

GEOPHYSICAL-GEOCHEMICAL REPORT  
on  
VLF-EM AND SOIL SAMPLE SURVEYS  
AM CLAIM  
KENTUCKY LAKE, NICOLA M.D., B.C.

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AM CLAIM: 5.5 kms S40°E of Aspen Grove,  
B.C.  
: 49° 120° NW  
: N.T.S. - 92H/15E

Written for: Silver Acorn Developments Ltd.,  
411-850 West Hastings Street,  
Vancouver, B.C.

by: David G. Mark,  
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Dated: June 5, 1978



GEOTRONICS SURVEYS LTD.  
Engineering & Mining Geophysicists  
VANCOUVER, CANADA

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ASSESSMENT REPORT  
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NO.

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### SUMMARY

During the last half of May, 1978, a combined soil sampling and VLF-EM survey was carried out on the AM Claim. The AM Claim is located 5.5 kms S40E of Aspen Grove to the immediate west of Kentucky Lake. Access to the central part of the property is easily gained by a 2-wheel drive vehicle. The terrain consists of mainly moderate slopes with some rock bluffs forested with moderately dense coniferous trees. The purpose of the surveys was to extend the known zones of copper mineralization.

Previous work consists of trenching, adit work and shaft work done some years ago.

The property is mainly underlain by Upper Triassic Nicola Group volcanics. The rock types are volcanic breccia, volcanic conglomerate, and lahar deposits with a division into a red sequence and a division into a green sequence. Dioritic intrusives are found on the southern part of the property. Faulting on the property is predominantly north-south. Mineralization occurs as chalcopyrite, bornite, and calcite as disseminations and with associated stringers within fracture or shear zones within the green volcanics.

The VLF-EM readings and the soil samples were taken every 30 meters on 120-meter separated east-west lines. The VLF-EM readings were Fraser-filtered, plotted, and contoured. The soil samples were tested for copper and silver, and the results statistically analyzed, plotted and contoured.

CONCLUSIONS

1. The zone of major economic interest on this property is the copper soil anomaly labelled A. It correlates with copper mineralization where some physical work has been done (adit, open cut, and shaft). The copper soil anomaly shows that this mineralization could possibly have a length of at least 750 meters since it is open to the south. The strike of this anomaly varies from northeast to north.
2. There are several other copper soil anomalies that are significantly smaller, and that seem to be related to contacts or fault zones.
3. Anomaly H, though it is a 1-value anomaly, is interesting because of its high value of 370 ppm, its correlation with a silver anomaly, and its correlation with a VLF-EM anomaly.
4. The VLF-EM anomalies have reflected mainly faults and some lithologic contacts. Some of these are related to copper soil anomalies.
5. Except for anomaly H, the silver geochemistry appears to show that there is no silver mineralization on the AM Claim.

RECOMMENDATIONS

1. It is felt the magnetic survey should still be carried out on the property, that is, when the frequency of the magnetic storms is much less. The magnetic survey should be quite useful in mapping structure as well as rock-types, especially the dioritic intrusive.
2. Detailed soil sampling should be done on the property from lines 72S to 144S. The station interval should be reduced to 15 meters and the line spacing to 60 meters. It would only be necessary to analyze for copper.
3. After the above has been carried out, then the various anomalies, especially A, should be diamond drilled. The location and dip of the holes will depend upon the results of the above.

GEOPHYSICAL-GEOCHEMICAL REPORT

on

VLF-EM AND SOIL SAMPLE SURVEYS

AM CLAIM

KENTUCKY LAKE, NICOLA M.D., B.C.

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INTRODUCTION AND GENERAL REMARKS

This report discusses the survey procedure, compilation of data, and the interpretation of a soil sampling survey and a very low frequency electromagnetic (VLF-EM) survey carried out over the AM Claim during the last half of May, 1978.

The surveys were done under the supervision of the writer and under the field supervision of R.R. Fassler with the aid of a helper. A total of 447 soil samples were picked up and 13 line kms of VLF-EM were done. The samples were tested for copper and silver.

It was intended at the same time to carry out a ground magnetic survey but magnetic storms were so frequent that it was impossible to carry out. Storms were checked for each day.

The primary purpose of the VLF-EM soil geochemistry surveys was to extend the known zones of copper mineralization

found on the property. A secondary object of the VLF-EM survey was to delineate faults and/or shear zones.

