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240 Adelaide Street West. Toronto, Canada M5H 1W7, Telephone (416) 971-5400,

# JAN 1 9 1988

## MINING LANDS SECTION

REPORT ON AN

#### AIRBORNE MAGNETIC AND VLF-EM SURVEY

#### KIPLING TOWNSHIP

#### PORCUPINE MINING DIVISION, ONTARIO

for

#### BLACK GREGOR EXPLORATIONS LTD.

by

TERRAQUEST LTD. Toronto, Canada

November 26, 1987

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No.	A-669.2-2,	Vertical Magnetic Gradient
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1. INTRODUCTION

This report describes the specifications and results of a geophysical survey carried out for Black Gregor Explorations Ltd. of 100-225 Watline Avenue, Mississauga, Ontario, L4Z 1P3 by Terraquest Ltd., 905 - 121 Richmond Street West, Toronto, Canada. The field work was performed on October 15, 1987 and the data processing, interpretation and reporting from October 15 to November 26, 1987.

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The purpose of a survey of this type is two-fold. One is to prospect directly for anomalously conductive and magnetic areas in the earth's crust which may be caused by, or at least related to, mineral deposits. A second is to use the magnetic and conductivity patterns derived from the survey results to assist in mapping geology, and to indicate the presence of faults, shear zones, folding, alteration zones and other structures potentially favourable to the presence of gold and base-metal concentration. To achieve this purpose the survey area was systematically traversed by an aircraft carrying geophysical instruments along parallel flight lines spaced at even intervals, 100 meters above the terrain surface, and aligned so as to intersect the regional geology in a way to provide the optimum contour patterns of geophysical data.

