	0.9	0	32	598683.4	6369782.5
11	10331	E/	0	29.1	56.5	0.6	0	38	598686.3	6369921.5
11	10331	F/	0	21.9	79.2	0.2	0	22	598680.3	6370715.0
11	10341	A/	0	17.2	66.4	0.2	0	27	598883.2	6374361.5
11	10341	B/	0	2.1	27.9	0.0	0	24	598887.4	6372440.0
11	10341	C/	0	10.2	51.0	0.1	0	24	598890.6	6371528.0
11	10341	D/	0	10.4	45.7	0.1	0	23	598892.4	6370802.5
11	10341	E/	0	19.6	43.8	0.4	0	42	598882.9	6369895.0
11	10341	F/	0	19.4	37.2	0.5	0	36	598895.8	6368475.0
11	10341	G/	0	8.6	37.0	0.1	0	23	598907.9	6368020.0
11	10351	A/	0	18.6	34.6	0.5	0	35	599118.4	6368386.0
11	10351	B/	0	19.4	43.8	0.4	0	33	599110.1	6369630.0
11	10351	C/	0	17.9	59.9	0.2	0	23	599130.0	6371560.0
11	10361	A/	0	12.7	28.2	0.3	0	51	599308.6	6371142.0
11	10361	B/	0	10.6	27.3	0.2	0	43	599289.1	6370005.5
11	10361	C/	0	15.2	34.4	0.3	0	49	599289.6	6369583.5
11	10361	D/	0	18.6	44.2	0.4	0	33	599274.7	6367654.0
12	10371	A/	0	33.8	61.3	0.7	0	29	599467.7	6369096.0
12	10371	B/	0	3.9	17.7	0.0	0	34	599475.4	6370024.0

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FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
12	10381	A/	0	14.3	37.8	0.3	0	34	599702.7	6371416.5
12	10381	B/	0	31.0	64.2	0.6	0	35	599683.7	6369530.0
12	10381	C/	0	14.9	38.8	0.3	0	32	599690.7	6369032.0
12	10392	A/	0	12.2	40.3	0.2	0	42	599933.0	6368917.0
12	10392	B/	0	-0.6	18.5	0.0	0	41	599902.3	6372656.0
12	10400	A/	0	9.8	26.8	0.2	0	43	600112.6	6369919.5
12	10400	B/	0	4.0	17.9	0.0	0	32	600094.4	6368909.0
12	10410	A/	0	14.7	48.3	0.2	0	34	600297.3	6370021.5
12	10410	B/	0	6.4	33.9	0.0	0	29	600291.1	6370562.0
12	10420	A/	0	7.1	44.3	0.0	0	28	600513.3	6372442.5
12	10420	B/	0	10.8	50.5	0.1	0	28	600514.2	6372352.5
12	10420	C/	0	9.0	46.0	0.1	0	25	600540.8	6371502.5
12	10420	D/	0	16.0	46.2	0.2	0	30	600528.4	6368842.0
13	10431	A/	0	21.2	52.9	0.4	0	31	600693.8	6367823.0
13	10431	B/	0	8.3	24.5	0.2	0	37	600695.1	6372358.5
13	10440	A/	0	11.9	79.7	0.0	0	19	600921.6	6372608.0
13	10440	B/	0	9.7	34.2	0.1	0	42	600915.3	6371873.0
13	10440	C/	0	3.0	16.3	0.0	0	31	600905.3	6371520.0
13	10440	D/	0	16.4	29.9	0.5	0	45	600899.8	6367978.5
13	10450	A/	0	8.8	16.4	0.4	0	60	601092.3	6368608.0
13	10461	A/	0	11.9	33.5	0.2	0	32	601299.1	6367173.5
12	10470	A/	0	26.6	54.3	0.5	0	30	601525.1	6366942.5
12	10470	B/	0	28.5	67.5	0.4	0	25	601512.3	6367223.0
12	10470	C/	0	26.0	61.6	0.4	0	27	601512.4	6367338.5
12	10470	D/	0	26.0	54.1	0.5	0	30	601524.9	6367490.5
12	10470	E/	0	27.9	43.2	0.8	0	40	601530.4	6369329.5
12	10470	F/	0	12.5	43.0	0.2	0	27	601515.6	6370991.0
12	10470	G/	0	13.2	39.5	0.2	0	27	601501.3	6371564.5
12	10480	A/	0	2.6	20.9	0.0	0	27	601700.8	6372783.0
12	10480	B/	0	5.7	27.0	0.0	0	30	601690.9	6372556.0
12	10480	C/	0	6.6	24.6	0.1	0	38	601712.8	6371542.0
12	10480	D/	0	23.7	70.5	0.3	0	26	601723.3	6370922.5
12	10480	E/	0	18.5	39.8	0.4	0	28	601726.8	6367487.0
12	10480	F/	0	35.9	66.3	0.7	0	26	601728.6	6367084.0

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ANTARES MINING AND EXPLORATION CORP. -- AL-MOOSE-JD BLOCK

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
12	10480	G/	0	31.0	75.0	0.4	0	24	601742.3	6366409.5
12	10490	A/	0	16.6	34.2	0.4	0	35	601897.2	6366466.5
12	10490	B/	0	7.8	19.5	0.2	8	26	601927.2	6367058.0
12	10490	C/	0	18.8	37.5	0.5	0	34	601921.1	6368671.0
12	10490	D/	0	22.2	49.4	0.4	0	32	601924.1	6371019.0
12	10490	E/	0	26.8	62.1	0.4	0	29	601902.4	6371183.5
12	10490	F/	0	6.8	27.4	0.1	0	27	601941.4	6372691.5
12	10490	G/	0	3.8	21.5	0.0	0	32	601923.5	6373764.5
12	10490	H/	0	4.5	31.6	0.0	0	22	601913.1	6374560.5
13	10501	A/	0	14.2	29.6	0.4	0	41	602086.1	6371167.5
13	10501	B/	0	3.9	28.1	0.0	0	28	602104.7	6372523.5
13	10501	C/	0	3.8	16.5	0.0	0	38	602100.3	6374569.0
13	10510	A/	0	8.2	27.9	0.1	0	36	602307.6	6368457.5
13	10520	A/	0	15.2	37.2	0.3	0	34	602463.4	6368361.5
13	10530	A/	0	2.0	20.7	0.0	0	45	602688.3	6371308.5
13	10530	B/	0	23.7	63.3	0.3	0	29	602701.1	6370926.5
13	10530	C/	0	32.4	66.0	0.6	0	33	602699.8	6370768.0
13	10530	D/	0	5.2	32.1	0.0	0	32	602692.1	6369817.0
13	10530	E/	0	8.8	34.1	0.1	0	37	602693.6	6368316.5
13	10540	A/	0	2.0	23.0	0.0	0	31	602890.2	6369114.5
13	10550	A/	0	11.5	24.3	0.3	0	54	603106.5	6370631.0
14	10561	A/	0	4.1	19.1	0.0	0	40	603340.3	6372840.0
14	10561	B/	0	7.6	27.6	0.1	0	41	603319.3	6373121.5
14	10570	A/	0	4.4	27.2	0.0	0	35	603477.1	6372846.5
14	10572	A/	0	3.1	29.2	0.0	0	25	603504.5	6368262.5
14	10580	A/	0	4.6	19.9	0.0	0	47	603754.7	6368233.0
12	10600	A/	0	1.1	14.0	0.0	0	28	604091.0	6370820.0
14	10620	A/	0	5.3	24.3	0.0	0	30	604502.3	6369102.5
5	10670	A/	0	27.3	46.6	0.7	0	33	605493.9	6367268.0
5	10680	A/	0	14.9	35.2	0.3	0	35	605669.9	6371516.5

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ANTARES MINING AND EXPLORATION CORP. -- AL-MOOSE-JD BLOCK

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
5	10680	B/	0	23.2	61.4	0.3	0	25	605677.2	6369249.5
5	10680	C/	0	21.0	33.3	0.7	0	42	605680.9	6367084.0
5	10691	A/	0	16.8	36.6	0.4	0	39	605887.9	6366713.5
5	10691	B/	0	18.9	33.7	0.5	0	35	605861.0	6369411.0
14	10710	A/	0	17.4	28.2	0.6	0	41	606293.8	6368373.5
14	10710	B/	0	13.1	25.4	0.4	0	40	606294.8	6368515.0
14	10710	C/	0	12.9	19.7	0.6	0	44	606307.1	6369319.0
14	10710	D/	0	9.2	18.2	0.3	0	45	606314.8	6370827.0
14	10720	A/	0	19.9	59.4	0.3	0	24	606539.0	6368804.0
14	10720	B/	0	22.3	81.0	0.2	0	21	606522.8	6368392.5
14	10720	C/	0	27.0	70.8	0.4	0	24	606519.8	6368248.0
14	10730	A/	0	23.1	36.0	0.7	0	37	606697.8	6367957.5
14	10740	A/	0	44.6	88.4	0.7	0	30	606881.3	6368354.5
14	10740	B/	0	41.4	84.2	0.6	0	28	606882.8	6368205.5
14	10740	C/	0	23.8	44.4	0.6	0	32	606877.5	6367854.0
14	10740	D/	0	13.3	37.7	0.2	0	38	606906.1	6365846.0
29	10751	A/	0	15.1	32.6	0.4	0	34	607086.8	6365984.0
21	10761	A/	0	2.9	19.0	0.0	5	20	607301.1	6373351.0
21	10761	B/	0	0.9	21.9	0.0	0	34	607300.6	6372316.5
21	10761	C/	0	-0.3	11.9	0.0	0	32	607324.2	6371862.0
21	10761	D/	0	8.4	26.4	0.1	0	32	607329.5	6371007.5
21	10761	E/	0	6.2	33.4	0.0	0	28	607331.0	6370741.5
21	10761	F/	0	17.9	29.1	0.6	0	42	607314.1	6366937.5
21	10771	A/	0	4.5	24.7	0.0	0	31	607494.3	6373607.5
21	10771	B/	0	2.5	15.6	0.0	0	28	607480.1	6372725.5
21	10771	C/	0	9.5	60.1	0.0	0	20	607481.8	6372014.5
21	10771	D/	0	11.3	43.8	0.1	2	20	607512.9	6371003.0
21	10771	E/	0	5.9	37.1	0.0	0	24	607505.3	6370665.0
21	10771	F/	0	4.3	27.9	0.0	0	28	607530.7	6364821.5
29	10781	A/	0	1.7	16.9	0.0	0	32	607694.8	6372949.5
18	10792	A/	0	14.8	43.9	0.2	0	27	607893.0	6366936.5
18	10792	B/	0	9.0	24.2	0.2	3	28	607899.3	6367211.5
18	10792	C/	0	9.5	26.3	0.2	3	26	607901.9	6367591.0
18	10800	A/	0	2.3	24.5	0.0	0	24	608111.8	6371565.5

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ANTARES MINING AND EXPLORATION CORP. -- AL-MOOSE-JD BLOCK

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
18	10810	A/	0	-2.0	30.5	0.0	0	25	608297.6	6367775.5
18	10820	A/	0	14.3	30.7	0.4	5	26	608482.1	6369889.0
18	10820	B/	0	9.7	23.2	0.3	0	40	608508.5	6362598.0
18	10830	A/	0	1.3	17.9	0.0	0	26	608702.6	6368467.0
18	10830	B/	0	7.9	29.5	0.1	0	38	608703.0	6370768.0
18	10840	A/	0	-5.9	12.6	0.0	0	34	608846.3	6371583.5
18	10840	B/	0	0.0	43.4	0.0	0	20	608888.6	6367067.5
18	10840	C/	0	1.5	12.4	0.0	0	43	608871.9	6366781.0
18	10840	D/	0	2.4	14.3	0.0	0	44	608881.4	6366644.0
18	10850	A/	0	-33.2	37.4	0.0	0	17	609106.5	6365402.0
18	10850	B/	0	0.8	14.7	0.0	0	31	609117.9	6366154.5
18	10850	C/	0	3.5	24.0	0.0	0	29	609104.7	6366738.5
18	10860	A/	0	6.1	41.8	0.0	0	29	609277.9	6367426.5
18	10860	B/	0	23.4	103.2	0.2	0	25	609283.5	6367030.5
19	10870	A/	0	10.6	56.8	0.1	0	20	609461.9	6366313.0
19	10870	B/	0	1.7	35.7	0.0	0	15	609477.5	6367835.5
19	10880	A/	0	16.0	54.7	0.2	0	32	609654.3	6368049.0
19	10880	B/	0	9.3	57.1	0.0	2	16	609636.4	6367793.5
19	10880	C/	0	3.1	25.4	0.0	0	30	609662.7	6367621.5
19	10880	D/	0	5.9	44.3	0.0	0	18	609645.3	6366853.0
19	10880	E/	0	11.5	53.1	0.1	0	31	609644.5	6366587.0
19	10880	F/	0	6.3	39.8	0.0	1	18	609642.7	6366333.5
19	10890	A/	0	8.7	40.4	0.1	0	29	609910.9	6366294.5
19	10890	B/	0	3.8	66.7	0.0	0	18	609928.2	6366726.5
19	10890	C/	0	14.8	54.6	0.2	0	24	609912.1	6368752.0
19	10900	A/	0	14.6	32.8	0.3	0	37	610083.4	6368668.0
19	10900	B/	0	9.9	22.8	0.3	0	46	610094.6	6367851.0
19	10900	C/	0	4.0	23.1	0.0	6	19	610091.9	6367694.0
19	10900	D/	0	10.3	47.9	0.1	0	37	610087.3	6367469.0
19	10900	E/	0	8.1	36.7	0.1	0	37	610082.8	6367359.5
19	10900	F/	0	5.2	24.4	0.0	0	27	610066.5	6366913.5
19	10900	G/	0	-23.4	40.7	0.0	0	16	610075.8	6365096.5
19	10910	A/	0	9.1	33.0	0.1	0	28	610317.1	6364314.0
19	10910	B/	0	-2.2	36.9	0.0	0	16	610320.1	6366748.0

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ANTARES MINING AND EXPLORATION CORP. -- AL-MOOSE-JD BLOCK

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
19	10910	C/	0	5.6	33.7	0.0	0	23	610301.5	6368197.0
19	10920	A/	0	1.8	47.2	0.0	0	32	610489.4	6367618.5
19	10920	B/	0	-17.8	75.5	0.0	0	7	610466.2	6367252.0
19	10920	C/	0	2.0	27.5	0.0	0	28	610487.8	6365219.5
19	10930	A/	0	1.1	16.2	0.0	0	35	610685.1	6365146.5
19	10930	B/	0	19.8	86.9	0.1	0	23	610687.2	6366172.5
19	10930	C/	0	4.7	28.4	0.0	0	42	610717.1	6367531.0
19	10930	D/	0	4.9	62.6	0.0	0	22	610707.6	6368321.0
19	10940	A/	0	3.1	26.6	0.0	2	18	610916.2	6367106.0
19	10940	B/	0	-3.2	20.0	0.0	0	24	610910.9	6365038.0
19	10940	C/	0	5.3	23.4	0.0	0	27	610880.3	6364457.0
19	10950	A/	0	9.8	39.0	0.1	4	18	611110.1	6368007.0
19	10950	B/	0	6.2	50.0	0.0	0	22	611098.6	6368275.5
19	10960	A/	0	11.4	57.9	0.1	0	23	611316.6	6367769.5
19	10960	B/	0	4.2	23.2	0.0	0	25	611312.6	6365778.5
19	10970	A/	0	4.1	18.5	0.0	0	50	611445.3	6365407.5
19	10980	A/	0	9.6	29.8	0.2	0	37	611694.2	6369553.5
19	10980	B/	0	2.8	16.4	0.0	0	30	611693.6	6367969.5
19	10980	C/	0	2.5	26.1	0.0	0	20	611685.7	6365747.5
21	10990	A/	0	3.9	28.6	0.0	0	29	611879.4	6365236.5
16	11000	A/	0	2.5	17.1	0.0	0	47	612112.7	6366981.0
21	11130	A/	0	-0.6	11.3	0.0	0	24	614716.1	6371616.0
21	11140	A/	0	-25.0	22.1	0.0	0	10	614907.7	6371073.0
23	11190	A/	0	-3.5	8.2	0.0	0	37	615886.4	6369538.0
23	11200	A/	0	-14.8	9.6	0.0	0	27	616108.2	6370480.5
23	11210	A/	0	-14.4	8.3	0.0	0	16	616301.3	6370458.5
23	11221	A/	0	-0.5	8.8	0.0	0	12	616497.2	6370650.5
23	11250	A/	0	-1.1	23.2	0.0	0	19	617099.0	6368752.5
29	11261	A/	0	2.9	16.5	0.0	0	32	617329.9	6368868.5