PROPERTY AND OWNERSHIP

The AM Claim consists of one claim of six units as shown on Figure 2 and as described below:

<u>Claim Name</u>	<u>No. Units</u>	<u>Record No.</u>	<u>Tag No.</u>	<u>Expiry Date</u>
AM	6	316(8)	36551	August 12, 1978

The property is owned by Silver Acorn Developments Ltd., Vancouver, British Columbia.

LOCATION AND ACCESS

The legal post of the AM Claim is found about one kilometer due west of Kentucky Lake and about 5.5 kms S40E of Aspen Grove.

The geographical coordinates are  $49^{\circ} 53\frac{1}{2}'N$  latitude and  $120^{\circ} 34'W$  longitude.

Access to the property is quite good and can be gained by a passenger car probably all year around (see Figure 2). One travels along Highway 5 for 30 kms south of Merritt or 5 kms south of Aspen Grove and then turns east on a well-used gravel road. About 5 kms on this road is a second turn-off to the south onto a dirt road. The AM Claim is about 0.5 kms along the dirt road.



### PHYSIOGRAPHY

The AM Claim lies in the southern part of the physiographic division known as the Thompson Plateau which is part of the Interior Plateau System. The terrain varies from flat or rolling hills over much of the property, to steep slopes with rock bluffs through the central part. The general trend of the topography runs north-south. Elevations vary from 1,000 meters a.s.l. at Kentucky Lake to 1,200 meters a.s.l. in the southwest corner to give a relief of only 200 meters.

The main water source is Kentucky Lake.

Vegetation of the property is lightly to moderately dense forest of mainly coniferous trees which consist of pine, fir and spruce.

### HISTORY OF PREVIOUS WORK

There is evidence of much physical work having been done on the property, but the writer is unsure of the dates. These include a shaft of unknown depth, an inaccessible winze and a number of open cuts.

### GEOLOGY

This is quoted from Sookochoff's engineering report on the property.

"The upper Triassic Nicola group of rocks predominate within the Kentucky Lake area and are part of the sporadically mineralized Nicola Belt stretching from south of Princeton to north of Kamloops Lake.

"On the Kentucky Lake property, which lies within the central part of this Belt, the rocks are comprised of massive andesitic flows and coarse pyroclastic units. Volcanic breccia, volcanic conglomerate, and lahar deposits predominate with

a division into a green to gray-green sequence (unit 1) and a red to purple sequence (unit 2). Dioritic intrusives outcrop on the southern portion of the property. The intrusives are of similar composition and have gradational relationships with the Nicola rocks and may be in some cases a result of volcanic recrystallization.

"Two large scale northerly trending ( $35^{\circ}$  -  $005^{\circ}$ ) faults occur on the property. The fault system is part of the Alleyne-Kentucky regional fault system indicated to project to the radiating group of faults at the Copper Mountain Camp.

"Prominent fault scarps on the property reflect the major northerly faults. East-west faulting is also reflected in shear zones and fractures.

"Mineralization occurs as chalcopyrite, bornite and chalcocite as disseminations and with associated stringers within fracture or shear zones within a massive green sequence of the Nicola volcanics.

"Two reported assays of samples from the shaft area assayed 1.50% Cu over 1.3 meters and 2.05% Cu over 1.6 meters. A grab sample of material, taken by the writer from a shaft dump, (well sorted), returned .90% Cu."

#### GOVERNMENT AEROMAGNETIC SURVEY

The survey was flown for the Federal and Provincial governments by Geotrex Limited from October 1969 to April 1972 with a terrain clearance of 300 meters.

The AM property sits on the east side of a northerly-trending series of aeromagnetic highs. One of these highs is found on the southwest part of the AM Claim and has an intensity of over 58,000 gammas. In correlating with the geological map of Preto, et al, the anomalous highs seem to be reflecting dioritic rocks. (An intrusive or a dioritic phase of the Nicola volcanics).

The writer has interpreted two major north-trending aeromagnetic lineations with one occurring on the eastern boundary of the AM Claim, and the other just west of Highway No. 5. A third lineation, striking northwest, is found to run through the center of the AM Claim. These lineations, especially the north-striking ones, very likely reflect major faults. They are shown on Figure No. 2.

#### VLF-EM SURVEY

##### 1. Instrumentation and Theory:

A VLF-EM receiver, Model 27, manufactured by Sabre Electronic Instruments Ltd., of Burnaby, British Columbia, was used for the survey. This instrument is designed to measure the magnetic component of a very low frequency (VLF) electro-magnetic field. The U.S. Navy submarine transmitter located at Seattle, Washington, and transmitting at 18.6 KHz. was used.