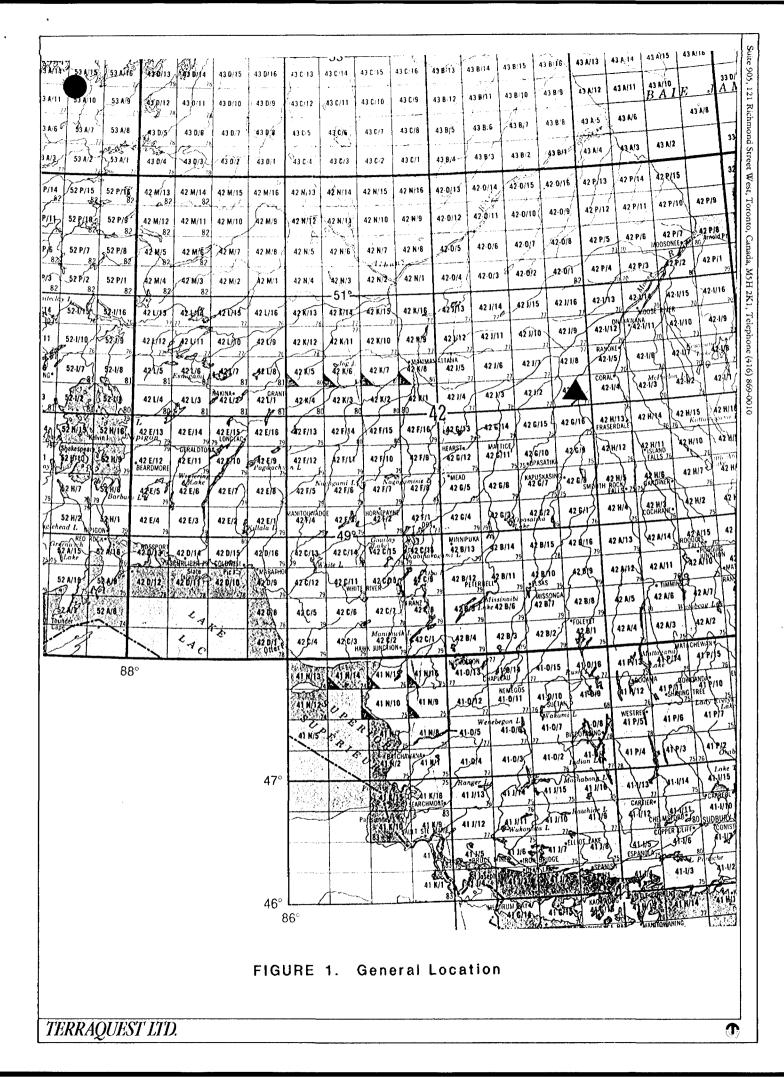
#### 2. THE PROPERTY

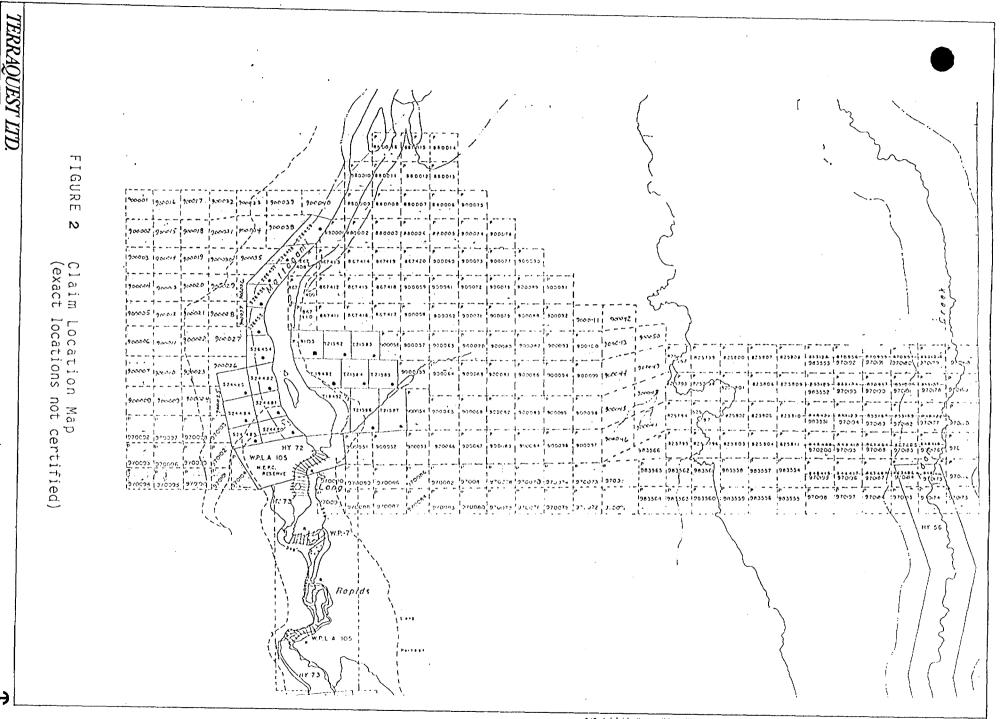
The property is located in Kipling township, in the Porcupine Mining Division of Ontario about 90 kilometres north of the town of Kapuskasing. The property lies near the centre of the township and can be reached by roads from the south.

The latitude and longitude are 50 degrees 10 minutes, and 82 degrees 10 minutes respectively, and the N.T.S. reference is 42J/1.

The claim numbers are shown in figure 2 and listed below:

Ρ.	825792-825811	(20)		
	867408-867420	(13)		
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	900001-900100√	(100)		
	970070-970104	(35)		
	970168-970200	(33)		
	983551-983566	(16)total	233	claims





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#### 3. GEOLOGY

Map References

 Map 20d: Moose River Tributaries. scale 1:253,440. O.D.M. 1911
 Map 2166: Hearst-Kapuskasing Sheet, Geological Compilation. scale 1:253,440. O.D.M. 1969

The survey area is underlain predominmantly by Mesozoic kaolinitic quartz sand, clay and lignite of the Mattagami Formation. These are underlain and bordered to the south by an Archean migmatitemetasedimentary-metavolcanic complex. A silica and kaolinite deposit lies along the Mattagami River within the Mattagami Formation.

#### 4. SURVEY SPECIFICATIONS

4.1 Instruments

The survey was carried out using a Cessna 206 aircraft, registration C-GGLS, which carries a magnetometer and a VLF electromagnetic detector.