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23	11270	A/	0	6.5	25.4	0.1	0	30	617523.6	6368813.5
27	30010	A/	0	16.5	35.8	0.4	0	32	594011.3	6370732.0
27	30020	A/	0	12.0	29.2	0.3	0	44	594189.1	6370492.5
27	30020	B/	0	15.8	33.4	0.4	0	40	594188.2	6369809.5
27	30030	A/	0	5.7	38.3	0.0	0	41	594383.3	6371431.0
27	30030	B/	0	9.1	31.0	0.1	0	34	594381.7	6371862.5
27	30040	A/	0	24.4	47.4	0.5	0	32	594631.3	6372309.5
27	30040	B/	0	11.7	39.9	0.2	0	29	594625.1	6371922.5
27	30040	C/	0	11.3	48.1	0.1	0	26	594593.4	6370740.5
27	30050	A/	0	20.1	37.4	0.5	0	40	594772.6	6369877.0
27	30050	B/	0	4.9	22.7	0.0	0	31	594769.3	6371363.5
27	30060	A/	0	6.4	37.1	0.0	2	18	595023.6	6371883.0
27	30070	A/	0	7.8	20.6	0.2	0	38	595204.5	6370417.0
27	30080	A/	0	16.1	52.2	0.2	0	32	595451.1	6372908.5
27	30080	B/	0	34.8	77.3	0.5	0	28	595445.3	6372544.5
27	30080	C/	0	8.3	24.1	0.2	0	34	595440.4	6372109.0
27	30080	D/	0	13.0	58.0	0.1	1	18	595418.8	6371775.5
27	30080	E/	0	2.9	24.4	0.0	4	17	595423.8	6371395.5
27	30080	F/	0	15.2	61.7	0.1	0	22	595402.1	6370495.0
27	30080	G/	0	21.6	37.1	0.6	0	36	595392.3	6369536.0
27	30080	H/	0	21.4	37.3	0.6	0	33	595396.5	6369362.5
27	30080	J/	0	26.5	47.7	0.6	0	34	595397.4	6369175.5
27	30090	A/	0	35.0	87.2	0.4	0	25	595612.4	6372745.0
27	30100	A/	0	24.0	49.3	0.5	0	39	595848.6	6372763.5
27	30100	B/	0	14.9	53.2	0.2	0	21	595829.3	6371850.0
27	30100	C/	0	22.5	72.2	0.2	0	23	595813.9	6371320.5
27	30100	D/	0	32.6	86.9	0.4	0	26	595825.3	6370730.0
27	30100	E/	0	11.9	41.9	0.1	0	24	595816.8	6370481.5
27	30100	F/	0	16.4	50.6	0.2	0	28	595804.9	6369730.0
27	30100	G/	0	12.6	22.6	0.5	0	42	595811.1	6369492.0
27	30100	H/	0	13.7	25.0	0.5	0	42	595815.1	6369359.0
27	30100	J/	0	14.6	36.9	0.3	0	32	595812.1	6369129.0
27	30110	A/	0	16.0	39.1	0.3	0	34	595982.8	6369305.0

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ANTARES MINING AND EXPLORATION CORP. -- AL-MOOSE-JD BLOCK

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
27	30110	B/	0	20.2	53.0	0.3	0	29	595997.4	6369518.5
27	30110	C/	0	19.8	55.2	0.3	0	27	595995.9	6369656.5
27	30110	D/	0	4.3	20.4	0.0	0	33	596021.8	6371024.0
27	30110	E/	0	8.3	25.3	0.2	0	39	596037.3	6371470.5
27	30110	F/	0	11.2	34.9	0.2	0	32	596031.0	6371868.0
27	30110	G/	0	23.3	45.3	0.5	0	38	596028.4	6372797.5
27	30120	A/	0	18.9	40.6	0.4	0	44	596169.5	6372801.0
27	30120	B/	0	7.7	43.7	0.0	0	26	596187.1	6370947.0
27	30120	C/	0	12.5	65.9	0.1	0	23	596180.6	6370594.5
27	30120	D/	0	5.2	52.0	0.0	0	21	596178.4	6370498.0
27	30120	E/	0	-3.8	46.6	0.0	0	22	596174.4	6370353.0
27	30120	F/	0	-2.4	35.2	0.0	0	23	596175.8	6370260.5
27	30120	G/	0	9.1	32.8	0.1	0	30	596189.9	6369897.5
27	30120	H/	0	12.0	33.2	0.2	0	29	596189.9	6369727.0
27	30130	A/	0	25.4	57.9	0.4	0	32	596402.1	6369195.0
27	30130	B/	0	9.0	28.3	0.1	0	37	596418.2	6369699.5
27	30130	C/	0	7.0	21.7	0.1	0	36	596366.3	6371541.0
27	30140	A/	0	21.0	105.1	0.1	0	18	596617.4	6371101.5
27	30140	B/	0	24.1	103.7	0.2	1	15	596618.9	6371023.5
27	30140	C/	0	31.0	72.7	0.5	0	33	596608.6	6369209.5
27	30140	D/	0	27.0	64.2	0.4	0	30	596608.8	6369106.0
27	30151	A/	0	18.6	35.8	0.5	0	38	596797.3	6373047.5
27	30151	B/	0	20.2	51.8	0.3	0	26	596797.3	6371206.5
27	30151	C/	0	17.0	50.2	0.2	0	25	596802.4	6371137.5
27	30151	D/	0	13.3	42.3	0.2	0	27	596784.7	6370681.0
27	30151	E/	0	13.3	49.5	0.1	0	27	596793.1	6369633.0
27	30151	F/	0	19.0	68.0	0.2	0	22	596798.9	6369450.0
27	30151	G/	0	52.1	112.7	0.6	0	29	596791.3	6369136.0
27	30151	H/	0	39.7	106.6	0.4	0	23	596788.4	6369064.0
27	30161	A/	0	20.1	38.1	0.5	0	40	596993.5	6369301.0
27	30161	B/	0	27.5	66.6	0.4	0	33	597002.0	6369806.5
27	30161	C/	0	12.2	25.8	0.3	0	42	597001.3	6371499.0
27	30171	A/	0	16.2	51.3	0.2	0	25	597198.6	6371647.5
27	30171	B/	0	25.7	97.3	0.2	0	19	597184.1	6370692.0
27	30171	C/	0	23.6	84.2	0.2	0	18	597183.1	6370621.5
27	30171	D/	0	23.6	60.7	0.4	0	36	597177.8	6370292.5
27	30171	E/	0	-8.2	49.6	0.0	0	22	597179.1	6370191.0
27	30171	F/	0	23.2	83.2	0.2	0	26	597176.6	6369956.5
27	30171	G/	0	33.3	94.2	0.4	0	27	597172.5	6369806.5

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27	30171	H/	0	22.0	76.5	0.2	0	26	597170.6	6369734.5
27	30181	A/	0	22.1	51.9	0.4	0	28	597388.2	6369409.5
27	30181	B/	0	25.1	53.9	0.5	0	28	597399.2	6370430.5
27	30181	C/	0	15.1	36.3	0.3	0	33	597407.6	6370788.0
27	30181	D/	0	24.1	50.4	0.5	0	36	597378.1	6371579.0
27	30191	A/	0	23.1	84.0	0.2	0	20	597599.2	6370857.5
27	30191	B/	0	25.2	74.3	0.3	0	25	597584.1	6370558.5
27	30191	C/	0	27.4	89.0	0.3	0	24	597616.7	6370287.0
27	30191	D/	0	50.1	92.0	0.8	0	29	597627.6	6369884.0
27	30203	A/	0	17.9	35.1	0.5	0	39	597783.1	6369504.5
27	30203	B/	0	16.1	40.8	0.3	0	35	597762.0	6371594.0
27	30213	A/	0	36.7	97.6	0.4	0	25	597987.9	6370495.0
27	30213	B/	0	16.3	51.8	0.2	0	36	597994.3	6370040.0
27	30213	C/	0	9.5	42.2	0.1	0	30	597991.4	6369965.0
27	30213	D/	0	20.2	46.3	0.4	0	41	597983.1	6369666.0
27	30213	E/	0	32.5	64.5	0.6	0	35	597979.8	6369587.0
27	30213	F/	0	32.1	64.4	0.6	0	30	597981.1	6369330.5
15	30230	A/	0	16.5	26.2	0.6	0	56	598395.8	6369968.5
15	30240	A/	0	8.4	18.7	0.3	0	42	598542.4	6372354.5
15	30251	A/	0	13.8	28.6	0.4	0	41	598800.6	6371568.0
15	30251	B/	0	15.7	30.9	0.4	0	34	598781.8	6370722.5
15	30251	C/	0	27.0	37.6	0.9	0	37	598786.4	6369962.5
15	30260	A/	0	17.9	29.0	0.6	0	38	598984.2	6369670.0
15	30270	A/	0	17.2	96.0	0.1	0	17	599187.0	6372160.0
15	30270	B/	0	10.8	24.4	0.3	0	46	599193.4	6371186.0
15	30270	C/	0	12.8	22.1	0.5	0	58	599205.3	6369618.5
15	30270	D/	0	18.4	30.0	0.6	0	39	599185.5	6369157.5
15	30280	A/	0	29.3	41.0	0.9	0	44	599376.8	6369383.0
15	30280	B/	0	19.3	37.9	0.5	0	41	599393.4	6369540.5
15	30290	A/	0	16.7	43.4	0.3	0	31	599577.4	6371332.0
15	30290	B/	0	15.1	38.6	0.3	0	33	599580.9	6371046.0
15	30290	C/	0	13.8	33.1	0.3	0	35	599574.1	6370752.0
15	30290	D/	0	11.2	25.4	0.3	0	33	599578.4	6370629.5
15	30290	E/	0	9.2	26.6	0.2	0	29	599572.6	6370426.0

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

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FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
15	30290	F/	0	7.9	18.8	0.2	0	37	599568.8	6370011.0
15	30290	G/	0	25.0	46.9	0.6	0	30	599586.3	6369056.0
15	30300	A/	0	10.7	26.2	0.3	0	44	599776.6	6369072.0
15	30300	B/	0	7.3	47.2	0.0	0	25	599731.5	6372558.0
15	30310	A/	0	9.3	26.2	0.2	0	34	599987.7	6371989.0
15	30310	B/	0	34.2	93.5	0.4	0	23	600003.3	6371444.0
15	30310	C/	0	29.2	81.8	0.3	0	21	600001.6	6371354.5
15	30320	A/	0	10.2	22.6	0.3	0	41	600173.1	6369915.5
28	40010	A/	0	13.7	36.4	0.3	0	26	608014.1	6366971.0
28	40020	A/	0	1.9	25.4	0.0	0	22	608222.0	6367773.5
28	40040	A/	0	17.1	37.7	0.4	0	31	608577.7	6369641.5
28	40040	B/	0	6.5	47.7	0.0	0	30	608595.1	6366633.0
28	40060	A/	0	1.6	61.4	0.0	0	19	608989.4	6367073.0
28	40060	B/	0	-0.9	23.0	0.0	0	31	609007.4	6366743.0
28	40070	A/	0	-0.8	21.0	0.0	0	25	609178.4	6366141.5
28	40080	A/	0	13.4	119.5	0.0	0	14	609393.6	6367213.0
28	40090	A/	0	7.7	41.4	0.0	0	28	609581.4	6367838.0
28	40090	B/	0	9.5	22.7	0.2	0	41	609573.8	6368079.0
28	40100	A/	0	14.0	49.3	0.2	8	14	609786.1	6368571.5
28	40100	B/	0	11.1	43.5	0.1	4	18	609800.6	6368402.0
28	40100	C/	0	11.1	36.8	0.2	0	34	609817.5	6368217.5
28	40100	D/	0	20.3	78.7	0.2	0	21	609809.4	6367916.0
28	40100	E/	0	14.3	52.1	0.2	0	30	609802.7	6367261.5
28	40100	F/	0	8.5	30.3	0.1	0	28	609804.3	6366360.0
28	40110	A/	0	7.5	22.0	0.2	1	30	609975.1	6366314.5
28	40110	B/	0	15.2	50.0	0.2	3	19	609998.4	6367990.0
28	40110	C/	0	6.6	23.3	0.1	2	26	609989.4	6368507.0
28	40120	A/	0	8.1	26.3	0.1	3	25	610198.9	6368270.0
28	40120	B/	0	13.5	36.6	0.2	0	32	610185.3	6367853.0
28	40120	C/	0	-14.5	28.1	0.0	0	20	610199.1	6367644.0
28	40120	D/	0	8.9	60.0	0.0	0	23	610190.9	6367471.5
28	40120	E/	0	7.6	48.8	0.0	0	23	610186.4	6367423.0

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

REPORT

ON A
COMBINED HELICOPTER-BORNE
ELECTROMAGNETIC MAGNETIC
AND RADIOMETRIC SURVEY

AL-MOOSE-JD AND LAWYERS BLOCKS
TOODOGGONE REGION
BRITISH COLUMBIA
NTS 94 E/6, E/11

FOR

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October 6, 1997

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J9778

GENERAL INTERPRETIVE CONSIDERATIONS

Electromagnetic

The Aerodat electromagnetic system utilized two different transmitter-receiver coil geometries. The traditional coaxial coil configuration is operated at widely separated frequencies. The horizontal coplanar coil configuration is similarly operated at different frequencies where at least one pair is approximately aligned with one of the coaxial frequencies.

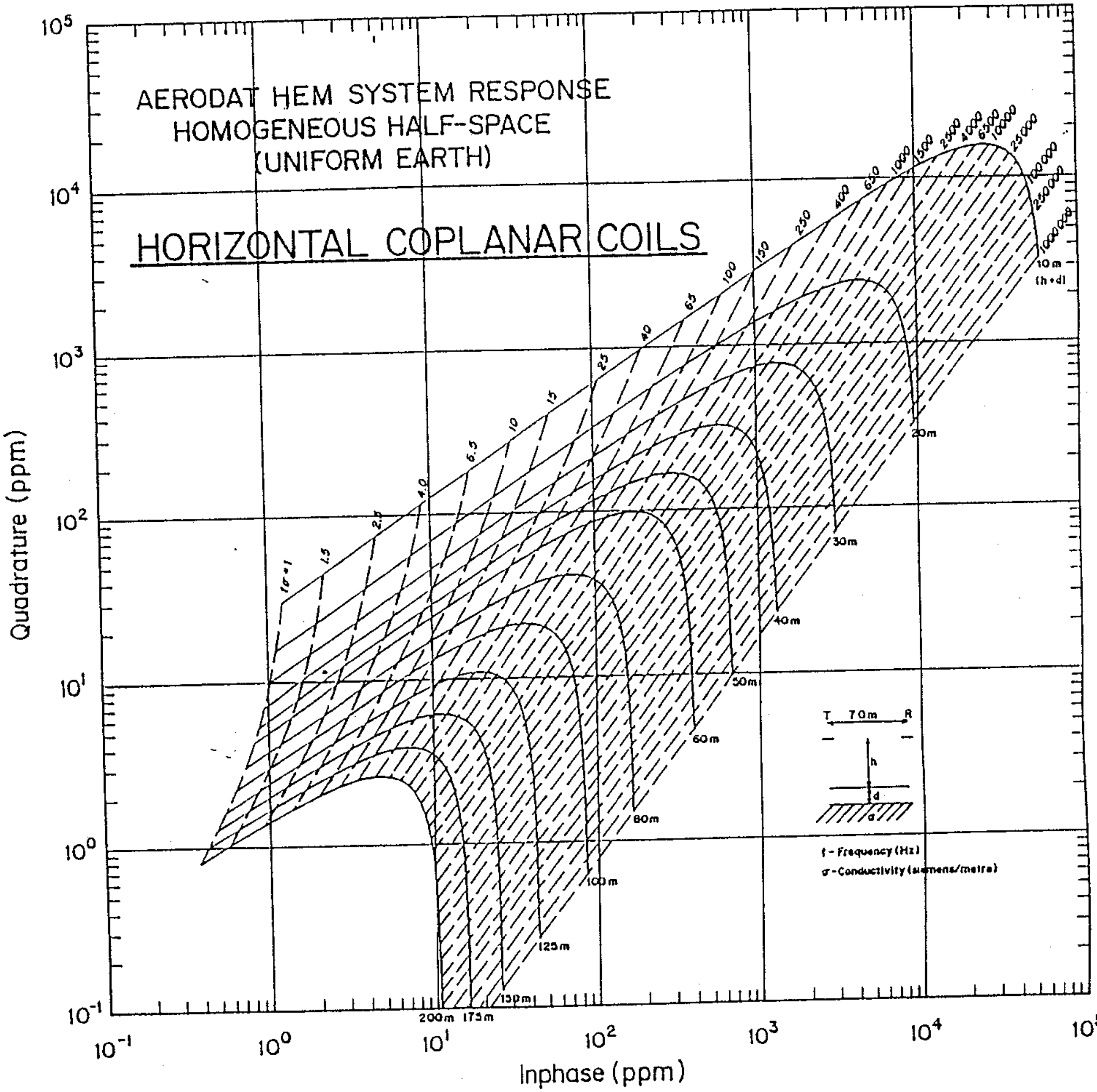
The electromagnetic response measured by the helicopter system is a function of the "electrical" and "geometrical" properties of the conductor. The "electrical" property of a conductor is determined largely by its electrical conductivity, magnetic susceptibility and its size and shape; the "geometrical" property of the response is largely a function of the conductor's shape and orientation with respect to the measuring transmitter and receiver.