In all electromagnetic prospecting, a transmitter produces an alternating magnetic field (primary) by a strong alternating current usually through a coil of wire. If a conductive mass such as a sulphide body is within this magnetic field, a secondary alternating current is induced within it which in turn induces a secondary magnetic field that distorts the primary magnetic field. It is this distortion that the EM

receiver measures. The VLF-EM uses a frequency range from 16 to 24 KHz. whereas most EM instruments use frequencies ranging from a few hundred to a few thousand Hz. Because of its relatively high frequency, the VLF-EM can pick up bodies of a much lower conductivity and therefore is more susceptible to clay beds, electrolyte-filling fault or shear zones, and porous horizons, graphite, carbonaceous sediments, lithological contacts as well as sulphide bodies of too low a conductivity for other EM methods to pick up.

Consequently, the VLF-EM has additional uses in mapping structure and in picking up sulphide bodies of too low a conductivity for conventional EM methods and too small for induced polarization (in places it can be used instead of IP). However, its susceptibility to lower conductive bodies results in a number of anomalies, many of them difficult to explain and, thus, VLF-EM preferably should not be interpreted without a good geological knowledge of the property and/or other geophysical and geochemical surveys.

## 2. Survey Procedure:

The VLF-EM survey was run on a grid in which the lines run east-west at 120-meter intervals from a baseline running due south from the legal claim posts. Dip angle readings were taken every 30 meters with the instrument facing towards the transmitter at Seattle. Fluorescent pink flagging was marked at each 30-meter stations with the grid coordinates marked thereon.

## 3. Compilation of Data:

The readings were reduced by applying the Fraser Filter. Filtered data, as shown on Sheet 4, are plotted between the reading stations. The positive filtered values were contoured at intervals of  $5^{\circ}$  starting at  $5^{\circ}$ .

The Fraser filter is essentially a four-point difference operator which transforms zero crossings into peaks, and a low pass smoothing operator which reduces the inherent high frequency noise in the data. Therefore, the noisy, non-contourable data are transformed into less noisy, contourable data. Another advantage of this filter is that a conductor that does not show up as a cross-over on the unfiltered data quite often will show up on the filtered data.

### SOIL GEOCHEMISTRY SURVEY

#### 1. Survey Procedure:

The soil samples were picked up at the 30-meter stations. The samples were picked up with a D-handled shovel at about a 15-centimeter depth. The horizon sampled was B except where it could not be obtained, then horizon C was sampled. Samples were placed in brown wet-strength paper bags with grid coordinates marked thereon.

#### 2. Testing Procedure:

All samples were tested by Acme Analytical Laboratories Ltd of Burnaby, British Columbia. The sample is first thoroughly dried and then sifted through a -80 mesh screen. A measured amount of the sifted material is then put into a test tube with subsequent measured additions of aqua regia. This mixture is next heated for a certain length of time. The parts per million (ppm) copper or silver is then measured by atomic absorption.

#### 3. Treatment of Data:

The values in ppm copper were grouped into logarithmic intervals of 0.10. The cumulative frequency for each interval was then calculated and then plotted against the

correlating interval to obtain the logarithmic cumulative frequency graph as shown on Figure 3.

The data population included the results of a soil survey carried out at the same time on the AR Claim to the immediate west to give a total of 858 samples.

The coefficient of deviation, indicative of the range or spread of values was calculated for copper to be 0.29, a moderately low figure. Therefore, the range of values is somewhat narrow. This statistical parameter is indicative of how well the element has been mechanically or chemically dispersed. Considering the lower than average value, one could then say the dispersion rate for copper is somewhat low.

The graph shows a break at the 19% level which therefore indicates that there is an excess of high copper values on the AM and AR claims. This is usually the case where copper sulphide mineralization occurs.

The graph for copper shows the mean background value to be about 20 ppm taken at the 50% level. The sub-anomalous threshold value (a term used by the writer to denote the minimum value that is not considered anomalous but still important as an indicator of mineralization), is taken at one standard deviation from the mean background value which is at the 16% level and is in this case 40 ppm. The anomalous threshold value is two standard deviations away at the 2 1/2% level and is on this property 75 ppm.

The copper values were plotted on Sheet 2 contoured at an interval of one standard deviation starting at the sub-anomalous contour (40 ppm). This contour was dashed in and the anomalous contours (75, 150 and 300) were drawn in solid.