The magnetometer is a high sensitivity airborne proton (Overhauser) type with the sensor element mounted in a towed bird at a distance of 14 metres below and 24 metres behind the aircraft. It's specifications are as follows:

Resolution:	0.01 gamma
Accuracy:	0.03 gamma for 2 readings per second
Cycle time:	0.5 second
Range:	20000-100000 gammas
Gradient tolerance:	Up to 5000 gammas per metre
Model:	GSM-11
Manufacturer:	GEM Systems Inc., 105 Scarsdale Rd.,
	Don Mills, Ontario, M3B 2R5

The VLF-EM unit uses three orthoganol detector coils to measure (a) the total field strength of the time-varying EM field and (b) the phase relationship between the vertical coil and both the "along line" coil (LINE) and the "cross-line" coil (ORTHO). The LINE coil is tuned to a transmitter station that is ideally positioned at right angles to the flight lines, while the ORTHO coil transmitter should be in line with the flight lines. It's specifications are:

Accuracy:	18	
Reading interval:	1/2 second	
Model:	TOTEM 2A	
Manufacturer:	Herz Industries,	Toronto

The VLF sensor is mounted in the left wing tip extension.

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FIGU	RE 3. Sample	of analogu	e data	

Other instruments are:

- . King KRA-10A Radar altimeter
- . UDAS-100 data processor with Digidata nine track tape recorder, manufactured by Urtec Ltd., Markham, Ontario.

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. Geocam video camera and recorder for flight path recovery, manufactured by Geotech Ltd., Markham, Ontario.

4.2 Lines and Data

100 metres a) Line spacing: b) Line direction: 360 degrees 100 metres c) Terrain clearance: d) Average ground speed: 193 km/hr. e) Data point interval: Magnetic: 11 metres 11 metres VLF-EM: f) Tie Line interval: 2 kilometres g) Channel 1 (LINE): NAA Cutler, 24.0 kHz h) Channel 2 (ORTHO): NSS Annapolis, 21.4 kHz i) Line km over total survey area: 635 j) Line km over claim groups: 466

4.3 Tolerances

a) Line spacing: Any gaps wider than twice the line spacing and longer than 10 times the line spacing were filled in by a new line.
b) Terrain clearance: Portions of line which were flown above 125 metres for more than one km were reflown if safety considerations were acceptable.
c) Diurnal magnetic variation: Less than ten gammas deviation from a smooth background over a period of two minutes or less as seen on the base station analogue record.
d) Manoeuvre noise: nil

4.4 Photomosaics

For navigating the aircraft and recovering the flight path, mosaics of aerial photographs were made from existing air photos.

#### 5. DATA PROCESSING

Flight path recovery was carried out in the field using a video tape viewer to observe the flight path as recorded by the Geocam video camera system. The flight path recovery was completed daily to enable reflights to be selected where needed for the following day.

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The magnetic data was levelled in the standard manner by tying survey lines to the tie lines. The IGRF has not been removed. The total field was contoured by computer using a program provided by Dataplotting Services Inc. To do this the final levelled data set is gridded at a grid cell spacing of 1/10th of an inch at map scale.

The vertical magnetic gradient is computed from the total field data using a method of transforming the data set into the frequency domain, applying a transfer function to calculate the gradient, and then transforming back into the spatial domain. The method is described by a number of authors including Grant, 1972 and Spector, 1968. The computer program for this purpose is provided by Paterson, Grant and Watson Ltd. of Toronto.

The VLF data was treated automatically so as to normalize the non conductive background areas to 100 (total field strength) and zero (quadrature). The algorithms to do this were developed by Terraquest and will be provided to anyone interested by application to the company.

All of these dataprocessing calculations and map contouring were carried out by Dataplotting Services Inc. of Toronto.

#### INTERPRETATION

#### 6.1 General Approach

To satisfy the purpose of the survey as stated in the introduction, the interpretation procedure was carried out on both the magnetic and VLF data. On a local scale the magnetic gradient contour patterns were used to outline geological units which have different magnetic intensity and patterns or "signatures". Where possible these are related to existing geology to provide a geological identity to the units. On a regional scale the total field contour patterns were used in the same way.