Electrical Considerations

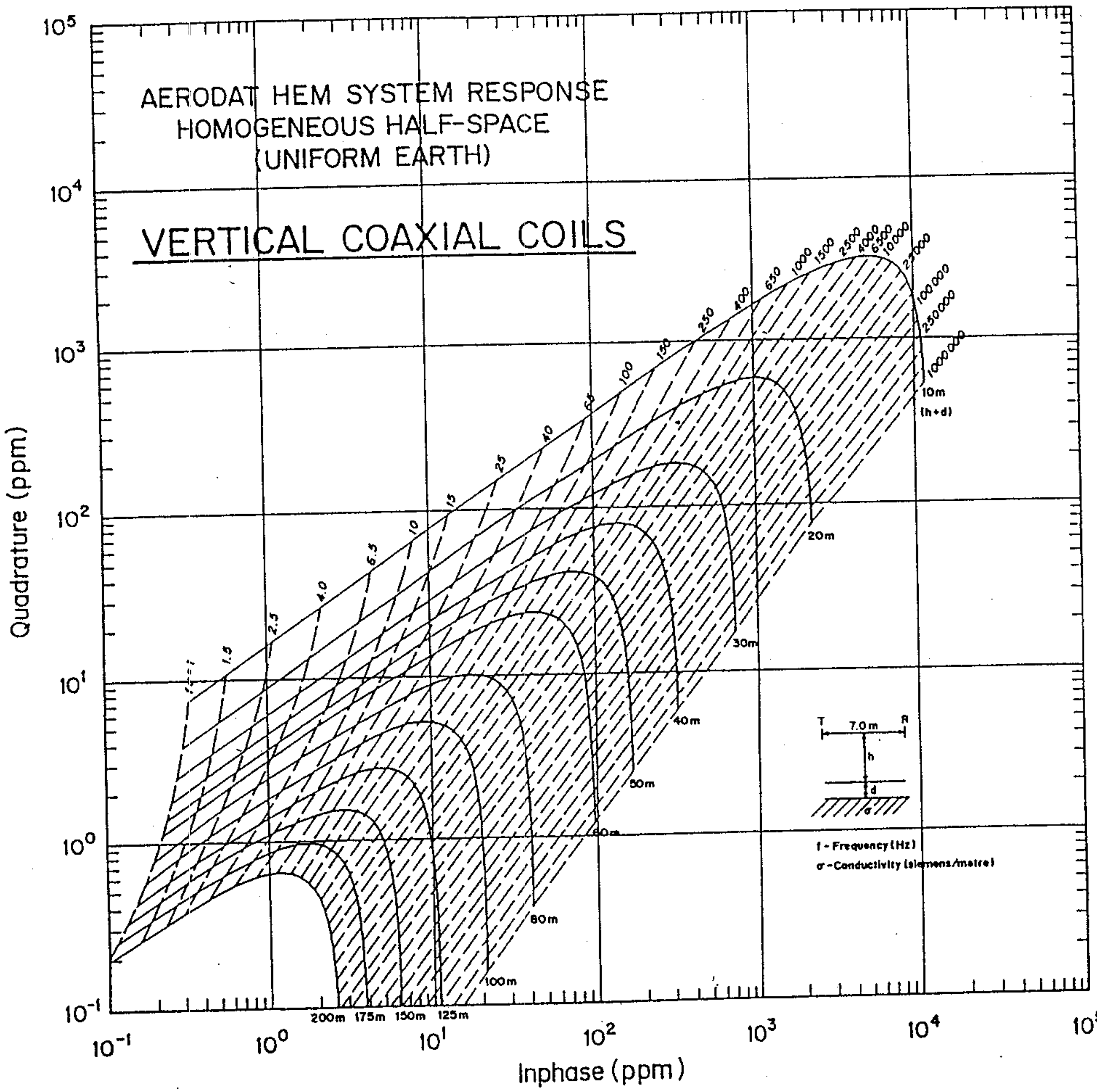
For a given conductive body the measure of its conductivity or conductance is closely related to the measured phase shift between the received and transmitted electromagnetic field. A small phase shift indicates a relatively high conductance, a large phase shift lower conductance. A small phase shift results in a large inphase to quadrature ratio and a large phase shift a low ratio. This relationship is shown quantitatively for a non-magnetic vertical half-plane and half space models on the accompanying phasor diagrams. Other physical models will show the same trend but different quantitative relationships

The phasor diagram for the vertical half-plane model, as presented, is for the coaxial coil configuration with the amplitudes in parts per million (ppm) of the primary field as measured at the response peak over the conductor. To assist the interpretation of the survey results the computer is used to identify the apparent conductance and depth at selected anomalies. The results of this calculation are presented in anomaly listings included in the survey report and the conductance and inphase amplitude are presented in symbolized form on the map presentation.

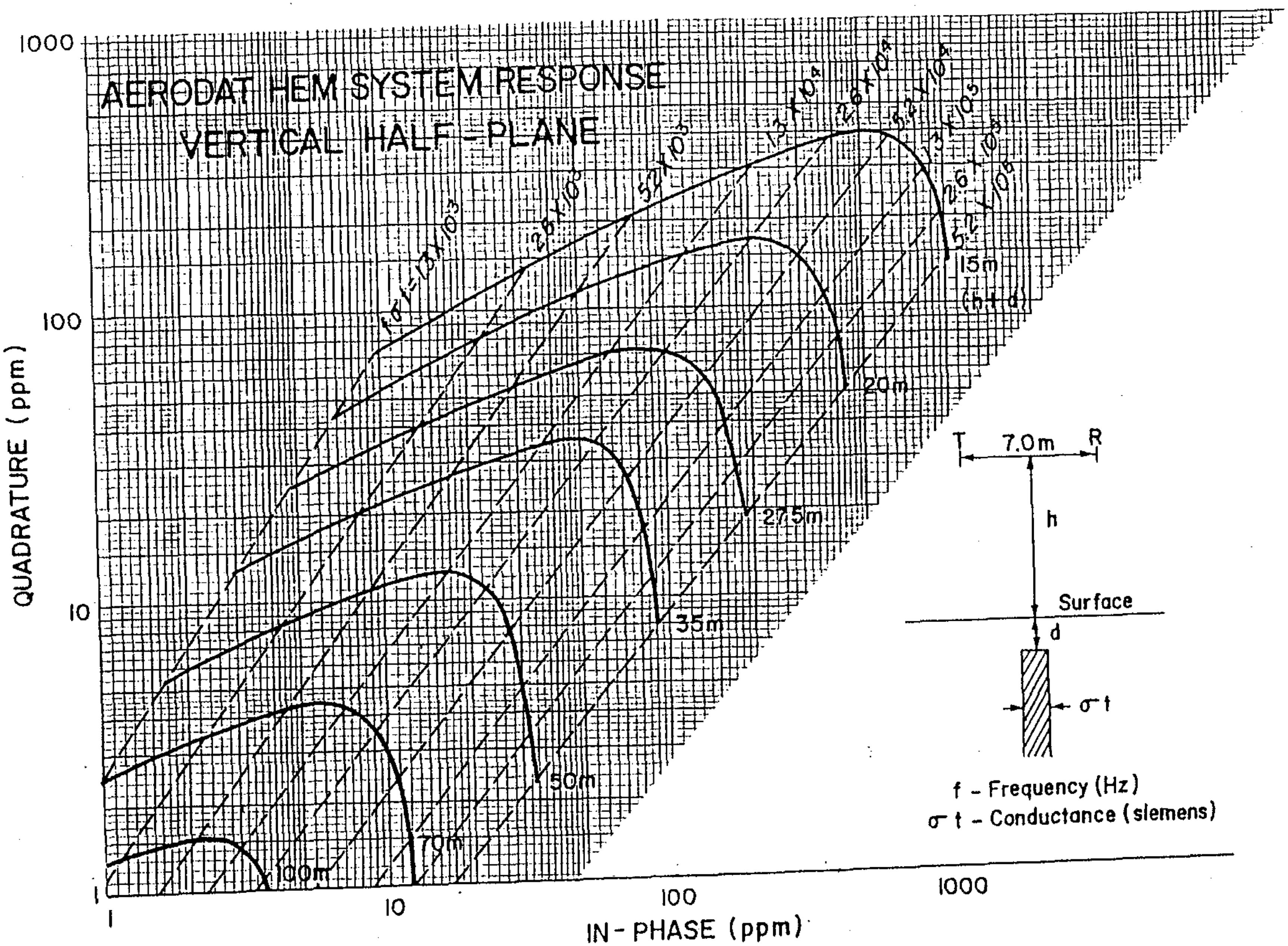
The conductance estimate is most reliable when anomaly amplitudes are large and background resistivities are high. Where the anomaly is of low amplitude and background resistivities are low, the conductance estimates are much less reliable. In such situations, the conductance estimate is often quite low regardless of the true nature of the conductor. This is due to the elevated background response levels in the quadrature channel. In an extreme case, the conductance estimate should be discounted and should not prejudice target selection.



AERODAT HEM SYSTEM RESPONSE
HOMOGENEOUS HALF-SPACE
(UNIFORM EARTH)
HORIZONTAL COPLANAR COILS
Quadrature (ppm)
Inphase (ppm)
10 m (h+d)
20m
30m
40m
50m
60m
80m
100m
125m
150m
175m
200m
T 7.0m R
h
d
f - Frequency (Hz)
σ - Conductivity (siemens/metre)



AERODAT HEM SYSTEM RESPONSE
HOMOGENEOUS HALF-SPACE
(UNIFORM EARTH)
VERTICAL COAXIAL COILS
Quadrature (ppm)
Inphase (ppm)
10m
(h+d)
20m
30m
40m
50m
60m
80m
100m
125m
150m
175m
200m
f·σ=1
1.5
2.5
4.0
6.5
10
15
25
40
65
100
150
250
400
650
1000
1500
2500
4000
6500
10000
25000
100000
250000
1000000
T
7.0m
R
h
d
σ
f - Frequency (Hz)
σ - Conductivity (siemens/metre)



AERODAT HEM SYSTEM RESPONSE
VERTICAL HALF-PLANE
QUADRATURE (ppm)
IN-PHASE (ppm)
1000
100
10
1
1
10
100
1000
15m
(h+d)
20m
27.5m
35m
50m
70m
100m
T
7.0m
R
h
Surface
d
σ t
f - Frequency (Hz)
σ t - Conductance (siemens)

The conductance and depth vales as presented are correct only as far as the model approximates the real geological situation. The actual geological source may be of limited length, have significant dip, may be strongly magnetic. Its conductivity and thickness may vary with depth and/or strike and adjacent bodies and overburden may have modified the response. In general the conductance estimate is less affected by these limitations than is the depth estimate, but both should be considered as relative rather than absolute guides to the anomaly's properties.

Conductance in mhos is the reciprocal of resistance in ohms and in the case of narrow slab-like bodies is the product of electrical conductivity and thickness.

The higher ranges of conductance, greater than 2-4 mhos, indicate that a significant fraction of the electrical conduction is electronic rather than electrolytic in nature. Materials that conduct electronically are limited to certain metallic sulphides and to graphite. High conductance anomalies, roughly 10 mhos or greater, are generally limited to massive sulphides or graphites.

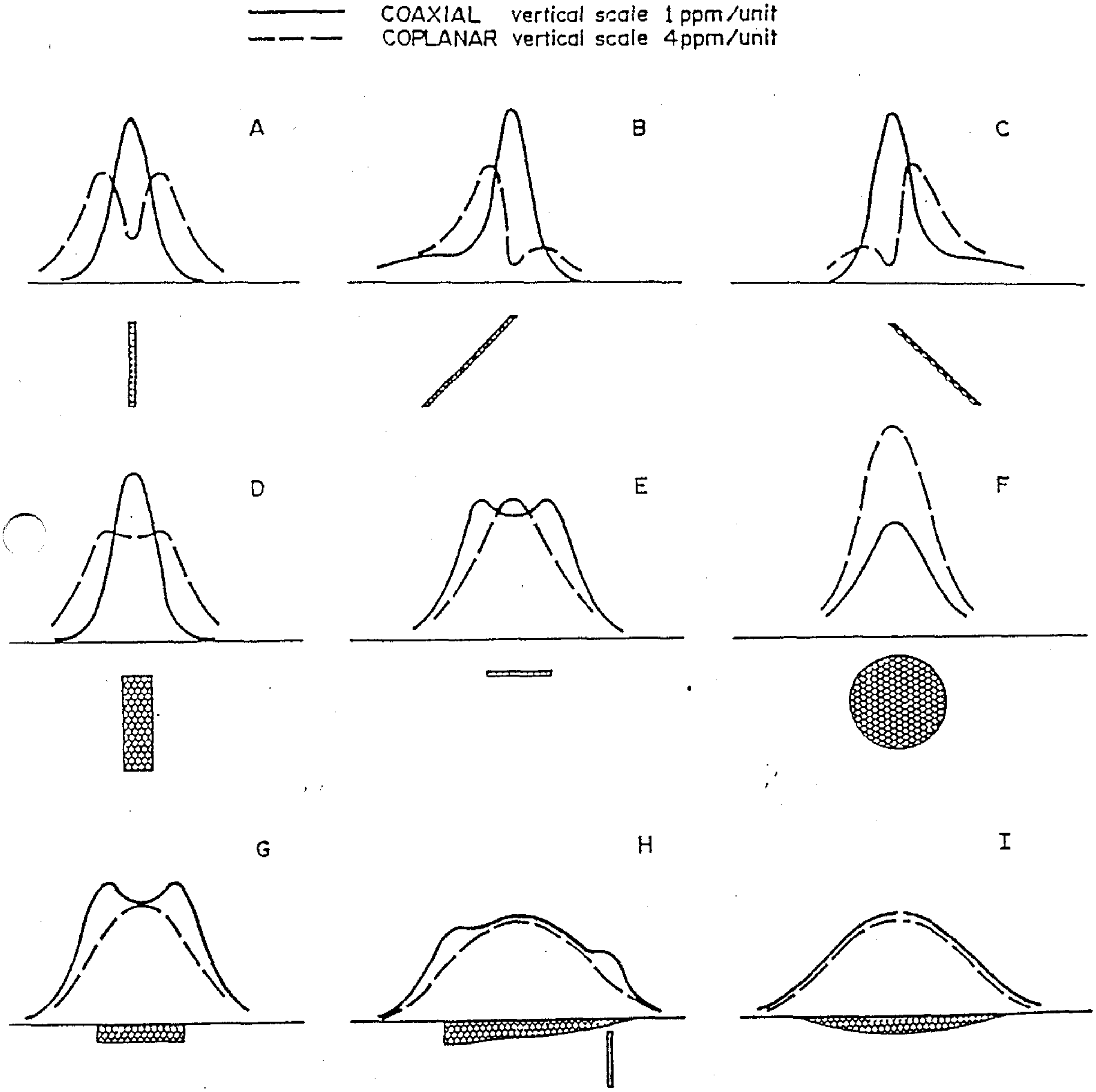
Sulphide minerals, with the exception of such ore minerals as sphalerite, cinnabar and stibnite, are good conductors. Sulphides may occur in a disseminated manner that inhibits electrical conduction through the rock mass. In this case the apparent conductance can seriously underrate the quality of the conductor in geological terms. In a similar sense the relatively non-conducting sulphide minerals noted above may be present in significant concentrations in association with minor conductive sulphides, and the electromagnetic response will only relate to the minor associated mineralization. Indicated conductance is also of little direct significance for the identification of gold mineralization. Although gold is highly conductive, it would not be expected to exist in sufficient quantity to create a recognizable anomaly. Minor accessory sulphide mineralization may however provide a useful indirect indication.