The silver geochemistry data was not analyzed with a cumulative frequency graph due to the way the data was distributed. Rather, the statistical parameters for silver were 'eyeballed' as follows:

Mean background level	0.1 ppm
Sub-anomalous threshold value	0.2 ppm
Anomalous threshold value	0.4 ppm

The contours for silver were:

Sub-anomalous contour	0.2 ppm
Anomalous contours	0.4 ppm

The silver values were plotted on Sheet 3, and contoured with the sub-anomalous contour dashed in and the anomalous contour drawn in solid.

#### DISCUSSION OF RESULTS

##### I. VLF-EM Survey:

The major cause of VLF-EM anomalies, as a rule, are geologic structures such as fault, shear and breccia zones. It is therefore logical to interpret VLF-EM anomalies to likely be caused by these structural zones. Of course, sulphides may also be a causitive source. But in the writer's experience, when VLF-EM anomalies correlate with sulphide mineralization, the anomalies are usually reflecting the structure associated with the mineralization rather than the mineralization itself.

The major trend of the VLF-EM anomalies, as seen on Sheet 1, is north with secondary trends of northwest and northeast. Considering the VLF-EM anomalies are likely reflecting structure, the major strike of structure on this property is concluded to be northerly. This is in agreement with the geological map produced by Preto, et al, which shows a major fault-contact trending north across the property as well as one northeasterly.

There is considerable variation in intensity from one VLF-EM anomaly to the next, that is, generally speaking, those anomalies striking northwesterly are lower in intensity than those striking northerly. It should therefore be pointed out that those conductors lying closer to the same direction as the direction to the transmitter (S25W) can be picked up easier than those that are lying at a greater angle. Depending upon its conductivity, a conductor may not be picked up at all if it's at too great an angle.

For ease of identification, the VLF-EM anomalies have been lettered by small letters, a to f.

The southern part of anomaly a, that is that part that strikes northeasterly, correlates directly with a fault as mapped by Preto. This part of the anomaly is the most intense within the survey area reaching an intensity of  $27^{\circ}$ . The northern part of the anomaly correlates with a contact between red volcanic breccia and green volcanic breccia as mapped by Preto.

The southern part of anomaly b and the northern part of anomaly d, that is, those parts that strike northwesterly, correlate with a contact between the red and green volcanics, as mapped by Sookochoff. The offset between anomalies b and d in the area between lines 72S and 84S suggest a transverse fault.



The northern part of anomaly b as well as anomaly e correlate with a major northerly-trending fault as mapped by Preto.

Anomaly c, in correlating with Sookochoff's geology map, is reflecting a northerly trending fault, as well.

There is some correlation of anomaly f with a north-trending fault (or possibly strong fracture?) as mapped by Sookochoff.

The southern part of anomaly d, the part that strikes north-northeasterly, cannot be explained by the geological mapping of either Preto or Sookochoff, mainly because of the lack of rock outcroppings in this area. However, considering the strong correlation of the other anomalies with geological structure, especially faults, the likely causitive source is a fault.

The correlation of the VLF-EM anomalies with the soil geochemistry will be discussed below.

## 2. Copper:

The copper anomalies have been labelled by the capital letters A to H, respectively.

Anomaly A is by far the largest and the most interesting. It is shown on Sheet 2 to stretch from the southern boundary of the property to the northern boundary to give a total length of at least 1,500 meters, being open at both ends. It reaches an intensity of 365 ppm.

However, the part of greatest interest is from line 84S and south. This part basically strikes northeasterly and has a minimum length of 750 meters since it is open to the south.

The maximum width is 150 meters on line 84S. Most of the physical workings within the AM claim have been done within anomaly A and include a shaft, an adit, and an open cut. Sookochoff has mapped copper sulphide mineralization within anomaly A in the area of these workings.

The anomaly does not appear to be underlain by any particular rock type as it seems to cut across lithological contacts.

The main part of anomaly A, line 84S to 108S, occurs to the immediate west of VLF-EM anomaly e which has been attributed to a major north-trending fault. Therefore, the sulphide mineralization that is the causative source of this anomaly is likely fault-related. Also, this part of the anomaly is found within the epidote and calcite zone as mapped by Sookochoff.

North of line 84S, anomaly A is composed entirely of sub-anomalous values and is therefore probably caused by very weak mineralization.