Grant, F.S. and Spector A., 1970: Statistical Models for Interpreting Aeromagnetic Data; Geophysics, Vol 35

Grant, F.S., 1972: Review of Data Processing and Interpretation Methods in Gravity and Magnetics; Geophysics 37-4

Spector, A., 1968: Spectral Analysis of Aeromagnetic maps; unpublished thesis; University of Toronto, 1968.

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Faults and shear zones are interpreted mainly from lateral displacements of otherwise linear magnetic anomalies but also from long narrow "lows". The direction of regional faulting in the general area is taken into account when selecting faults. Folding is usually seen as curved regional patterns. Alteration zones can show up as anomalously quiet areas, often adjacent to strong, circular anomalies that represent intrusives. Magnetic anomalies that are caused by iron deposits of ore quality are usually obvious owing to their high amplitude, often in tens of thousands of gammas.

VLF anomalies are categorized according to whether the phase response is normal, reverse, or no phase at all. The significance of the differing phase responses is not completely understood although in general reverse phase indicates either overburden as the source or a conductor with considerable depth extent, or both. Normal phase response is theoretically caused by surface conductors with limited depth extent.

Areas showing a smooth response somewhat above background (ie. 110 or so) are likely caused by overburden which is thick enough and conductive enough to saturate at these frequencies. In this case no response from bedrock is seen.

The VLF-EM conductor axes have been identified and evaluated according to the Terraquest classification system (Figure 4). This system correlates the nature and orientation of the conductor axes with stratigraphic, structural and topographic features to obtain an association from which one or more origins may be selected. Alternate associations are indicated in parentheses.

#### 6.2 Interpretation

The magnetic and VLF-EM data are shown in contoured format on maps at a scale of 1:10,000 in the back pocket. An interpretation is also provided. The following notes are intended to supplement these maps.

The total magentic field has a relief of approximately 925 gammas and shows broad magnetic anomalies trending to the east and northeast over most of the survey area and narrow, east trending anomalies along the southern edge of the property. The vertical magnetic gradient improves the resolution of these anomalies and enhances the magnetic trends in the magnetically quiet areas.

The Jurassic clastic sediments of the Mattagami Formation probably possess insignificant magnetic susceptibilities. Therefore none of the observed responses are interpreted to come from these sediments, but from the underlying metamorphic rocks.

The strong magnetic anomaly in the southwest corner correlates well with the regionally interpreted diabase dyke trending to the

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	FIGURE 4	
	TERRAQUEST CLASSIFICATION OF	VLF-EM CONDUCTOR AXES
<u>SYMBOL</u>	CORRELATION	ASSOCIATION: Possible Origins
a, A	Coincident with magnetic stratigraphy	Bedrock magnetic horizons: stratabound mineralogic origin or shear zone
b,B	Parallel to magnetic stratigraphy	Bedrock non-magnetic horizons: stratabound mineralogic origin or shear zone
<b>c</b> , <b>C</b>	No correlation with magnetic stratigraphy	Association not known: possible small scale stratabound mineralogic origin, fault or shear zone, overburden
d, D	Coincident with magnetic dyke	Dyke or possible fault: mineralogic or electrolytic
f , F	Coincident with topographic lineament or parallel to fault system	Fault zone: mineralogic or electrolytic
ob, OB	Contours of total field response conform to topographic depression	Most likely overburden: clayey sediments, swampy mud
cul, CUL	Coincident with cultural sources	Electrical, pipe or railway lines

### NOTES

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- 1 Upper case symbols denote a relatively strong total field strength
- 2 Underlined symbols denote a relatively strong quadrature response
- 3 Mineralogic origins include sulphides, graphite, and in fault zones, gouge
- 4 Electrolytic origins imply conductivity related to porosity or high moisture content

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northeast. The same trend continues across the map area beneath the Jurassic sediments. The broader nature of this anomaly north of the Mattagami River is probably due to the increased depth to the dyke beneath the Jurassic sediments. Several north-northwest trending diabase dykes have been interpreted over the eastern half of the property and one southeast of the dam at the Metagami River.