In summary, the estimated conductance of a conductor can provide a relatively positive identification of significant sulphide or graphite mineralization. A moderate to low conductance value does not rule out the possibility of significant economic mineralization.

Geometrical Considerations

Geometrical information about the geologic conductor can often be interpreted from the profile shape of the anomaly. The change in shape is primarily related to the change in inductive coupling among the transmitter, the target, and the receiver. The accompanying figure shows a selection of HEM response profile shapes from nine idealized targets. Response profiles are labelled A through I. These labels are used in the discussion which follows.

HEM RESPONSE PROFILE SHAPE AS AN INDICATOR OF CONDUCTOR GEOMETRY



In the case of a thin, steeply dipping, sheet-like conductor, the coaxial coil pair will yield a near symmetric peak over the conductor. On the other hand, the coplanar coil pair will pass through a null couple relationship and yield a minimum over the conductor, flanked by positive side lobes (Profile A). As the dip of the conductor decrease from vertical, the coaxial anomaly shape changes only slightly, but in the case of the coplanar coil pair the side lobe on the down dip side strengthens relative to that on the up dip side (Profiles B and C).

As the thickness of the conductor increases, induced current flow across the thickness of the conductor becomes relatively significant and complete null coupling with the coplanar coils is no longer possible (Profile D). As a result, the apparent minimum of the coplanar response over the conductor diminishes with increasing thickness, and in the limiting case of a fully 3 dimensional body or a horizontal layer or half-space, the minimum disappears completely.

A horizontal conducting layer such as a horizontal thin sheet or overburden will produce a response in the coaxial and coplanar coils that is a function of altitude (and conductivity if not uniform). The profile shape will be similar in both coil configurations with an amplitude ratio (coplanar:coaxial) of about 4:1* (Profiles E and G).

In the case of a spherical conductor, the induced currents are confined to the volume of *the sphere, but not relatively restricted to any arbitrary plane as in the case of a sheet-like* form. The response of the coplanar coil pair directly over the sphere may be up to 8* times greater than that of the coaxial pair (Profile F).

In summary, a steeply dipping, sheet-like conductor will display a decrease in the coplanar response coincident with the peak of the coaxial response. The relative strength of this coplanar null is related inversely to the thickness of the conductor. A pronounced null indicates a relatively thin conductor. The dip of such a conductor can be inferred from the relative amplitudes of the side-lobes.

Massive conductors that could be approximated by a conducting sphere will display a simple single peak profile form on both coaxial and coplanar coils, with a ratio between the coplanar to coaxial response amplitudes as high as 8*.

Overburden anomalies often produce broad poorly defined anomaly profiles (Profile I). In most cases, the response of the coplanar coils closely follows that of the coaxial coils with a relative amplitude ration of 4*.

Occasionally, if the edge of an overburden zone is sharply defined with some significant depth extent, an edge effect will occur in the coaxial coils. In the case of a horizontal conductive ring or ribbon, the coaxial response will consist of two peaks, one over each edge; whereas the coplanar coil will yield a single peak (Profile H).

* It should be noted at this point that Aerodat's definition of the measured ppm unit is related to the primary field sensed in the receiving coil without normalization to the maximum coupled (coaxial configuration). If such normalization were applied to the Aerodat units, the amplitude of the coplanar coil pair would be halved.

Magnetics

The Total Field Magnetic Map shows contours of the total magnetic field, uncorrected for regional variation. Whether an EM anomaly with a magnetic correlation is more likely to be caused by a sulphide deposit than one without depends on the type of mineralization. An apparent coincidence between an EM and a magnetic anomaly may be caused by a conductor which is also magnetic, or by a conductor which lies in close proximity to a magnetic body. The majority of conductors which are also magnetic are sulphides containing pyrrhotite and/or magnetite. Conductive and magnetic bodies in close association can be, and often are, graphite and magnetite. It is often very difficult to distinguish between these cases. If the conductor is also magnetic, it will usually produce an EM anomaly whose general pattern resembles that of the magnetics. Depending on the magnetic permeability of the conducting body, the amplitude of the inphase EM anomaly will be weakened, and if the conductivity is also weak, the inphase EM anomaly may even be reversed in sign.

The interpretation of contoured aeromagnetic data is a subject on its own involving an array of methods and attitudes. The interpretation of source characteristics for example from total field results is often based on some numerical modelling scheme. The vertical gradient data is more legible in some aspects however and useful inferences about source characteristics can often be read off the contoured VG map.

The zero contour lines in contoured VG data are often sited as a good approximation to the outline of the top of the magnetic source. This only applies to wide (relative to depth of burial) near vertical sources at high magnetic latitudes. It will give an incorrect interpretation in most other cases.

Theoretical profiles of total field and vertical gradient anomalies from tabular sources at a variety of magnetic inclinations are shown in the attached figure. Sources are 10, 50 and 200 m wide. The source-sensor separation is 50 m. The thin line is the total field profile. The thick line is the vertical gradient profile.

The following comments about source geometry apply to contoured vertical gradient data for magnetic inclinations of 70 to 80°.

Outline

Where the VG anomaly has a single sharp peak, the source may be a thin near-vertical tabular source. It may be represented as a magnetic axis or as a tabular source of measurable width - the choice is one of geological preference.

Where the VG anomaly has a broad, flat or inclined top, the source may be a thick tabular source. It may be represented as a thick body where the width is taken from the zero contour lines if the body dips to magnetic north. If the source appears to be dipping to the south (i.e. the VG anomaly is asymmetric), the zero contours are less reliable indicators of outline. The southern most zero contour line should be ignored and the outline taken from the northern zero contour line and the extent of the anomaly peak width.

Dip

A symmetrical vertical gradient response is produced by a body dipping to magnetic north. An asymmetrical response is produced by a body which is vertical or dipping to the south. For southern dips, the southern most zero contour line may be several hundred meters south of the source.

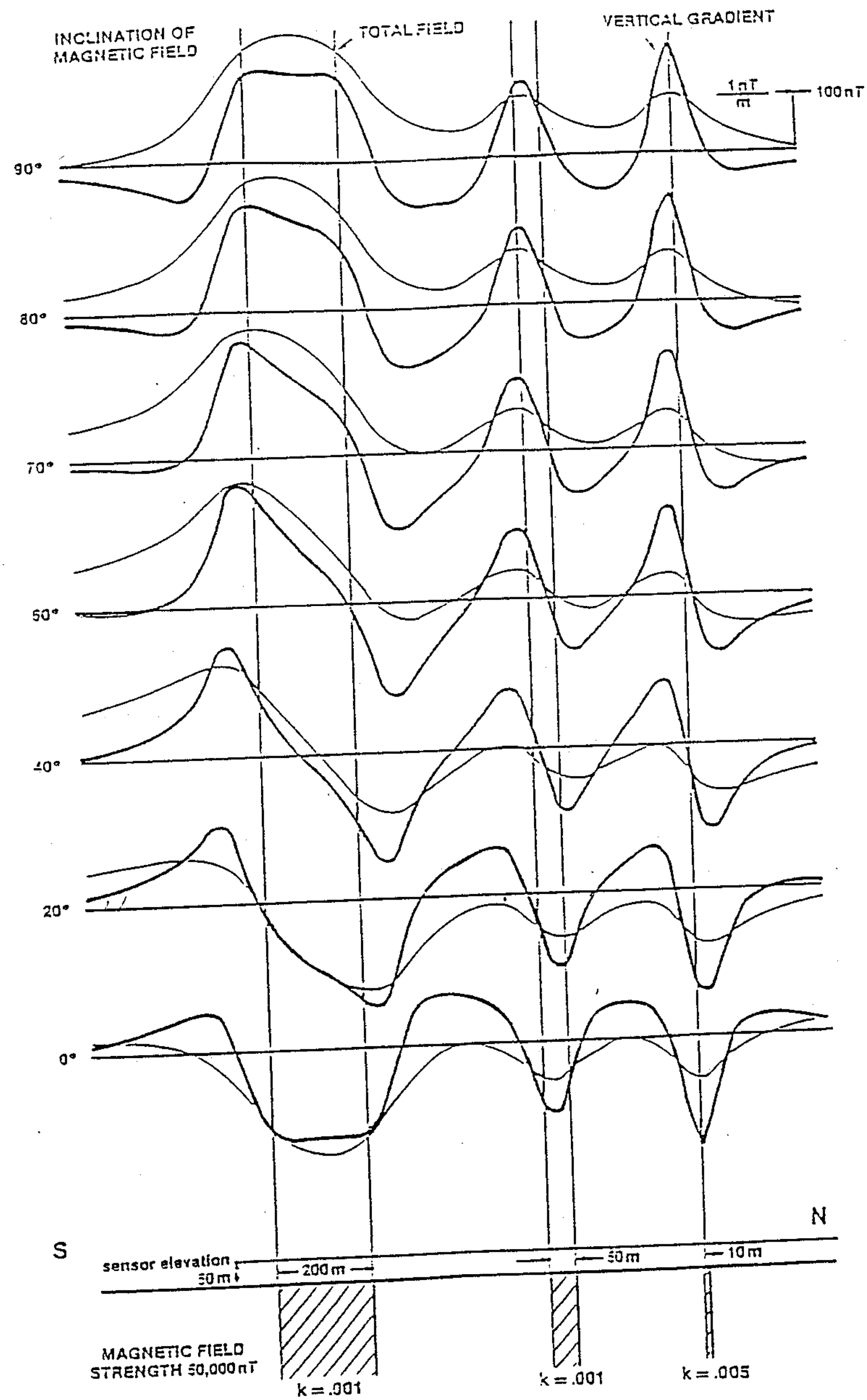
Depth of Burial

The source-sensor separation is about equal to half of the distance between the zero contour lines for thin near-vertical sources. The estimated depth of burial for such sources is this separation minus 50 m. If a variety of VG anomaly widths are seen in an area, use the narrowest width seen to estimate local depths.

VLF Electromagnetics

The VLF-EM method employs the radiation from powerful military radio transmitters as the primary signals. The magnetic field associated with the primary field is locally horizontal and normal to a line pointing at the transmitter.

The Herz Totem uses three coils in the X, Y, Z configuration to measure the total field and vertical quadrature component from two VLF stations. These stations are designated Line and Ortho. The line station is ideally in a direction from the survey area at right angles to the flight line direction. Conductors normal to the flight line direction point at the line station and are therefore optimally coupled to VLF magnetic fields and in the best situation to gather secondary VLF currents. The ortho station is ideally 90 degrees in azimuth from the line station.


INCLINATION OF MAGNETIC FIELD
TOTAL FIELD
VERTICAL GRADIENT
1 nT / m
100 nT
90°
80°
70°
60°
40°
20°
0°
S
N
sensor elevation
50 m
200 m
50 m
10 m
MAGNETIC FIELD STRENGTH 50,000 nT
k = .001
k = .001
k = .005

The vertical quadrature component over steeply dipping sheet-like conductor will be a cross-over type response with the cross-over closely associated with the upper edge of the conductor.

The response is a cross-over type due to the fact that it is the vertical rather than total field quadrature component that is measured. The response shape is due largely to geometrical rather than conductivity considerations and the distance between the maximum and minimum on either side of the cross-over is related to target depth. For a given target geometry, the larger this distance the greater the depth.

The vertical quadrature component is rarely presented. Experience has shown the total field to be more sensitive to bedrock conductors and less affected by variations in conductive overburden.

Apparent Resistivity/Conductivity Maps

Overburden and different types of bedrock may be modelled as a large area horizontal conductor of fixed thickness. A phasor diagram may be constructed, in the same fashion as for the vertical sheet, to convert the measured HEM in-phase and quadrature response to a depth and conductivity value for a horizontal layer. Traditionally if the thickness is large, an infinite half-space, the associated conductivity value is referred to as "apparent conductivity". We have generalized the use of the word "apparent" to include any model where the thickness of the layer is a fixed as opposed to a variable parameter. The units of apparent resistivity are ohm-m and those of apparent conductivity are the inverse mhos/m or siemen/m. If the chosen model layer thickness is close to the true thickness of the conductor then the apparent conductivity will closely conform to the true value; however, if the thickness is inappropriate the apparent value may be considerably different from the true value.

The benefit of the apparent conductivity mapping is that it provides a simple robust method of converting the HEM in-phase and quadrature response to apparent change in ground conductivity.

A phasor diagram for several apparent resistivity models is presented. The general forms for the various thicknesses is very similar and also closely resembles the diagram for the vertical sheet. The diagrams also show the curves for apparent depth. As with the conductivity value the depth value is meaningful if the model thickness closely resembles the true conductive layer thickness. If the HEM response from a thin conducting layer is applied to a thick layer model the apparent conductivity and depth will be less than the true conductivity and depth.

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FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
8	20010	A/	1	37.1	44.4	1.3	0	38	605976.0	6357653.0
8	20010	B/	0	12.4	33.6	0.2	0	32	605992.6	6355342.0
8	20010	C/	0	26.7	72.5	0.4	0	20	605989.8	6354918.0
8	20010	D/	0	29.0	50.5	0.7	0	30	605977.7	6354548.5
8	20010	E/	0	39.0	86.5	0.6	0	21	605997.4	6354253.5
8	20020	A/	0	38.1	64.2	0.8	0	31	606225.8	6354089.0
8	20020	B/	0	33.6	59.9	0.7	0	32	606194.6	6354288.5
8	20020	C/	0	25.9	58.8	0.4	0	31	606213.4	6354807.5
8	20030	A/	0	14.0	28.1	0.4	0	38	606409.1	6356109.5
8	20030	B/	0	26.3	75.4	0.3	0	23	606383.6	6355713.5
8	20030	C/	0	23.6	61.6	0.3	0	26	606382.7	6355604.5
8	20030	D/	0	16.9	44.5	0.3	0	25	606375.3	6355438.5
8	20030	E/	0	6.2	21.0	0.1	0	32	606356.8	6355140.5
9	20041	A/	0	19.7	51.1	0.3	0	36	606615.5	6354168.0
9	20050	A/	0	24.9	59.9	0.4	0	26	606798.4	6355699.5
9	20060	A/	0	7.8	29.7	0.1	0	32	607024.6	6356385.0
9	20060	B/	0	14.8	34.3	0.3	1	28	607026.6	6356040.5
2	20080	A/	0	4.3	24.2	0.0	0	40	607403.0	6356596.0
2	20100	A/	0	10.1	34.3	0.1	0	29	607789.4	6356935.0
2	20110	A/	0	27.9	38.3	0.9	0	47	608015.2	6349993.0
2	20110	B/	1	32.3	40.4	1.1	0	39	607991.4	6350199.0
2	20110	C/	0	19.8	50.0	0.3	0	36	608001.5	6352114.5
2	20120	A/	0	5.3	33.2	0.0	0	31	608243.1	6356736.0
2	20120	B/	0	9.6	45.4	0.1	0	33	608211.4	6353411.5
2	20120	C/	1	72.9	127.0	1.0	0	22	608213.4	6350182.0
2	20120	D/	1	48.9	75.0	1.0	0	30	608213.9	6349989.0
2	20130	A/	1	46.9	67.3	1.1	0	31	608364.5	6349981.5
2	20130	B/	1	59.3	84.9	1.2	0	33	608393.0	6350247.5
2	20130	C/	0	20.7	28.0	0.8	0	53	608392.8	6351632.5
2	20130	D/	0	15.7	43.7	0.3	0	42	608397.9	6352037.5
2	20130	E/	0	1.6	23.4	0.0	0	40	608398.6	6353587.0
2	20130	F/	0	-0.3	20.9	0.0	0	25	608371.1	6355543.5
2	20130	G/	0	8.2	26.6	0.1	0	44	608386.1	6356735.5
2	20130	H/	0	7.5	23.4	0.1	0	41	608383.1	6356915.5