Anomaly B correlates with VLF-EM anomaly b which has been attributed to a contact between red sequence and green sequence volcanics. The anomaly seems to occur mainly within the green volcanics. The anomaly strikes northwesterly, has a length of 240 meters, and reaches an intensity of 100 ppm.

Anomaly C is 500 meters long and strikes northwesterly, as well. It is a long, narrow anomaly that is composed of only sub-anomalous values. The interesting part of this anomaly is that it correlates directly with a minor contact between two different volcanic rock-types as mapped by Sookochoff. However, the causative source is likely very weak copper mineralization.

Anomaly D, in correlating with Sookochoff's geological map, appears to be fault-related. The strike of the anomaly is north, its minimum length is 840 meters, being open to the south, and it reaches an intensity of 88 ppm. Most of the anomaly is composed of sub-anomalous values. The anomalous part is 240 meters long. The underlying rock is very probably volcanics, though what type, it is difficult to say.

Anomaly E strikes mainly northerly, has a minimum length of about 400 meters, is open to the south, and reaches an intensity of 196 ppm. It occurs between VLF-EM anomalies e and d, and most of it, within the epidote zone. The underlying rock type is that zone marked 2-5 (green volcanics to feldspar porphyry) on Sookochoff's geological map.

Anomaly F strikes northwesterly, is about 240 meters long, and reaches an intensity of 192 ppm. The most intense part of the anomaly is underlain by green volcanics and occurs within the calcite zone.

Anomaly G strikes northerly, is about 240 meters long, and reaches an intensity of 196 ppm. The most intense part of this anomaly, (the southern half) is underlain by the dioritic intrusive phase of the Nicola volcanics. The northern half is underlain by the volcanic sequence marked as 5-2, (feldspar porphyry to green volcanics) by Sookochoff.

Anomaly H is fairly interesting in that it correlates directly with an arm of VLF-EM anomaly a and, also, with the only silver anomaly of any significance. The copper value is the highest on the property and is 370 ppm. The silver value is also the highest and is 0.6 ppm.

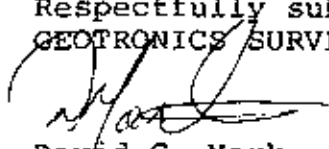
The VLF-EM results suggest that the soil anomaly strikes southwesterly onto the adjoining property and is, therefore, open in this direction. The soil results on the adjoining property show this anomaly to continue for about another 100 meters.

3. Silver:

There is very little within the soil geochemistry silver results that can be said to be anomalous. In fact, the only anomaly that is of economic interest at all is anomaly H discussed above within the upper geochemistry section. This is quite different from that experienced by the writer to the south on the Bluey claim, where there occurs strong silver anomalies, and these correlate quite well with the copper anomalies.

It can be seen on Sheet 3, that the silver content within the soil increases quite significantly on the southern part of the AM Claim. This could be due to very minor (to the point of being insignificant) silver mineralization occurring with the copper mineralization within this area. Or, possibly, it may simply be due to an increase in the background content of silver within the bedrock.

Respectfully submitted,  
GEOTRONICS SURVEYS LTD.,



David G. Mark  
Geophysicist

June 5, 1978

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July 16, 1976.


GEOPHYSICIST'S CERTIFICATE

I, DAVID G. MARK, of the City of Vancouver, in the Province of British Columbia, do hereby certify:

THAT I am a Consulting Geophysicist of Geotronics Surveys Ltd., with offices at 420-890 West Pender Street, Vancouver, British Columbia.

I further certify:

1. I am a graduate of the University of British Columbia (1968) and hold a B.Sc., degree in Geophysics.
2. I have been practising in my profession for the past ten years and have been active in the mining industry for the past thirteen years.
3. I am an active member of the Society of Exploration Geophysicists and a member of the European Association of Exploration Geophysicists.
4. This report is compiled from data obtained from VLF-EM and soil sampling surveys carried out under the supervision of myself during the last part of May, 1978.
5. I have no direct or indirect interest in Silver Acorn Developments Ltd., or the AM Claim, nor do I expect to receive any interest therein.