The remaining magentic responses correlate with the migmatite-metasedimentary-metavolcanic complex (Unit 4) which is exposed along the southern edge of the survey area and extends beneath the Jurassic metasediments. The weaker magnetic responses are probably related to the metasediments and felsic metavolcanics. The stronger responses shown as 4m on the interpretation map are probably associated with the mafic metavolcanics and possibly to increased concentrations of magnetic minerals such as pyrrhotite or magnetite. The broader nature of the magnetic horizons to the north are probably due to the increased distance between the magnetometer sensor and the source rocks.

Magnetically interpreted faults trend to the northeast and northwest. The northeast trending set appears to truncate the northwest trending faults. Despite the fact that these faults are interpreted from data derived from the underlying metamorphic rocks, they correlate well with topographic lineaments. This suggests that the faults a) may have been reactivated, b) post-date the Jurassic sediments, or c) have had a controlling influence on the deposition of the Jurassic sediments. East trending faults or shear zones are suspected but are difficult to identify as they would parallel the magnetic stratigraphy.

The VLF-EM responses across most of the survey area are remarkably flat with only a few definitive conductive zones. This is probably a consequence of a uniform layer of conductive clayey overburden that effectively masks or saturates any responses from either the Jurassic or underlying rocks. The margins of the conductive overburden are often associated with the VLF-EM responses.

The east trending conductor axes across the southern part of the property are parallel to the magnetic stratigraphy and therefore possess potential for bedrock conductors such as sulphides or graphite. The stronger ones should be investigated on the ground using EM or IP techniques. Alternatively these conductor axes may be related to clay filled depressions overlying recessive lithologies or possibly to east trending structures. The north-south trending conductive axes are associated with structural sources, either faults or shear zones. Conductivity associated with faulting may be related to: a) minerals such as sulphides, graphite or gouge along a structure or to b) an ionic effect created by water or porosity along a structure or to clay in an overlying depression.

#### 7. SUMMARY

An airborne combined magnetic and VLF-EM mapping survey has been carried out at 100 metre line intervals with data reading stations at ll metres along the flight lines. All data is produced on maps at a scale of 1:10,000.

Canada M5H 1W7, Telephone (416) 971-5400, Fax (416) 971-6449 The magnetic data has been used to modify and update the existing geology and has shown a number of new contacts and faults. The VLF-EM responses are flat and weak suggesting a extensive cover of conductive overburden. Conductor axes over the exposures of the metamorphic rocks may be related to stratigraphic sources or possibly to structure or overburden in areas of recessive lithology.

GOGIATION

CHARLES Q. BARRIE

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TERRÁQUEST LTD.