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

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FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
2	20140	A/	0	3.7	24.9	0.0	0	30	608606.7	6356980.0
2	20140	B/	0	9.7	38.7	0.1	0	28	608611.6	6356755.5
2	20140	C/	1	67.3	111.7	1.0	0	22	608601.7	6351299.5
2	20140	D/	1	77.2	107.5	1.3	0	30	608605.8	6349981.5
2	20150	A/	0	7.5	21.3	0.2	0	42	608800.6	6356805.5
2	20150	B/	0	6.4	22.1	0.1	0	39	608807.1	6356888.5
2	20160	A/	0	4.4	22.3	0.0	0	28	608993.4	6356886.5
2	20160	B/	0	4.9	29.4	0.0	0	23	608988.9	6356747.0
2	20160	C/	0	5.5	18.1	0.1	0	36	608974.6	6352531.5
2	20160	D/	1	121.1	173.8	1.5	0	23	608991.9	6350563.0
2	20170	A/	1	56.0	68.6	1.4	0	35	609184.8	6350611.5
2	20170	B/	0	9.5	21.0	0.3	0	44	609192.7	6351675.5
2	20170	C/	0	6.0	22.0	0.1	0	34	609203.1	6356973.0
2	20180	A/	0	5.4	19.9	0.1	0	30	609399.9	6356830.0
2	20180	B/	0	5.9	22.6	0.1	2	27	609395.1	6355720.0
2	20180	C/	3	46.8	21.9	4.7	5	33	609401.6	6355597.0
3	20191	A/	0	2.1	16.1	0.0	0	45	609577.0	6354665.5
3	20191	B/	0	3.3	16.7	0.0	0	49	609583.4	6354460.0
3	20192	A/	0	3.0	24.1	0.0	0	25	609580.2	6356078.5
9	20200	A/	0	1.0	24.3	0.0	0	27	609803.4	6356091.5
9	20200	B/	0	47.5	107.1	0.6	0	29	609795.9	6350319.5
9	20210	A/	0	22.9	43.0	0.6	0	42	609952.3	6350059.0
9	20210	B/	0	23.9	55.8	0.4	0	32	609978.6	6350520.5
9	20210	C/	0	11.7	37.3	0.2	0	38	609981.7	6351394.0
9	20211	A/	0	2.1	34.1	0.0	0	25	610017.2	6356368.5
9	20220	A/	0	0.3	17.7	0.0	0	27	610222.8	6357289.0
9	20220	B/	0	4.6	26.2	0.0	0	34	610238.3	6356441.0
9	20220	C/	0	2.3	25.6	0.0	0	30	610236.2	6356277.5
9	20220	D/	0	3.6	34.1	0.0	0	28	610240.8	6356084.5
9	20220	E/	0	1.8	34.5	0.0	0	25	610232.5	6355963.5
9	20220	F/	0	-0.5	15.5	0.0	0	43	610218.2	6355068.5
9	20220	G/	0	21.4	65.6	0.3	0	34	610217.4	6350656.0
9	20230	A/	0	2.6	29.9	0.0	0	33	610423.6	6353061.0

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

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FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
9	20240	A/	0	4.1	19.0	0.0	0	36	610591.4	6356397.5
9	20240	B/	0	-1.5	12.5	0.0	0	37	610603.6	6354718.5
9	20240	C/	0	12.1	61.4	0.1	0	21	610657.5	6351038.0
9	20240	D/	0	9.0	57.4	0.0	0	23	610627.8	6350789.5
9	20250	A/	0	0.5	12.5	0.0	0	45	610809.6	6354610.5
9	20260	A/	0	-4.8	10.9	0.0	0	46	611021.3	6356383.5
9	20260	B/	0	5.2	17.9	0.1	0	50	611035.8	6354514.5
9	20260	C/	0	8.6	30.5	0.1	1	25	610998.1	6349936.0
9	20270	A/	0	8.0	39.1	0.1	0	28	611208.3	6354534.0
9	20270	B/	0	-8.7	15.2	0.0	0	32	611192.1	6356307.5
3	20280	A/	0	4.9	30.2	0.0	0	23	611399.0	6350822.0
3	20280	B/	0	15.1	29.8	0.4	0	36	611392.2	6354328.5
3	20280	C/	0	-8.9	23.3	0.0	0	25	611417.7	6356151.0
3	20280	D/	0	-3.6	19.7	0.0	0	30	611391.3	6356700.5
3	20280	E/	0	15.3	83.4	0.1	0	28	611398.3	6357240.5
3	20290	A/	0	-3.6	23.9	0.0	0	30	611583.1	6357144.5
3	20290	B/	0	1.8	17.0	0.0	0	41	611568.6	6356689.0
3	20290	C/	0	11.6	27.4	0.3	0	34	611606.6	6353573.0
3	20300	A/	0	2.9	15.2	0.0	0	40	611802.6	6356634.0
3	20310	A/	0	-1.8	8.1	0.0	0	35	612009.3	6356649.0
3	20310	B/	0	12.4	30.1	0.3	0	31	611992.5	6353100.5
9	20320	A/	0	0.3	16.9	0.0	0	34	612210.8	6353868.5
9	20330	A/	0	6.1	24.7	0.1	0	38	612350.5	6353019.5
10	20340	A/	0	-4.0	7.4	0.0	0	47	612592.4	6353834.5
10	20340	B/	0	-4.7	6.5	0.0	0	41	612594.6	6353631.0
10	20351	A/	0	-9.4	23.9	0.0	0	19	612847.8	6353404.5
10	20360	A/	0	-12.3	15.5	0.0	0	27	613026.8	6353342.5

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

IN ND EXPLORATION CORP. -- LAWYERS BLOCK

MALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
	0	4.1	19.0	0.0	0	36	610591.4	6356397.5
	0	-1.5	12.5	0.0	0	37	610603.6	6354718.5
	0	12.1	61.4	0.1	0	21	610657.5	6351038.0
	0	9.0	57.4	0.0	0	23	610627.8	6350789.5
	0	0.5	12.5	0.0	0	45	610809.6	6354610.5
	0	-4.8	10.9	0.0	0	46	611021.3	6356383.5
	0	5.2	17.9	0.1	0	50	611035.8	6354514.5
	0	8.6	30.5	0.1	1	25	610998.1	6349936.0
	0	8.0	39.1	0.1	0	28	611208.3	6354534.0
	0	-8.7	15.2	0.0	0	32	611192.1	6356307.5
	0	4.9	30.2	0.0	0	23	611399.0	6350822.0
	0	15.1	29.8	0.4	0	36	611392.2	6354328.5
	0	-8.9	23.3	0.0	0	25	611417.7	6356151.0
	0	-3.6	19.7	0.0	0	30	611391.3	6356700.5
	0	15.3	83.4	0.1	0	28	611398.3	6357240.5
	0	-3.6	23.9	0.0	0	30	611583.1	6357144.5
	0	1.8	17.0	0.0	0	41	611568.6	6356689.0
	0	11.6	27.4	0.3	0	34	611606.6	6353573.0
	0	2.9	15.2	0.0	0	40	611802.6	6356634.0
	0	-1.8	8.1	0.0	0	35	612009.3	6356649.0
	0	12.4	30.1	0.3	0	31	611992.5	6353100.5
	0	0.3	16.9	0.0	0	34	612210.8	6353868.5
	0	6.1	24.7	0.1	0	38	612350.5	6353019.5
	0	-4.0	7.4	0.0	0	47	612592.4	6353834.5
	0	-4.7	6.5	0.0	0	41	612594.6	6353631.0
	0	-9.4	23.9	0.0	0	19	612847.8	6353404.5
	0	-12.3	15.5	0.0	0	27	613026.8	6353342.5

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may be deeper or to one side of the flight
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AIR SURVEY RESULTS

IN THE TOODOGGONE RIVER REGION,

B.C.

for

ANTARES MINING AND EXPLORATION CORP.

by

J. B. Boniwell

Exploration Geophysical Consultant

February 10, 1998

EXCALIBUR INTERNATIONAL CONSULTANTS LTD.

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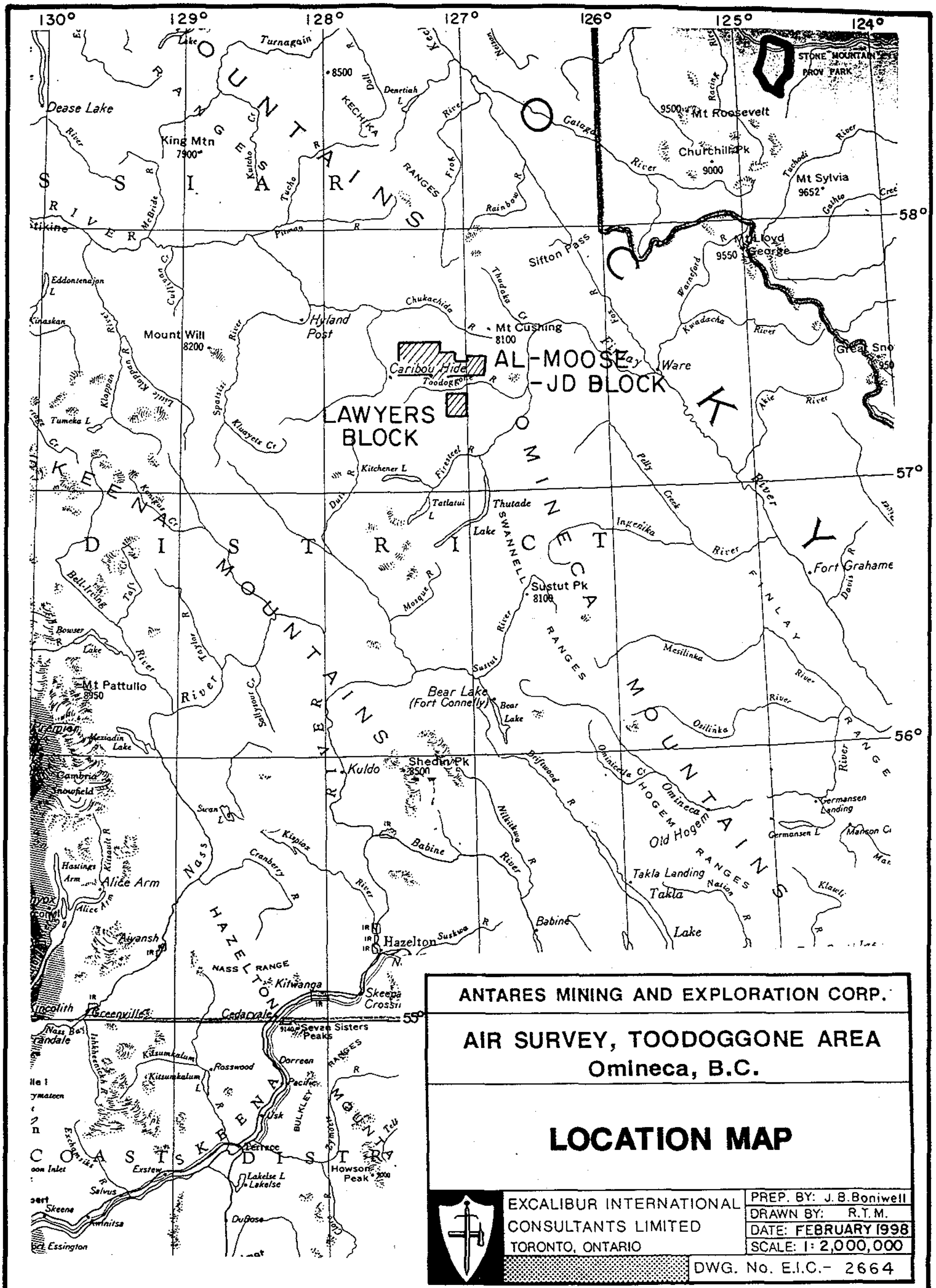
INTRODUCTION

Two tracts of ground in the Toodoggone district of B.C. have been overflown in survey by a multi-sensor helicopter-mounted geophysical system. This work was carried out in the summer of 1997, complementing several years of prior exploration on the ground. The target here is polymetallic mineralization in the presumed context of major porphyry or other intrusions. The country rocks are undifferentiated volcanics of Triassic to Jurassic age.

The results of the air survey form the subject of this report. They are evaluated herein not just for their specific metallic pertinence but also for what they may grant in the way of understanding regional mineral incidence, controls, and genesis.



ANTARES MINING AND EXPLORATION CORP.

AIR SURVEY, TOODOGGONE AREA
Omineca, B.C.

LOCATION MAP

EXCALIBUR INTERNATIONAL CONSULTANTS LIMITED
TORONTO, ONTARIO

PREP. BY:	J.B.Boniwell
DRAWN BY:	R.T.M.
DATE:	FEBRUARY 1998
SCALE:	1: 2,000,000

DWG. No. E.I.C.- 2664

FUNDAMENTALS OF SURVEY

The two survey blocks of ground lie approximately 2.5 kms apart, separated by the Toodoggone River here flowing west to east. They are identified as the AL-Moose-JD Block, it the more northerly and the larger, and the Lawyers Block situated centrally to the south (Dwg. No EIC-2664). Both are rugged topographically with elevation changes of 600-900 m internally at an average 1600 m above mean sea level.

Primary coverage was attained on flight lines nominally spaced 200 m apart and oriented due N-S. The two blocks were similarly surveyed, with the exception of some in-fill flying at 100 m line spacing through two separate sectors within the AL-Moose-JD Block. These in-fill areas are known as BONANZA and FINN.

On survey, the helicopter sought to maintain a 60 m mean terrain clearance. The towed bird housing the em system is designed to fly 30 m below the aircraft; thus 30 m above the ground. In the conditions of a rugged terrain which characterize the two survey blocks, deviations from the norm have to be expected. Aircraft altitude and positioning were carried out electronically and digitally recorded synchronously with the geophysical measurements.

The sensing systems actually flown were em, in two coil configurations, total field magnetics, and differential radiometrics. The survey was flown under contract by Aerodat Inc. of Mississauga, Ontario and was completed in the period 17-31 August, 1997. Details of operation and equipment specifications can be had from the contractor's report accompanying delivery of final maps and archival data files. The total coverage amounted to 1585 line kms including tie lines.

POSITIONING

There are evident discrepancies in positioning. This is not a matter of navigation and real-time processing but one of map representation and reproduction. The Aerodat maps are devoid of topographic feature and internal UTM co-ordinates. Those which are provided at map edges do not measure up according to scale (1:20,000). This is typically due to paper stretch and is not a major problem so long as all Aerodat maps are the same -- and they are --and subsequent maps based on the Aerodat data are shown relative to the Aerodat survey area outline. This is the approach adopted.

Unfortunately an awkwardness arises when trying to introduce the drainages of the area. These come from government topo maps published at 1:20,000 scale which, not surprisingly, are more accurate. Thus to place the various streams and pondages on the current interpretation map calls for some juggling which would be infinite in degree if an exact fit were demanded everywhere. Such exercise is not undertaken here. Instead the shown drainages on all interpretation maps should be accepted and regarded as approximate locations only, the same for the posted co-ordinates. They are considered close enough for all practical purposes at this stage of investigation.

ELECTROMAGNETIC CONSIDERATIONS

Two coil geometries have been flown, viz. co-axial and coplanar. The separation between coil pairs, that is between transmitter and receiver in effect, for 5 frequencies remains the same (at 6.4 m). Each geometry has its particular functions and place in exploration.

a) Co-axial

Response anomalies from this configuration tend to derive from localized and steeply dipping sources. Conductive massive sulphide bodies and vein mineralization generally fall in this category. In the present study, priority is granted these data for survey wide screening, especially at the medium frequency of 4600 Hz where the countervailing demands of source coupling and depth of penetration are met reasonably well. At the high frequency (32 kHz), response is mostly surficial and overwhelming. At the low frequency (865 Hz), penetration below surface is superior but at the cost of coupling, that is of an energizing capability with a potential source. It is notable for instance that through the area many of the anomalies picked up at 4600 Hz are down-graded dramatically or altogether disappear at 865 Hz. An exceptional example of this is provided by flight line 20280 in the Lawyers Block. Towards the north end of the line, at fiducial 202422, a substantial in-phase anomaly at 4600 Hz is reduced to nothing at 935 Hz. All that is left is a heavily moderated out-of-phase excursion, an event of no apparent consequence. Strange as it may seem, all this is normal.