  
David G. Mark  
Geophysicist

June 5, 1978

AFFIDAVIT OF EXPENSES

The soil geochemistry and VLF-EM surveys were carried out on the AM Claim, Kentucky Lake, Nicola M.D., B.C. to the value of the following:

FIELD

Geophysical Technician and helper 40 hours at \$35/hour	\$ 1,400.00
Vehicle rental, 7 days at \$60/day	420.00
Room and Board, 2 men at \$30/man day, 10 days	300.00
Survey supplies	40.00
VLF-EM instrument rental, 1 week at \$75/week	75.00
	<hr/>
	\$ 2,235.00

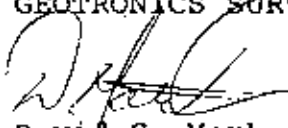
LAB

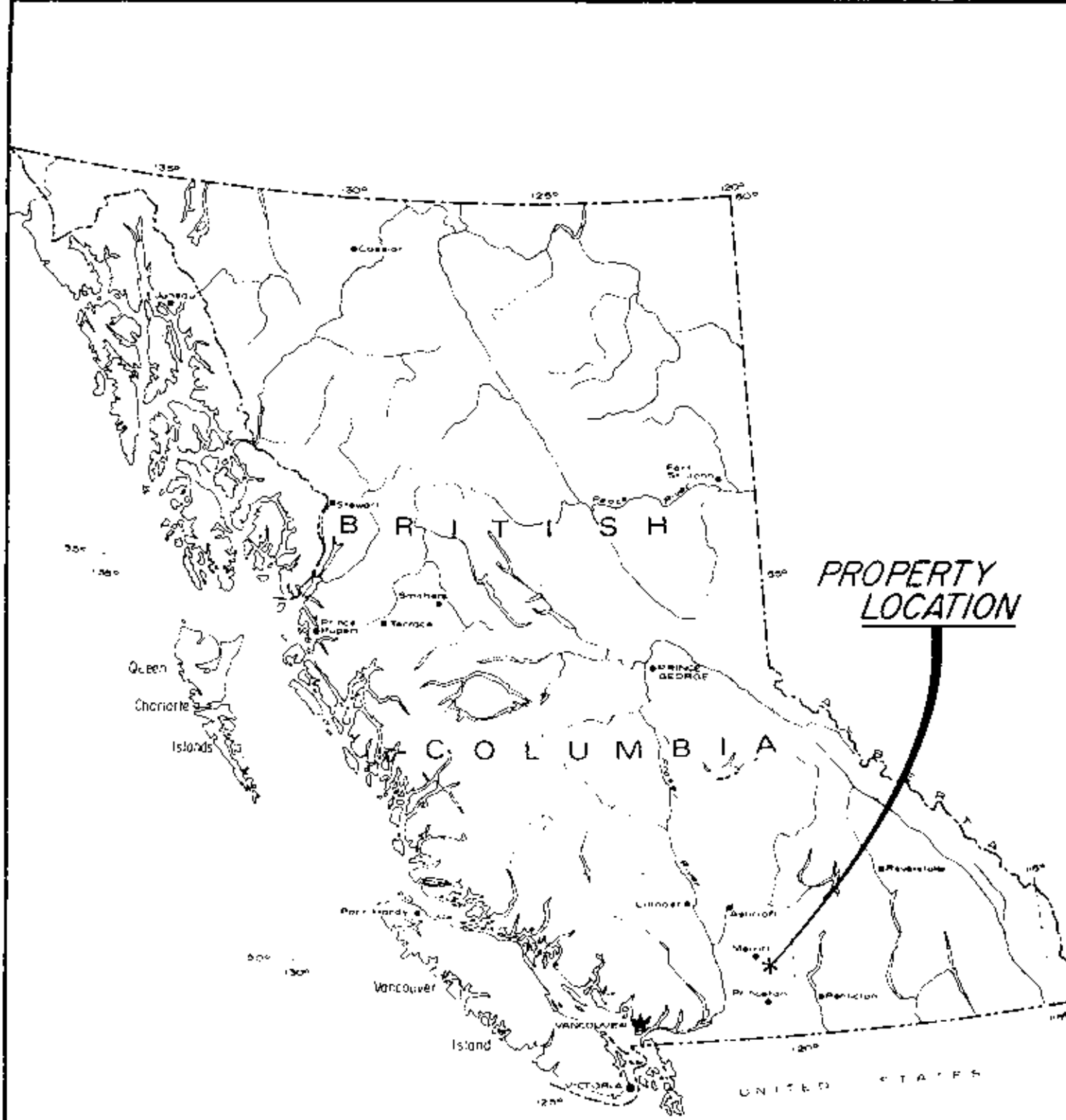
Soil testing, 447 samples at \$2/sample	\$ 894.00
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REPORT