Charles Q. Barrie, M.Sc Geologist

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I hereby certify that I have a		nowledge of	the facts set /	orth in the Report	of Work anne	xed hereto, h	naving performed th	ne work
or witnessed same during an	d/or after its completion						~~	
Name and Postal Address of Per			_	1 1 1 -			· /	
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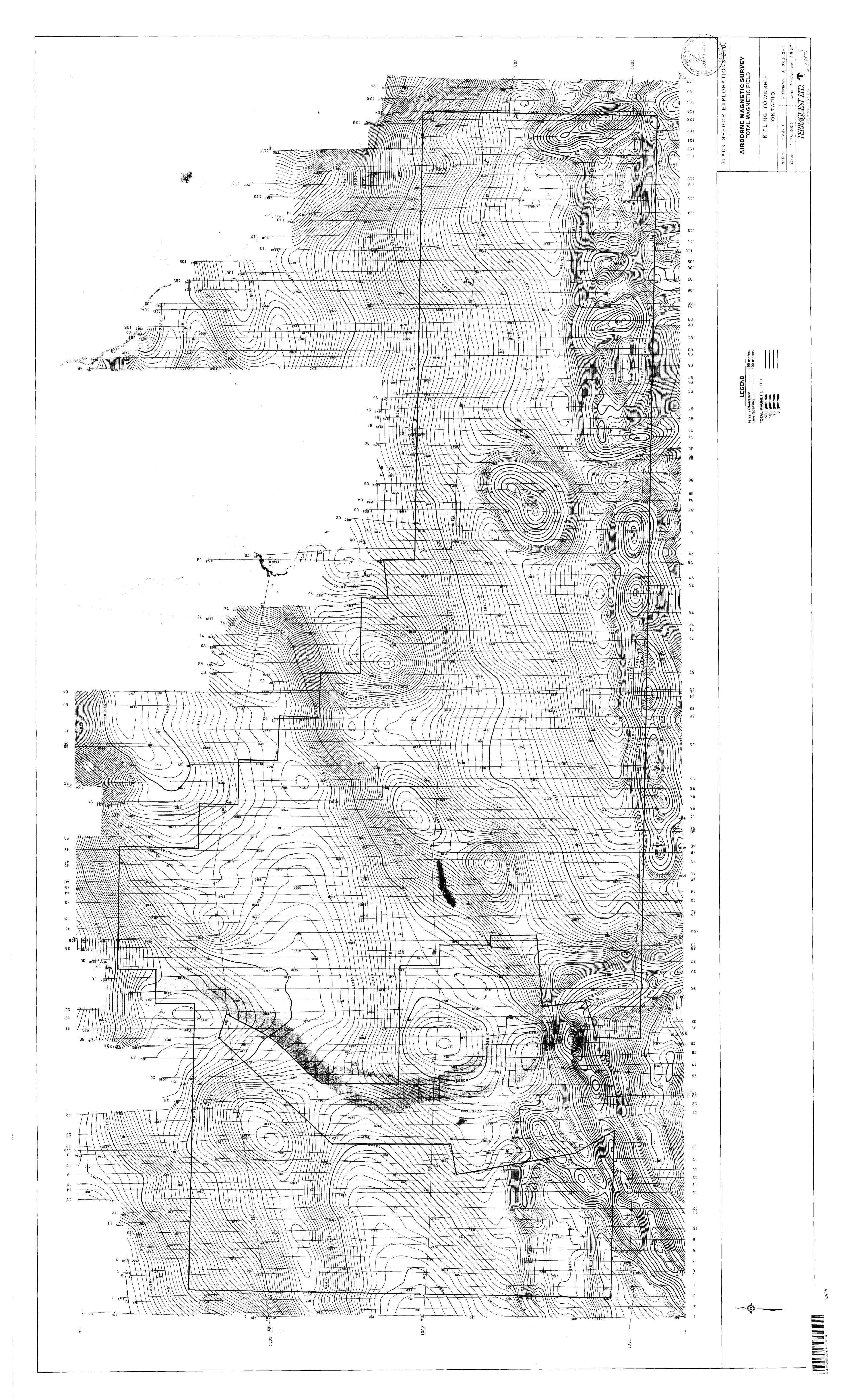
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		a personal and intimate kr	nowledge of 1	the facts set f	prth in the Report of	of Work annex	ed hereto, h	naving performed t	he work
or wit	nessed same during an	d/or after its completion							
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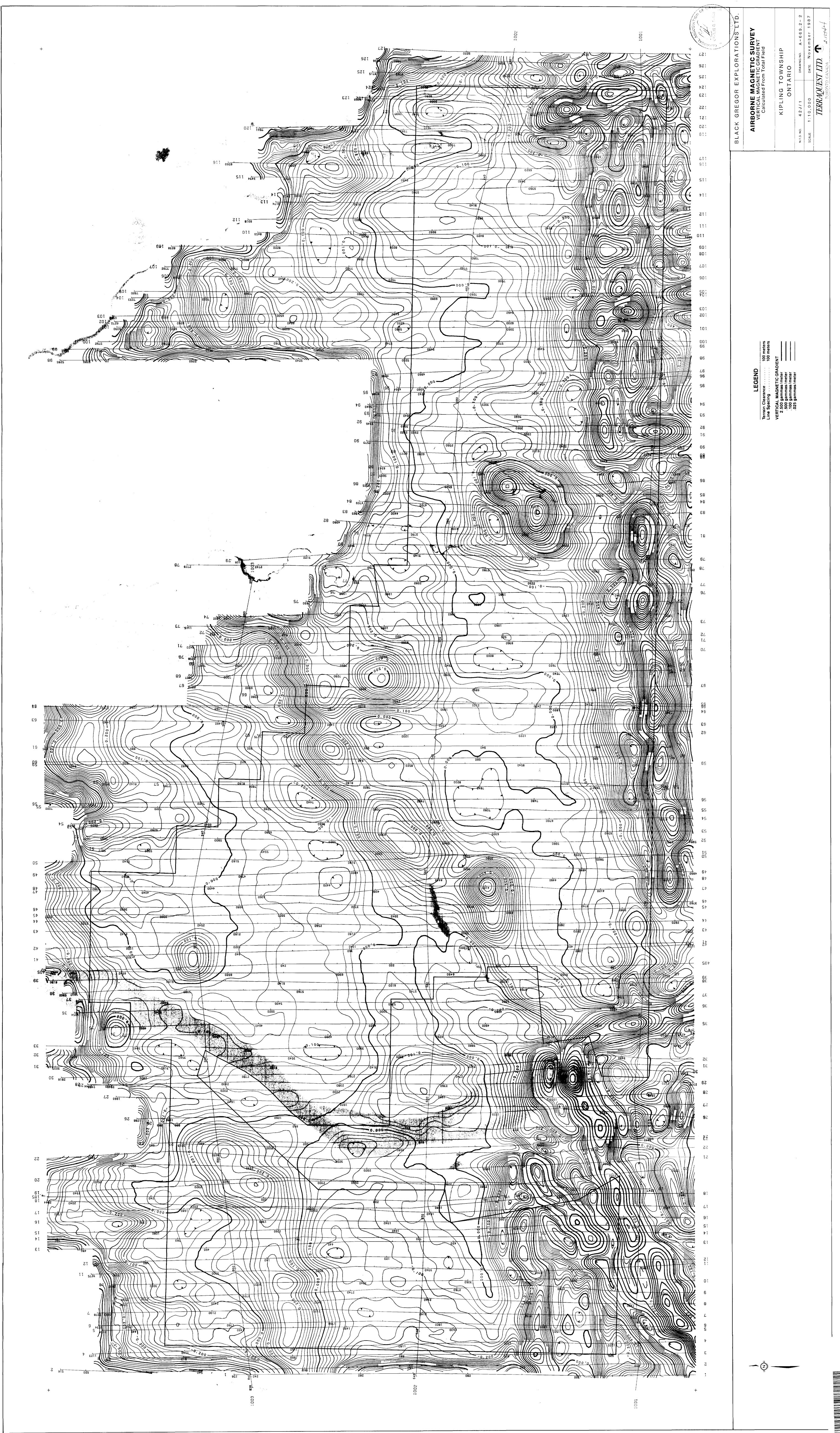
Nov. 19 Instructions: --- Please type or print. Ministry of Report of Work Geochemical and Expenditures - If number of mining claims traversed Northern Affairs exceeds space on this form, attach a list. and Mines Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns. Note: -Ontario Mining Ac Do not use shaded areas below. Type of Survey(s) Township or Area AIRBORNE, EM MAGNETIC. Prospector's Licence No. M 21208. JCE BOUCHARD TERRDDDUFST · VATLINE AVE. STE 100 MISSISSAUGA LY7-1P3 RRDQUEST ad Address of Author (of Geo-Technical report) m571241 1 RICHMONDST.W 2 ST. W STE 905 TORONTO Mining Claims Traversed (List in numerical sequence) BARRIE 12 Credits Requested per Each Claim in Columns at right Special Provisions Mining Claim Mining Claim Days per Claim Expend. Days Cr. Expend. Geophysical Prefix Number Prefix Days Cr. Number For first survey: - Electromagnetic Þ 900047 900000 