These changes mostly take place in the in-phase component, it is emphasized. Out of phase anomalies by themselves are poor quality events inherently. They arise from in-overburden sources (e.g. wet clays), and from surficial weathering and alteration products; they can also stem from bedrock sources of low conductivity, such as fault gouge and thinly developed argillaceous units. It is thus noteworthy that the west half of the area contains more anomaly than the east, especially in the HUMP sector. Hence perceptible increases in any or all of the above cited causes can be expected there.

Another response source in the area is magnetite. When in sufficient concentration locally, it provides a marked negative departure in the in-phase component which is not reflected in the out-of-phase; the latter may respond positively in correspondence or be neutral. The negative in-phase response notably increases in magnitude with decreasing em frequency. These type anomalies commonly indicate magnetite segregations in and around mafic to ultramafic intrusions, or in faults. Magnetitic iron formations are improbable in this environment.

Some noise resides in the data. This appears in the in-phase low frequency profiles specifically and is erratically distributed. It mainly but not entirely falls outside the in-fill areas BONANZA and FINN. Operational in nature, it is plainly system noise due evidently to some instability in the low frequency coil pair. No correction can be or ought to be applied to the affected sections. Happily these do not bear too heavily on the area as a whole, and not at all on the data at other frequencies.

b) Coplanar

Since the coplanar configuration is also a horizontal one (nominally), it responds best to flat lying sources. Thus data from these coils are used to calculate apparent resistivities, since the model used is that of a layered earth. This model approximates actual conditions over short flight sections only in this terrain and in this type geology. The result, as shown, is a plan contouring of the surveyed area for two of the three frequencies applied (4175, 865 Hz).

Excluding the sections of low frequency noise as recognized above, there is no major difference between outputs except one of degree. The highs are higher and the lows are lower at the higher frequency, and perhaps enlarged a bit, but the general features remain essentially comparable. What is important is the fact that there is direct correlation between resistivity high and topographic high for most of the survey area. This implies that outcrop or sub-crop dominate the data, and rather irrespective of lithology. Notwithstanding, the resistivity maps are useful in helping to detect and delineate fault structures, point to possible alteration products in places and to bring a further perspective to changes across the area.

In this latter regard, it is seen that the eastern quarter is about 10 times more resistive than the western. On this basis and as a generalization, it is supposed that a felsic intrusion underlies the east and that a combination of altered country rocks, weathering and overburden constitutes the west.

[In passing here, it is deplored that these resistivity presentations use an inverse colour coding. For virtually any other parameter in geophysics: it is the norm that relative highs be shown in warm colours, oranges and reds, the opposing lows in

ANTARES MINING AND EXPLORATION CORP. -- AL-MOOSE-JD BLOCK

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
28	40120	F/	0	5.7	34.9	0.0	0	23	610176.1	6367294.0
28	40130	A/	0	2.8	21.3	0.0	0	24	610385.8	6367269.5
28	40140	A/	0	3.9	29.5	0.0	1	20	610590.1	6368313.0
28	40140	B/	0	5.1	21.5	0.0	0	30	610584.9	6368138.5
28	40140	C/	0	4.2	28.7	0.0	0	30	610589.8	6367554.0
28	40140	D/	0	3.0	28.0	0.0	1	19	610599.6	6367300.0
28	40140	E/	0	9.0	30.7	0.1	0	37	610603.9	6365989.5
28	40150	A/	0	11.1	45.6	0.1	0	34	610790.4	6366152.0
28	40150	B/	0	6.5	64.5	0.0	0	26	610795.7	6368180.0
28	40160	A/	0	2.1	17.3	0.0	0	27	610989.4	6368051.5
28	40170	A/	0	7.2	21.5	0.1	0	40	611235.6	6368064.0
28	40170	B/	0	4.4	28.8	0.0	0	33	611197.1	6368314.5
28	40180	A/	0	4.8	29.6	0.0	0	25	611385.3	6368087.0
28	40180	B/	0	10.0	40.4	0.1	2	20	611395.8	6367750.0
28	40180	C/	0	5.2	34.5	0.0	0	21	611392.6	6367279.5
28	40180	D/	0	8.6	70.5	0.0	0	19	611376.4	6367090.0
28	40180	E/	0	8.2	56.1	0.0	0	19	611377.5	6367029.0
28	40180	F/	0	-18.9	40.4	0.0	0	19	611385.8	6366797.0
28	40190	A/	0	4.8	25.7	0.0	0	28	611566.4	6367326.5
28	40190	B/	0	4.3	23.7	0.0	3	21	611564.9	6367475.0
28	40190	C/	0	1.4	18.6	0.0	2	18	611599.4	6368162.5
28	40190	D/	0	-2.1	38.5	0.0	0	18	611588.9	6368534.0
28	40200	A/	0	5.4	29.6	0.0	0	25	611829.0	6367143.5
28	40220	A/	0	4.9	20.3	0.0	0	31	612173.8	6366979.0

Estimated depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or overburden effects.

APPENDIX I

FAVOURED TARGET LOCALITIES

AL-MOOSE-JD BLOCK

Target #	Locality	UTM Co-ord	Remarks
1	SSE CREEK zone, FINN Complex	67830N 8650E	Magnetic low appearing as southern extension to discovery setting 300 m to NW. On NNW fault. Modest K^{40} peak.
2	CROWN zone, FINN Complex	66600N 10300E	Confined magnetic low 150 m NE from known mineralization. On NNW fault within K^{40} high.
3	CROWN vicinity, FINN Complex	65880N 10700E	Uranium anomaly over confined magnetic low centred on same NNW fault as 2. Lies within same K^{40} high. Cross fault likely.
4	South FINN area, FINN Complex	66450N 11500E	Confined K^{40} anomaly with uranium core in close association with elongated magnetic low closure. Close to Fissure Fault.
5	North SCHMITT zone, FINN Complex	68050N 10450E	Salient uranium anomaly at heart of K^{40} activity over FINN area mineralization. On edge of magnetic low at intersection of faults.
6	NE EOS zone FINN Complex	68250N 11150E	Confined K^{40} anomaly adjacent to known mineralization, sits on N-S fault which transects magnetic low 250 m north.

Target #	Locality	UTM Co-ords	Remarks
7	NW SCHMITT zone, FINN Complex	68450N 9500E	Magnetic low centred on fault intersection, one N-S, other E-W. Locale of strong IP anomaly. Radioactivity subdued.
8	NE EOS zone, FINN Complex	68850N 11950E	Magnetic low close to intrusive edge. In sector of faulting and projected IP anomaly. No radioactivity.
9	Centre AL Complex	69220N 3160E	Uraniuum anomaly at centre of K^{40} high sitting astride Fissure Fault. Closely associates with magnetic low.
10	South edge AL Complex	68380N 2880E	Isolated K^{40} anomaly to south of 7. Correlates with magnetic low. Internal faulting implicit.
11	North centre AL Complex	70100N 2950E	Isolated uranium anomaly in arm of K^{40} high and correlating magnetic low. Internal faulting implicit.
12	North centre AL Complex	70520N 2580E	Marked magnetic low on N-S fault within K^{40} high of 11 above. Local thorium peak in vicinity.
13	North centre AL Complex	69900N 2620E	Magnetic low with local thorium anomaly. Shares same potassium feature as 11,12 above. At intersection of faults close to Fissure Fault.
14	NW centre AL Complex	70620N 2100E	Local thorium anomaly in magnetic saddle. Central to K^{40} anomaly of its own. E-W faulting likely.

Target #	Locality	UTM Co-ords	Remarks
15	W edge AL Complex	70180N 1480E	Magnetic low embayment on N-S fault with enclosing K^{40} anomaly. Close to Fissure Fault.
16	GOSSON vicinity, AL Complex	70250N 350E	Local K^{40} anomaly outside intrusion. Close to Fissure Fault and possible small mafic plug. In magnetic saddle, adjacent to GOSSON showing.
17	Sth HUMP zone HUMP Complex	70700N 5450E	Magnetic low at intersection of Fissure Fault and NNW cross-fault. K^{40} anomaly associated, also potentially HUMP zone geochemistry.
18	Nth HUMP zone HUMP Complex	71500N 5250E	Salient thorium anomaly at intersection of NE and same NNW fault as for 13. Also associated with HUMP zone geochemistry. Magnetic embayment to low whose centre 600 m NW.
19	BBX HUMP Complex	71000N 6250E	Correlates with magnetic low at edge of intrusive complex. Structural setting of intersecting faults. No strong radioactivity, but locale probably under cover.
20	Nth BV zone, HUMP Complex	69820N 6840E	Localized K^{40} anomalies in vicinity of Fissure Fault to north and BV mineralization to south. Intersecting cross-faults. Minor abatement possible in magnetic setting.

NB UTM co-ordinate figures are abbreviated. To obtain a full accounting, add 6300000 to the northings, and 600000 to the eastings for the AL and FINN complexes, 590000 for the HUMP.

APPENDIX II

LAWYERS BLOCK

FAVOURED TARGET LOCALITIES

APPENDIX II

FAVOURED TARGET LOCALITIES

LAWYERS BLOCK

Target #	Locality	UTM Co-ords	Remarks
1	Duke Ridge NE, Lawyers Complex	55140N 9300E	In magnetic saddle between Duke Ridge and AGB zones. Elongated radioactivity in K^{40}, uranium, thorium suggesting that location connects both zones. Structural interaction between N-S, NNW faulting.
2	N centre Lawyers Complex	56350N 8600E	In magnetic low W of AGB zone. Flanked by K^{40} high to NE side. On local fault striking NW. In centre of encircling uranium anomaly.
3	NW periphery Lawyers Complex	56420N 6430E	In magnetic low at intersection of faults. Uranium radio-activity following one such fault bearing N-S. Sits just outside complex.
4	West edge area	55000N 6400E	Combined K^{40}, uranium, thorium anomaly at creek edge. Coincides with intersection of Phoenix Fault with N-S fault passing through 3 above. Outside complex 500 m.
5	West cliff zone, Lawyers Complex	54540N 7200E	Local magnetic low on Phoenix Fault at intersection with N-S break. Sits on complex west contact. Muted radioactivity present in locale.

Target #	Locality	UTM Co-ords	Remarks
6	E end Duke Ridge zone, Lawyers Complex	54640N 9610E	Separate K^{40} anomaly with two local uranium highs. Close to intersection of Phoenix Fault with NE cross-fault. Lies on NNW fault locally.
7	SE Marmot Lake Lawyers Complex	51960N 10620E	Confined magnetic low on NNW fault passing through 1 above. Coincident with thorium anomaly. Occurs within Lawyers satellite.
8	SE corner area	51960N 11160E	Uranium, thorium anomaly at satellite contact. In sector of fault interaction and magnetics abatement.

NB UTM co-ordinates are abbreviated. To obtain a full accounting, add 6300000 to the northings and 600000 to the eastings.

cool, greens and blues. Yet, since em is regarded the primary governance to the derivations, it has been presumed that resistivity lows are of top exploration interest, and have been so highlighted. It simply is not so, of course. Such assumption ignores the signficance of geology, and in the mineral context, its primary alteration product, viz. silicification, a resistivity high in most circumstances normally.]

c) Geologic Content of Em Results

For the coaxial coil pair, the most evident contribution to geology they make is in delineating faults. In quite several places across the area, em anomalies line up most persuasively and faults are projected as cause. It is possible in more exceptional circumstances that similar anomalies are defining lithologic contacts, between a very resistive rock unit, say, and a relatively conductive one, but these are more difficult to recognize. Contacts are likely to be non-linear, and moreover dips need to be steep for satisfactory projections. As for mineralization, there is little evidence to suppose that sulphides have been detected anywhere in the area. Responses remain stubbornly low in quality and amplitude, and resolutions rarely lift a response truly clear of background. Thus virutally all anomalies dwell in a realm where ionic sources such as wet clays, fault gouge, etc. are probable.

The anomalies due to magnetite are also useful in helping define faults and contact zones, and to some extent lithology. However, they appear to have no bearing on sulphide occurrence; certainly no magnetite expression is intimately associated with any of the known prospects in the area. This would make eminent sense if in fact hydrothermal alteration had depleted magnetite locally.

The resistivity results promise to augment geology appreciably as more becomes known. As it is, the felsic intrusion propounded for the east quarter can be held to extend across the north central sectors of the area based on somewhat similar high resistivity domains located there. It follows that once lithologies extant in the area become factually identified, extra projections based on geophysical parameters will become more precise and more sound.

While much of the foregoing pertains to the AL-Moose-JD Block in particular, the Lawyers Block furnishes much the same in terms of essential em characteristics. However there are some stronger anomalies in the area. The singular line 20280 response already introduced is likely derived from an unusual concentration of clay in a creek flood plain underlain by faulting. Also recorded in this area is a wide belt of what manifestly is pronounced near-surface conduction. Its significance to exploration is discussed later herein.

MAGNETIC CONSIDERATIONS

a) AL-Moose-JD Block

There is a very fair amount of magnetic relief across the area, it reaching over 2800 nT in its full extant. Contouring has given emphasis and detail to the middle part of the range where on the average intervals of 25 nT pertain. This means that the extremities are diminished comparatively. This is good practice since it not only aids geologic description of the rocks constituting background but elaborates upon host settings in sectors of likely mineralization.

At the broad scale, the most magnetic parts of the area clearly lie in the northwest and in the centre south. In both places, the magnetic build-up is substantial, and in the northwest particularly, is coherent. Large bodies of mafic lavas are suspected as cause. In the northwest case, the shadowed magnetics specifically give the impression of a volcanic pile with individual flows fingering out from a centre beyond the survey north boundary. The centre south occurrence is more ambiguous and mafic intrusion is perhaps equally possible there.

In the east quarter a considerable amount of magnetic activity exists towards the high end of the range. While not very orderly on the face of it, there is nevertheless enough cohesiveness to discern the makings of quasi-circular components to what potentially is a zoned intrusion. It is however not fully defined. By virtue of its large size (+6 kms in diamter), it extends well beyond the survey boundaries, hence complete outlines are not seen. Notwithstanding, it is a talisman of magmatic incursion in the region and of the pre-existence of structural circumstances amenable to it.

From the standpoint of mineralization, the more attractive indication is of a set of three smaller intrusive centres, typically 2.5 kms by 4 kms, strung across the area. Their recognition and placement is not derived from the magnetics alone but also to a signficant degree from the survey's radiometrics, as is discussed later. What is most intriguing about them here is that they are arranged in a lineal fashion along a WNW axis. An underlying fault control is supposed. Such a fault would provide a common link and so become a crucial structural element in hydrothermal mineral possibility.

In fact such a fault can be perceived in the present magnetics. It is here called the Fissure Fault and is projected to transect the area completely as shown (Dwg. No. EIC-2665). The smaller plutons along it are here designated HUMP, AL and FINN respectively, taking them in order from west to east. Most of the known mineralization through the area is either embraced by them or is closely peripheral to them.

The magnetics do not describe these plutons particularly well in detail. Internally they furnish a hodge-podge of response, and no two plutons are quite the same. Since it is suspected they represent multi-faceted intrusions, they are dubbed complexes. Their given outlines are entirely provisional and are amenable to change.

Besides these considerations, what the magnetics most specifically supply in the way of extra feature are indications of faults. On the evidence, they abound. They also appear ubiquitous and exist at all scales. Not all are shown in the interpretation, nor should they be. What needs to be maintained at this juncture is a perspective, and this is reached by delineating the more typifying structures in all segments of the area while not losing sight of beckoning local controls to mineralization wherever they promise to occur. This is what has been attempted in Dwg. No. EIC-2665.

Remaining is the conundrum of dating. Which faults pre-date others, and which pre-date the mineralization, and so help control it, are questions not easily answered. Much is involved, not least of which is the potential reactivation of faults in any fresh tectonic activity regionally. It alone renders the solution almost impossible.

However some faults appear fundamental to the area. The E-W breaks for example including the Fissure Fault, the NNW, NW lineaments which parallel the Rocky Mountain Trench and the several ENE axes which appear as their conjugates, all appear primary. They control the intrusions even though they patently cross them. This is typical.