Geophysicist, 15 hours at \$30/hour	\$ 450.00
Office Assistant, 15 hours at \$15/hour	225.00
Drafting and Printing	300.00
Typing, xeroxing and compilation	120.00
	<hr/>
	\$ 1,095.00
	<hr/>
TOTAL	\$ 4,224.00

Respectfully submitted,  
GEOTRONICS SURVEYS LTD.,

  
David G. Mark  
Manager

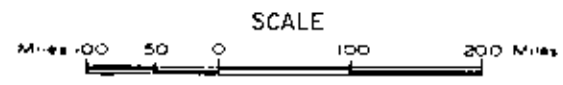


PROPERTY  
LOCATION

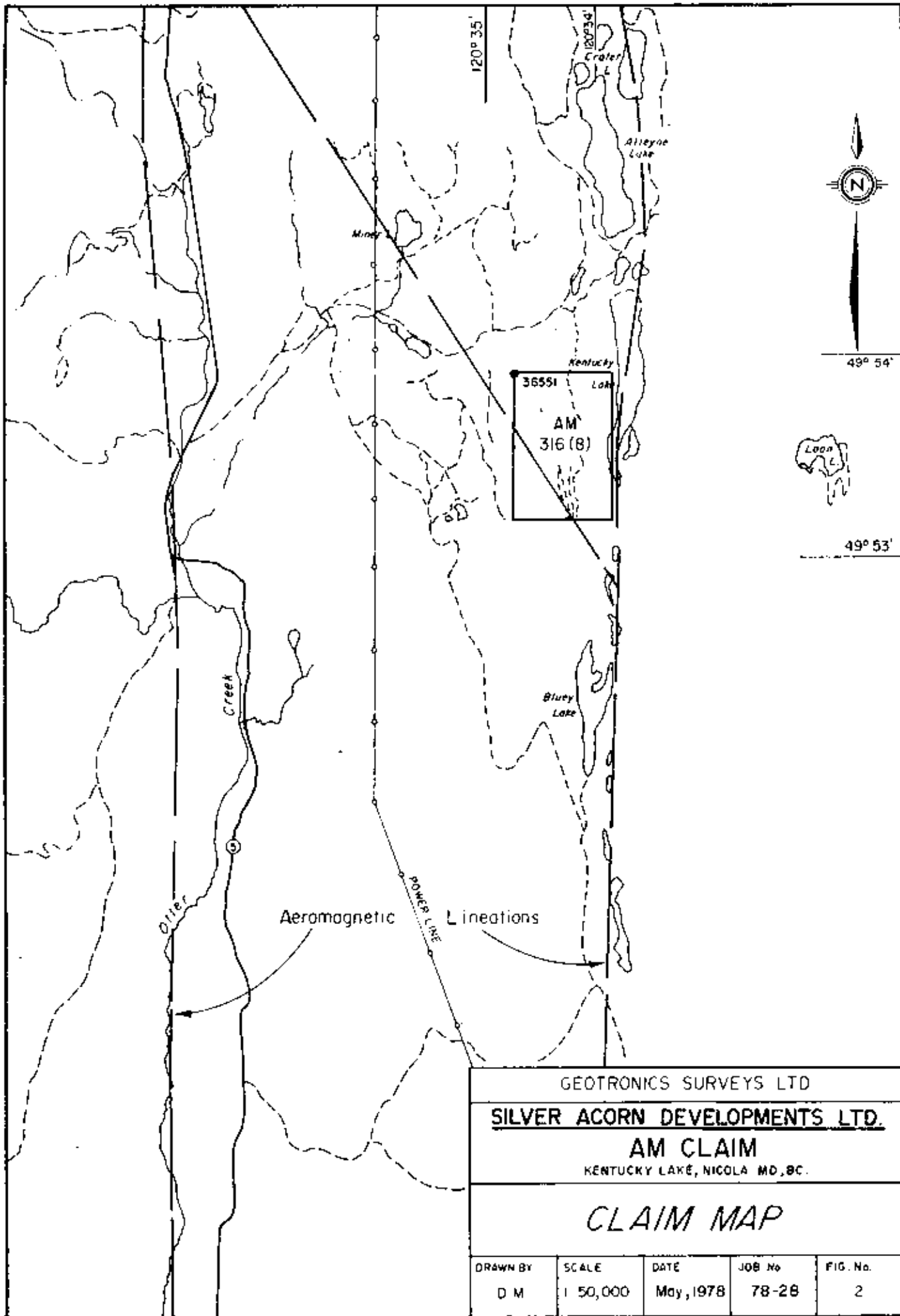
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SILVER ACORN DEVELOPMENTS LTD.