Enter 40 days. (This includes line cutting) Magnetometer 900071 900048 - Radiometric الم المحجم الم For each additional survey: 900049 900072using the same grid: -- Other 900073 900050 Enter 20 days (for each) Geological . هاره به م 400074 900051 print. Geochemical 900052 900075 -----Man Days 1 Days per Claim Geophysical 900053 900076 Complete reverse side V E Dromagnetic and enter total(s) bec EI 900054 900077  $\mathcal{A}^{(1)}$  Magnetometer 900055 900078 9000BECOR DED 1987 adiometric 071 ger vær 900079 900057 Other 900080 MINING LANDS SECTION ្រ 900580FP 3h 1987 900081 Geochemical 900059 900082 Airborne Credits Days per 900053 Claim 900060 Note: Special provisions Electromagnetic 40 • 900084 900051 credits do not apply Magnetometer to Airborne Surveys. 40 400095 900062 Radiometric 900063 900086 Expenditures (excludes power stripping) 90006.4 900087 Type of Work Performed 12 L 14 1 960065 900088 Performed on Claim(s) 900066 SEP 30 1987 700089 900061 900090 900068 910091 Calculation of Expenditure Days Credits Total 900069 **Total Expenditures Days Credits** 900092 \$ 15 ÷ Total number of mining claims covered by this report of work. Instructions Total Days Credits may be apportioned at the claim holder's For Office Use Only choice. Enter number of days credits per claim selected Total Days Cr. **Date Recorde** in columns at right. Recorded 57 3,680 Date Approved Date Recorder Holder or Agen/ (Signature) Hoffer . n130/3 Certification Verifying Refort of Work I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true. Name and Postal Address of Person Certifying MAURICE HIBBIARD, SENAR HILL Date Cornitiod CONNAUCHT 10N 1270 .