Not seen in the magnetics is any credible marker horizon. Its absence mitigates against the postulation of any extra deformational forces impinging on the area. The bowing of some of the throughgoing fault structures however suggest that they exist; thus a NNW bearing compressional force is mooted in the southeast quarter striking into the FINN intrusive complex. So located, it would explain much of the observed arching; also its origin may well lie at the heart of the felsic intrusion inferred here.

b) <u>Lawyers Block</u>

The main magnetic relief in this area comprises the strongly elevated eastern parts which appear as an extension of the mafic volcanics ascribed in the south centre segment of the AL-Moose-JD Block to the north. They are here patently fault-bounded on their west side by a N-S break, or breaks.

In the bulk of the area, the magnetics, while still animated, are more irregular in their aspect. Such heterogeneity is appropriate to a porphyry intrusion which is thought to underlie these sections, as is emphasized later. Again the data provide evidence of faulting. In this case however, the view is limited, and apart from the N-S system referred to above, there are no major lineaments strongly expressed on other headings.

RADIOMETRIC CONSIDERATIONS

The over-arching governance of the various radiometric measurements is the availability of rock in outcrop or suboutcrop. Anomaly appears in the area where there is rock in virtual exposure, topographically either on peaks and ridges or along the sides of deeply incised gullies (gulches). There is nothing surprising about this, since it takes very little surficial cover (ca. 0.6 m) to effectively blank all response. Three spectral windows have been recorded in survey, all in standard manner, these representing the equivalent of potassium, uranium and thorium radioactivity. In addition, a total count has been undertaken across the full gamma ray spectrum as received at the spectrometer.

Of these various measurements, potassium and uranium are viewed the most important to present exploration. Potassium, or K^{40} radioactivity, points to potential sericitic alteration which if relatively localized could be describing hydrothermally derived mineral concentration in the near-surface. Uranium or Bi^{214} anomaly could infer something similar but per faulting and other rock shattering of the setting. It is thus appropriate that most local uranium anomaly recorded in the area shows a certain independence from heightened potassium response. The whole east quarter of the

J.D. claims provides an example. Here uranium response is endemic, even more so than potassium, and in detail there are many cases of non-coincidence of the two radiation levels in anomaly terms.

What emerges therefrom is a uranium regime that is distinctive and not really repeated anywhere else in the area. Almost certainly it reflects the presence of a felsic intrusion, most probably zoned and partially circular in shape. In a crude way it is seen that uranium anomaly is distributed through the sector in a semi-circular fashion, not forming the complete ring on the west side due to the onset of overburden on the edge of the McClair Creek valley. Potassium anomaly emulates this disposition in a general way but as just described, there are many misfits locally. One of the most notable of the latter is a large potassium high actually sitting close to the valley floor near the north survey boundary. Actually it correlates there with a pinnacle of rock that juts out from the floor, a salient outlier of the main intrusion, it seems. This presumably is more silicified than its environment; it also falls on the perceived outer rim of the encircling magnetic aureole.

If uranium anomaly tends to be more apt in delineating fault axes, it is likely because of upward and lateral migration of radon gas, a daughter product, as well as of uranium salts in solution generally. It is therefore considered right to presume that lineal type features of uranium response are defining structure in the sub-region. They are certainly drawn upon here to project faults through the area, and to tighten the probabilities of their occurrence.

In the Lawyers Block, a startling combination of potassium, uranium and thorium anomaly has been recorded in the centre north of the area. This trenchant feature tends to overshadow almost everything else, but notwithstanding there is a fair scatter of other anomaly similar to the intruded settings in the north. Mineral possibilities are enhanced thereby, as are discussed in the next report section.

MINERAL CONSIDERATIONS

A. AL-Moose-JD Block

The various showings in the area and the prospects probed by the drill denote a scattered, often disseminated mineralization locally concentrated in fracture, fault and breccia zones. The depositions themselves are polymetallic but gold remains the mineral most likely to produce ore grades and amounts in this circumstance. It therefore constitutes the premier target in current exploration; there are two aspects to consider.

a) Statistical, Empirical

Gold is rarely ever detected directly in large scale survey programmes, geophysically almost never. Thus what is looked for in geophysical data sets is evidence of associated minerals, sulphides for example, pyrite in particular which is the most frequent ancillary, also of accompanying alteration, and of the kind of structural/lithologic setting which empirically favours the incidence of gold.

In the present instance, the airborne geophysical search is well served by the existence of a number of mineral occurrences discovered and to some extent defined by prior ground exploration. Their response to the various geophysical sensors flown over them thus provide an invaluable insight as to what to try and recognize elsewhere. This of course is a simplistic approach to all that the geophysical data have to offer but it is a vital first step.

On this premise, the following are observed:

i) the typical sulphide occurrence is not a conductor, that is to say it can not be induced to conduct by conventional em method. Across the area, there appears no exception, including importantly the newly found CREEK zone wherein massive sulphides are reported;

ii) there is a strong structural presence in all the showing settings, either hinted at or defined. Usually such structure is manifested by high angle faulting but thrust planes are a definite consideration where pertinent, e.g. FINN. The faults themselves are variously described by the magnetics (primarily) but also by resistivity, em anomaly, and radiometrics (secondarily). Topography plainly makes a contribution in places as well.

iii) there is a perceptible abatement of magnetics in and around each mineralized locale. Sometimes this is very marked, sometimes only subtle, but it is almost always there. Unlike several lows, there are no cases of magnetic high in direct correlation with known mineralization;

iv) potassium radioactivity is frequently associated, and uranium anomaly is present on occasion. Thorium occurs in rather similar fashion to uranium but more weakly. The existence of radioactive correlations with magnetic lows particularly is seen to enhance the probabiilty of alteration specific to a hydrothermal occurrence.

Taking these points for their positives, several attributes emerge which can be used to finger new prospective localities. Casting about through the mineralized environment of the J-D claims for example (the FINN In-Fill), at least 8 new locations can be recognized as priority prospects, each fulfilling to some fair extent the geophysical criteria set out above. Significantly, only one of the 8 reside in the CREEK zone sector. This outcome underscores the intrinsic vulnerability of radiometrics as an indicator parameter: it is too prey to obliteration by transported cover (including snow and water where accumulated). There is no doubt that the CREEK zone offers further potential on the basis of the magnetics; both structural elements and alteration aspects are provided by them and the scope for enlargement appears good.

The mineral showings on the AL claims, that is in the BONANZA In-Fill area, do not fare as well. Of those that have been described by past work, only the THESIS II & III, BBX, and the HUMP exhibit potential under the present criteria, and of these, the HUMP offers most. This is because its radioactive association is the greatest, including a salient thorium anomaly which centres on the east shoulder of the topographic peak known as Albert's Hump. So located, it evokes images of an erstwhile volcanic vent which has subsequently been plugged with pegmatitic material. The corresponding uranium anomaly is not quite as commanding here but it does exist in a strong, even wider correlation.

Interestingly, to the east of the BONANZA In-Fill, several localities occur which qualify as prospective under the terms of the current screening. What they seemingly lack however is a history of mineralization. Four prospects are registered in the compilation for this sector but only one has a name (GOSSON), and none coincides with the present emergent situations. It is not known in consequence whether ground prospecting has been assiduously pursued into all these localities despite their appearing on higher ground and their possessing radioactive associations, or whether they are in fact barren. This set of a further 8 events thus provides an excellent opportunity to test the validity of the screening process and the presumptions underlying it. Should it eventually prove there truly is mineral occurrence at many of these points, then the air survey has yielded a practical tool to further exploration in the region.

All the situations deemed perspective by the foregoing analysis are listed in an Appendix herewithin (Appendix I).

b) Genetic, Geological

Inasmuch as geophysical measurements are always describing geology to some extent or another, the air data allow speculation on the geological processes involved in gold emplacement here. From such exercise, it should be possible to assign probabilities of occurrence from one part of the area to another, to establish indeed where it is best to look for gold on genetic grounds.

This is not so easy since gold is well known for its vagaries - "gold is where you find it" is an old credo. Nevertheless the attempt is worth making just to cope with the corollary of determining why gold occurs where it does.

In the FINN In-Fill area, the thesis can be advanced that the various showings encountered there stem from an underlying intrusive adjacent to but set apart from the larger mass to the east. There is persuasive evidence that such mineralization is grouped within and around its own local centre, supported by radiometrics. In fact, that means the mineralization is confined to an approximately 5 km x 6 km area within the block. A vent system thus appears as a primary control here.

While the foregoing provides a feasible rationale for the FINN mineralization, no such scenario applies to BONANZA. Showings there are more widely scattered and variable in their geophysical context. The suspicion thus arises there is no common host or governance here, that a number of the showings in fact are incidentals, small pockets or fracture fillings of sulphides which might be found anywhere in an igneous domain. Such inkling is strenghtened by the fact that most of BONANZA showings did not meet the screening requirements of the prior section. The HUMP appears an exception, largely because of its radiometric signatures.

However in the sector east of BONANZA In-Fill where the 8 promising situations aforementioned locate, and on examining the distribution of radiometric response thereabouts, the makings of another circular feature can be perceived underlying. This is a revelation. Immediately it becomes possible to geologically and genetically link the three centres recognized, herewith identified as the FINN (in the east), the AL (Antoine Louis in the centre) and the HUMP (in the west). Notably the three line up along an WNW axis and are roughly spaced an equi-distant 8 kms apart; moreover there may be a rake to the west: the three centres diminish in areal size progressively proceeding west from FINN. The evident periodicity of occurrence appears dictated by cross-structural intercession, specifically by the interaction of the controlling WNW fault with major faults striking out of the NE. Each of the three centres, it is noted, are distinguished by one or more such intersections at its heart. This appears more than coincidence.

A working hypothesis thus emerges. The centres appear as syntectonic plutons -- intrusive complexes internally -- which are distributed along a fissure emanating from the area ESE just beyond air survey limits. The felsic intrusion in this quarter, may or may not be related. However, somewhere is needed a large heat engine to spawn the smaller plutons and to drive mineral solutions up into the fissure and out into the wallrock environments. This particular intrusion could qualify. It is likely too that a geothermal gradient was in place at the time of the mineralizing episode, and that there will prove to be an optimum distance from any intrusive centre for the emplacement of an ore-grade assemblage.

Gold in the circumstances would be regarded syngenetic with the sulphides -- until otherwise demonstrated. It is important to note that what has been achieved in the recognition of individual centres of mineralization is a means to discriminate more prospective sectors of the area from the less promising. These latter parts in effect, together with barren country rocks, form background.

It follows that the FINN, AL, and HUMP vent areas as outlined (Dwg. NO. EIC-2665) are the favoured sectors in this evaluation. Since there remains much work to do in all of them, the 20 selected localities occurring within become immediate priority targets for future exploration.

B. Lawyers Block

What immediately gives focus to this smaller survey area is the combination of obtained potassium, uranium and thorium anomaly arranged in a rough semi-circle at its centre. Albeit dictated to by land form to some fair extent, this grouping nonethless evokes the lively chance of a vent at its heart, a probability seemingly strengthened by the recording of a singular em anomaly thereat.

This particular response is extraordinary -- it has no equal anywhere in either block -- but it almost certainly is due to man-made structure, to wit, an old mill located in the creek valley close to the AGB mineral zone. In em terms, it is simply too good to be true for a naturally occurring geologic source. It is therefore discounted from further consideration.

Given that the radioactivity here signifies alteration, then a substantial system of hydrothermal fluid incursion is indicated for the vicinity. The magnetics in the central locale exhibit tendencies to lower amplitudes in the embracing arms of the K^{40} anomaly, and at the centre even to produce a relative low. This foretells a magnetite depletion in the setting with an intensification where it needs to be for the relationship to be credible. Otherwise by themselves, the magnetics are ambiguous in their representations, if not downright confusing.

However expectedly they do furnish intimations of faulting. As prior noted, the most dominant of such structures is a N-S break which passes through the east half of the area. It has regional connotations, and likely connects with the fault(s) with the same approximate bearing which command the centre of the AL-Moose-JD block to the north. There, it passes between the AL and FINN intrusive complexes as recognized. Similarly in the present area, it neighbours but does not transect the central radioactivity and its magnetite-depleted core. Thus by analogy another intrusive complex can be proposed here in the middle of the Lawyers block. Its outline as shown (Dwg. No. EIC-2666) is drawn from the magnetics principally, but is abetted by the resistivity results.

What is fascinating about the latter is the strong suggestion that an outer zoning exists beyond the radioactivity. This springs from the em results which display both in profile and in the calculated resistivity presentations an aureole of unmistakable environmental conductivity. This attribute is unique; nowhere else in the two blocks flown has anything like it been encountered. Interesting, even here it is not fully defined, in the first instance by the limits of coverage -- the full width of the band has not been determined --, in the second instance by the N-S fault of above mention. This structure seems to play a part in bounding the zone in the eastern quarter. Incidentally if true, this would mean that this fault is younger than most other things in the area, viz. the intrusion, its associated mineralization-cum-alteration and the local faults that controlled its emplacement.

The cause of this remarkable outer ring is deemed to be alteration, specifically argillic alteration involving a heavy clay development. If this is substantiated on the ground, then what emerges is a classic copper porphyry alteration pattern. The parent intrusion lies at depth, possibly as much as 1 km down, with the present mineralization residing in the wall rocks draped over it. At surface what appears are therefore the peripheral effects including the zoning, and the alteration, but most of all the mineralization which appears in fractures, faults and breccias and as replacement bodies in virtual outcrop.

The conductivity halo above described also suggests that a satellite plug exists in the south centre of the area, appearing there as a likely apophysis from the main porphyry body. It too probably does not come to surface. The Marmot Lake mineralization together with proximal uranium and thorium anomaly distinguishes the setting.

What is not so obvious in the Lawyers Block is the local equivalent of the Fissure Fault. Nonetheless it seems more than likely something akin to it will exist here since this is a structural trend which parallels the Toodoggone River, and the graben it purportedly occupies. Moreover, the intrusion itself demands a structural control. As it so happens, the most likely candidate exists in the southern half of the area where an apparent throughgoing break bearing WNW passes by to their south side of the Cliff and Duke Ridge mineral zones. Defined primarily by the magnetics, it finds support in the topography and to a lesser extent resistivity. Most promising of its aspects is that it is in intersection with a robust cross-fault with a northeast heading at the Phoenix prospect site. Thus the analogy with the Fissure Fault and its significance to intrusion and mineralization in the northern survey block is fairly preserved here. The key fault locally has been named the Phoenix Fault.

This outcome, naturally leads to the employment of the same screening process that has been used with effect in the north. Applying the same criteria as heretofore, it is possible to discern another 8 localities in this area which can be rated prospective. They too are itemized in an Appendix (Appendix II).

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

An air geophysical survey over the AL, JD and Lawyers claim blocks has recently been completed. The results have proven informative, the magnetics and radiometrics particularly shedding light on geology and the probabilities of mineral occurrence. This outcome in its turn has stimulated ideas in genesis and structural controls to additional deposits in the region. Above all, such analysis has yielded twenty-eight (28) select targets for follow-up on the ground.

The ultimate measure of the present study will surely lie in the success or otherwise of that follow-up. There is therefore a need here to formulate a set of recommendations which will give all ensuing programmes of exploration in the sub-region some sense of guidance and thrust.

It is recommended that:

i) working from the situations listed in Appendix I, the 8 FINN prospects be given priority. This stems naturally from the higher grade, highly promising mineralization already encountered in the FINN and CREEK zones in this host environment. The 8 AL prospects should be pursued as soon as time and logistics allow. The imperative here is to establish the presence of mineralization of the kind and in the amount forecast by analogy in this perceived second vent setting. What has been found here before is not well known, but presumably is not of economic stature. A third vent priority is the HUMP. In this instance, the prospects appear fewer and not so scattered, and it seems not too much effort would be required to test the resident possibilities;

ii) the 8 Lawyers prospects be similarly investigated as the others. This however appears an important setting because of the greater probability of a porphyry underpinning. It is thus accorded a priority second only to FINN;

iii) the components of the follow-up programme be comprised of geologic scouting, -- and as discretion dictates partial mapping --, geochemical sampling and geophysical traversing. The latter should be spear-headed by IP/resistivity cross-sectioning backed by magnetic profiling. Other methods such as VLF, radiometrics, even gravity, might be considered with time as events unfold, and initiated as pilot projects thereupon;

iv) conventional em methods be dispensed with. Even in any future airborne survey in the region, em ought be excluded, despite the loss of the (apparent) resistivity determination. This advocacy is based on the reality that em represents another order of complexity and cost for the airborne operation, and in the reigning conditions, the likely return will not be commensurate with the outlay;

v) em applications in down-hole logging continue to be entertained. This is where em is superior to other methods, given sulphide mineralization, excepting sphalerite, in the core.