Ontario	Ministry of No:thern Affairs and Mines	Report of Work (Geophysical, Geolog Geochemical and Ex	gical,	-+= 22 	3/87 1 10447 g Act	-	exceeds space on the Only days credits "Expenditures" section in the "Expend.	ing claims traversed his form, attach a list. s calculated in the ction may be entered Days Cr." columns.
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Nov. Minictry of + Instructions: -- Please type or print. **Report of Work**  If number of mining claims traversed exceeds space on this form, attach a list. Northern Affairs (Geophysical, Geological, and Mines Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns. Geochemical and Expenditures) Note: -)ntario 2.10144 Mining A Do not use shaded areas below. Type of Survey(s) Township or Area Claifor Holder(s) KIPLINC Prospector's Licence Ng M-23594 Im C/D CARLSON MINESLED 225 WATLINE STE 100 MISSISSAUGAL471P3 Date of Survey (from & to) Total Miles of line Cut Bay | Mo. | STr. | Bay | Mo. | Address of Author (of Geo-Technical report) Claim in Columns at right Mining Claims Traversed (List in numerical sequence) BARRIE. Credits Requested per Each Claim in Columns at right Special Provisions Mining Claim Expend. Days Cr. Daγs per Claim Expend. Days Cr. Mining Claim Geophysical Prefix Number Prefix Number For first survey: - Electromagnetic 970070 970093 Enter 40 days. (This includes line cutting) Magnetometer 970094 970071 7 mitter - Radiometric مينا بريا مينا بريا For each additional survey: 970072-970093 using the same grid: Other 970073 972096 Enter 20 days (for each) Geological . . . . . . . 972097 Geochemical 970098 70075 Man Days ę. Days per Claim Geophysical 970076 970099 Complete reverse side Electromagnetic 910077 970100 and enter total(s) here ويواد أو أمراره RECEIVE D - Magnetometer 970078 970101 - Radiometric 970102 4141.3 2 9 9 9 970079 DOT 1 4 1987 - Other 47010 970080 MINING LANDS SECTION CONT 97008 97010 نيموه نوي <u>ب</u> Geochemical 970082 **Airborne Credits** Days per Claim 970093 Note: Special provisions Electromagnetic 970084 ĽΩ credits do not apply to Airborne Surveys. Magnetometer 40 970085 Radiometric 970086 Expenditures (excludes power stripping) Type of Work Performed R ECORDED 970087 970098 Performed on Claim(s) 970089 SEP 30 1987 SEP 30 1987 3**1**73 970090 Stor A. Alto 97009 Calculation of Expenditure Days Credits Total 1001 **Total Expenditures** Days Credits \$ 15 Total number of mining claims covered by this report of work. 3 5 Instructions Total Days Credits may be apportioned at the claim holder's For Office Use Only choice. Enter number of days credits per claim selected Total Days Cr. Date Recorded Recorded Mining in columns at right. \$0D Date or Agent (Signature) Date Approved as SiEp] 30 ha. Certification Verifying Report of Work I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true. Name and Postal Address of Person Certifying HIBBARD CEOARHILL MAURICE

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