JBB:sb
February 10, 1998

J. B. Boniwell
Exploration Geophysical Consultant

CERTIFICATE

I, JOHN B. BONIWELL, of 1522 Clearwater Dr., in the City of Mississauga, County of Peel, in the Province of Ontario do hereby certify:

1. That I am an exploration geophysical consultant holding office at 10 Hurontario St., Mississauga, Ontario.

2. That I am a graduate of the University of Tasmania in physics, maths and geology, and that I have been practising my profession of exploration geophysics for the past 40 years.

3. That I am a Fellow of the Geologic Association of Canada and a member in good standing on the Society of Exploration and Geophysicists, KEGS, and the Prospector's Developer's Association.

4. That I have no interest, direct or indirect in the property discussed herein, nor do I expect to receive any such interest.

5. That this report is based on data supplied by Paul Hawkins of Paul A. Hawkins & Associates, Calgary, and on an aeromagnetics file furnished by the Geological Survey of Canada.

February 10, 1998
MISSISSAUGA, Ontario

J. B. Boniwell
Exploration Geophysical Consultant

COST ESTIMATES FOR GROUND FOLLOW-UP

For primary geophysics only, viz. IP and magnetics:

i)	Grid preparation: assume an average 5 lines 500 m long, 100 m apart, for each locality investigation; at $500/km incl. local mob.	$1,250.00
ii)	IP traversing; assume 4 crew days at $1800 p.d.	7,200.00
iii)	Magnetic traversing; assume 2 man days at $350 p.d.	700.00
iv)	Interpretation, reporting, recommendations, etc., incl. drill lay-outs; assume 2 man days at $650 p.d.	1,300.00
	per target	$10,450.00

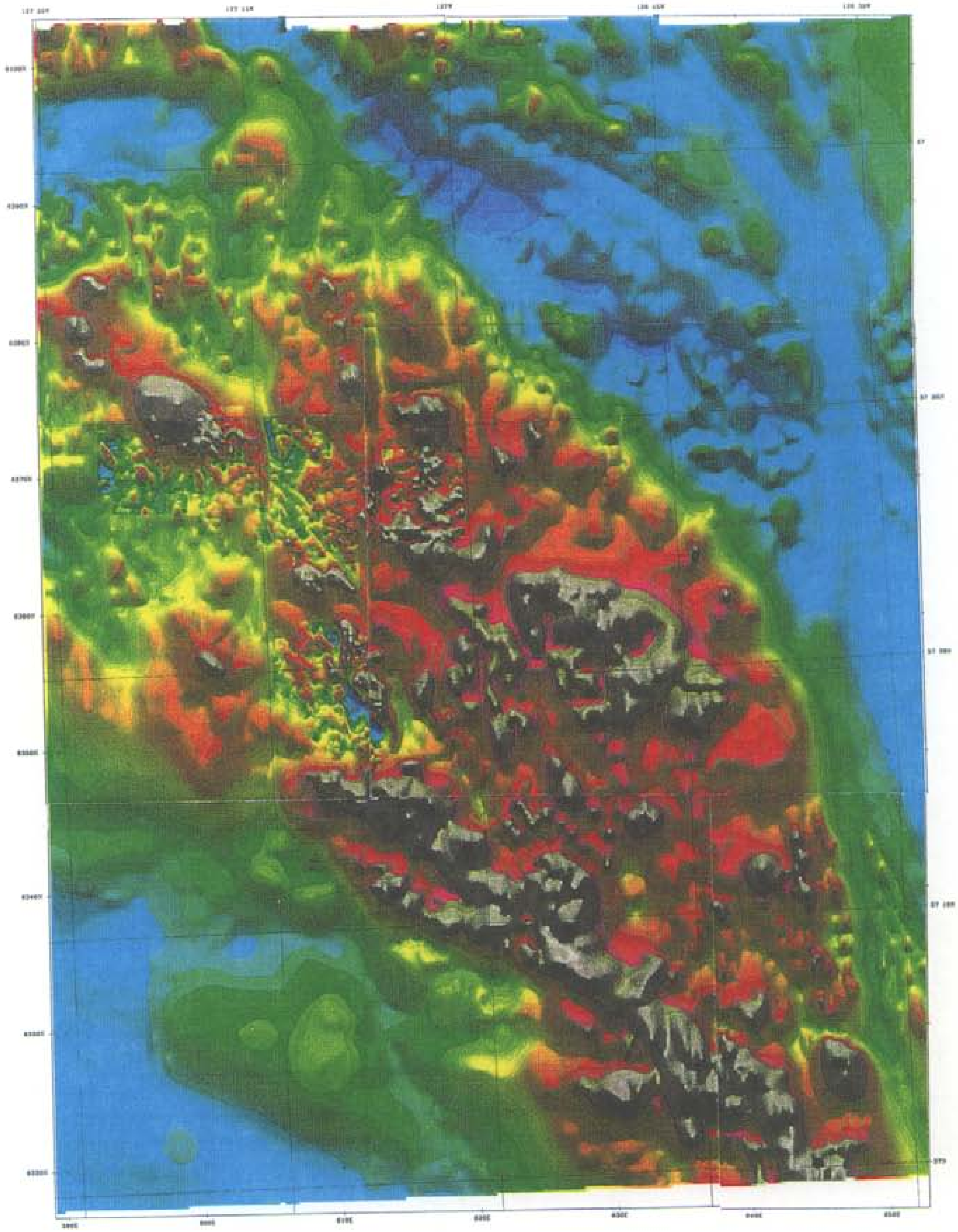
For a programme involving all 28 target localities as selected herein, the total cost would amount to $360,000.00 as follows:

primary geophysics, 28 @ 10,450	292,600.00
contingencies 15%	43,890.00
	$336,490.00
GST 7%	25,550.00
	$360,040.00

APPENDIX I

AL-MOOSE-JD BLOCK

FAVOURED TARGET LOCALITIES



TJM - GEO - MAP

Tel. 905-271-7202

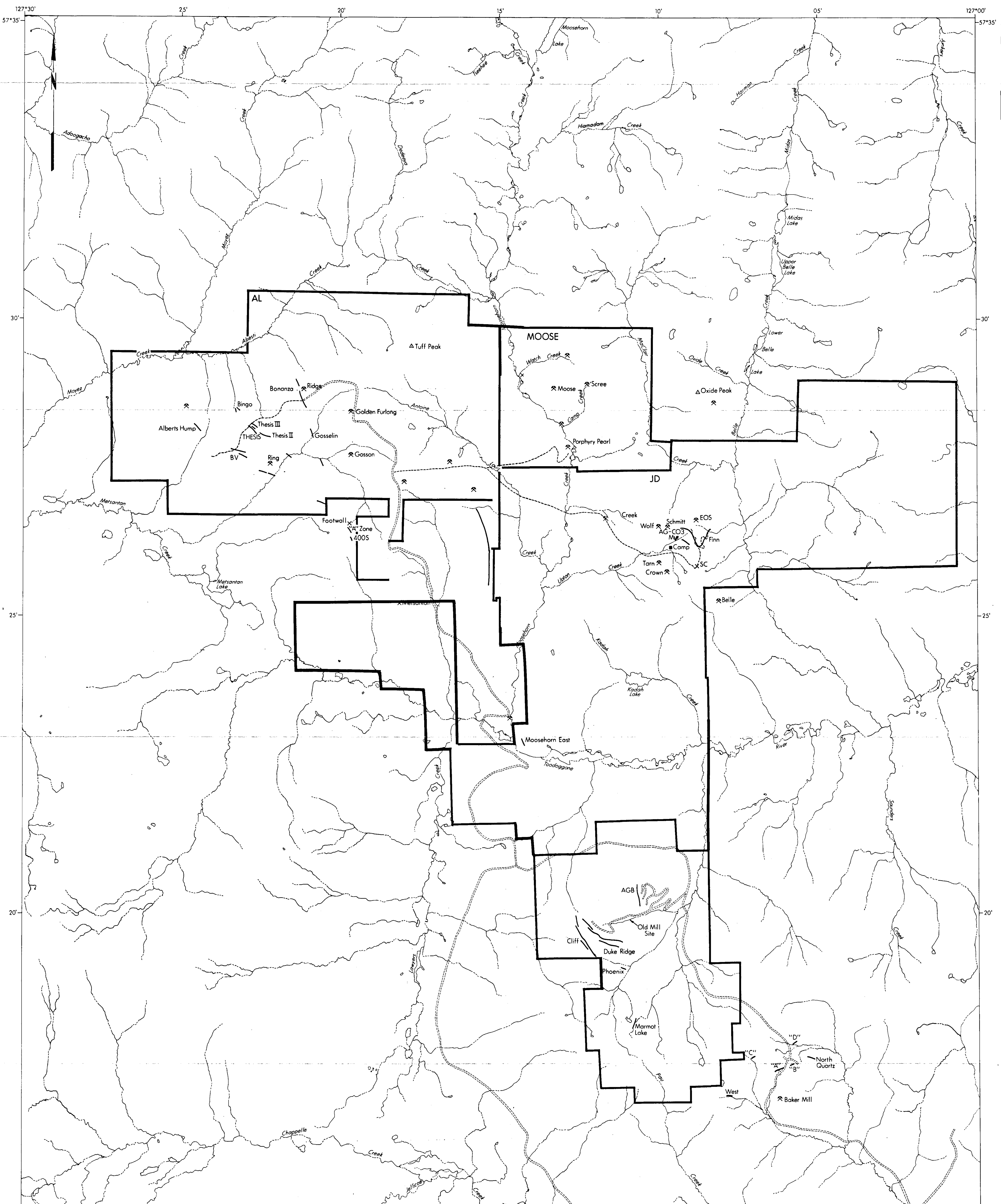
SCALE 1 : 125,000

ANTARES MINING
Toodoggone Region B.C.

RESIDUAL MAGNETICS
NE-SW and NW-SE SHADOW

EXCALIBUR INTERNATIONAL CONSULTANTS LIMITED
TORONTO ONTARIO

EK 2667



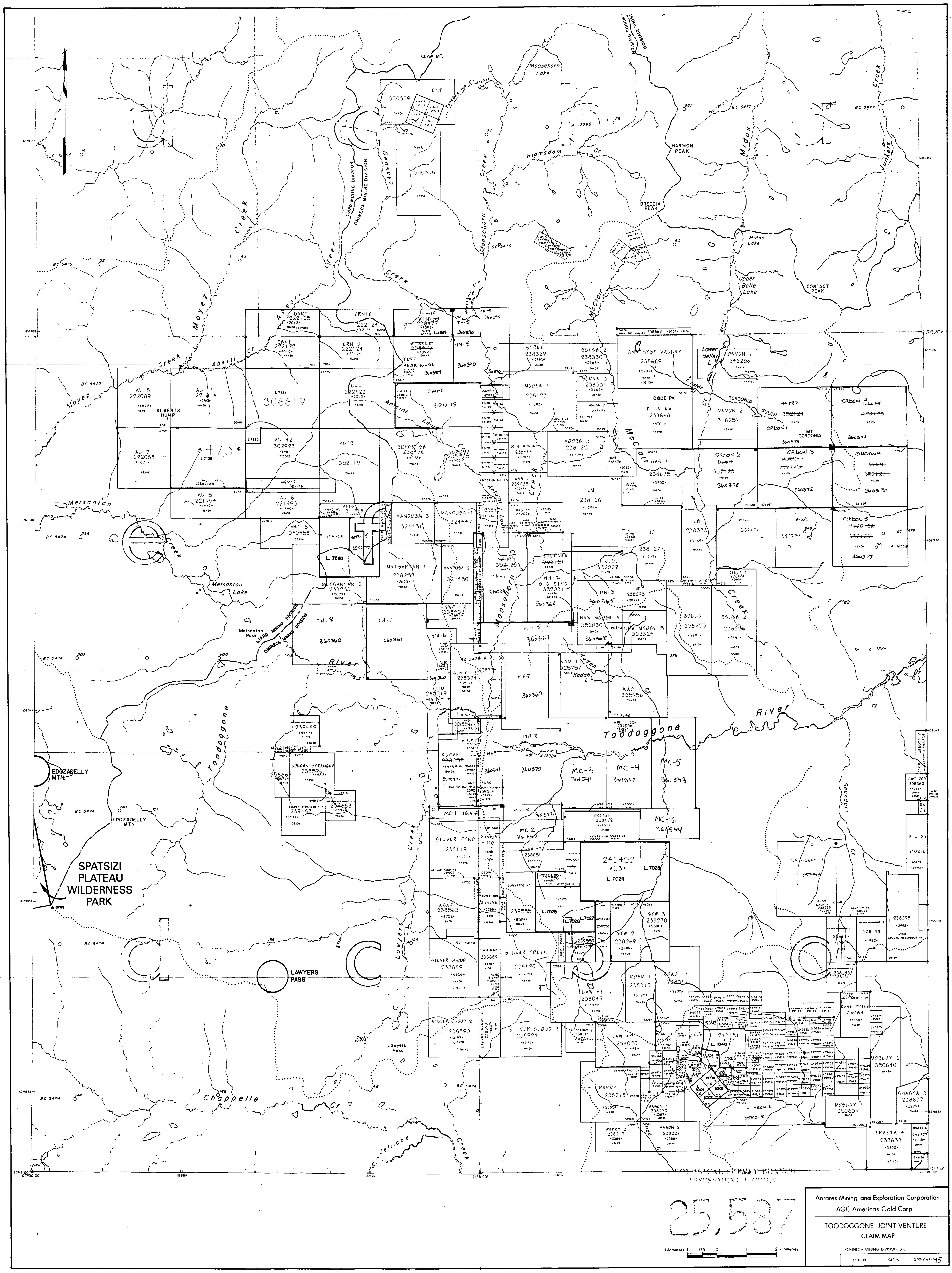
GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,587

AGC Americas Gold Corp.

J.D. PROPERTY
MINERAL DEPOSITS

1:50,000	94 E/6,11	X97-065-96



CLAW MT.
Moosehorn Lake
HARMON PEAK
BRECCIA PEAK
Midas Lake
Upper Belle Lake
CONTACT PEAK
LIARD MINING DIVISION
OMINECA MINING DIVISION
Moosehorn Creek
Abesti Creek
Moyez Creek
ALBERTS HUMP
Metsantan Lake
Metsantan Pass
Toodoggone River
EDOZADELLY MTN.
SPATSIZI PLATEAU WILDERNESS PARK
LAWYERS PASS
Chappelle Cr.
Jellicoe Creek
MT. GORDONIA
McClair Creek
Saunders Cr
AMETHYST VALLEY
OXIDE PK
KIDVIEW
SILVER POND
SILVER CREEK
SILVER CLOUD 1
SILVER CLOUD 2
SILVER CLOUD 3
GOLDEN STRANGER
MOSLEY 1
350639
MOSLEY 2
350640
SHASTA 3
238637
SHASTA 4
238638
kilometres 1 0.5 0 1 2 kilometres
25,587
Antares Mining and Exploration Corporation
AGC Americas Gold Corp.
TOODOGGONE JOINT VENTURE
CLAIM MAP
OMINECA MINING DIVISION B.C.
1:50,000
94E/6
X97-065-95

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT
25,587
Square: Grid North
Star: True North
Arrow: Magnetic North
Angles presented are approximate mean deviations for centre of NTS sheet.
Use diagram for reference only.
Grid North - True North : 1.5°
Grid North - Magnetic North : 26.8°
Annual change : -0.16°
ANTARES MINING AND EXPLORATION CORP.
BASE MAP
AL - MOOSE - JD BLOCK
TOODOGGONE REGION, B.C.
SCALE 1:20 000
aerodat
AERODAT INC.
Date Flown : AUGUST 1997
NTS : 94 E/6,11
Project : J9778
Map Ref : 1 - 1
ALBERTS HUMP
S W A N N E L L
O M I N E C A
M O U N T A I N
R A N G E S
SPATSIZI
RIVER
METSANTAN LAKE
KADAH LAKES
McCLAIR
BELLE LAKE
CORINTHIA
FINLAY FOREST RESERVE