AM CLAIM  
 KENTUCKY LAKE, NICOLA MD, B.C.

*LOCATION MAP*







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**SILVER ACORN DEVELOPMENTS LTD.**  
**AM CLAIM**  
 KENTUCKY LAKE, NICOLA MD, BC.

*CLAIM MAP*

DRAWN BY	SCALE	DATE	JOB No	FIG. No.
D M	1:50,000	May, 1978	78-28	2

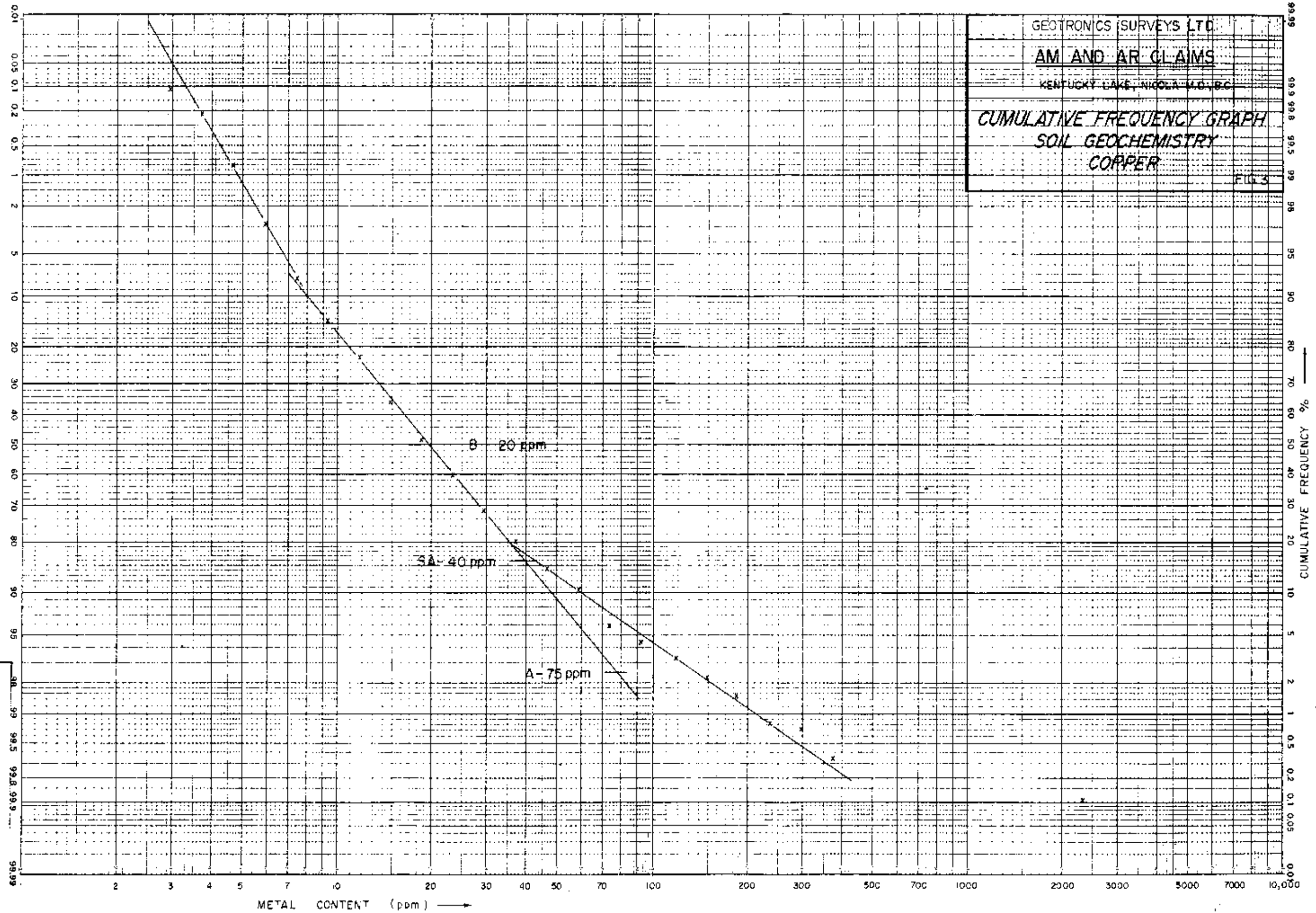
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AM AND AR CLAIMS

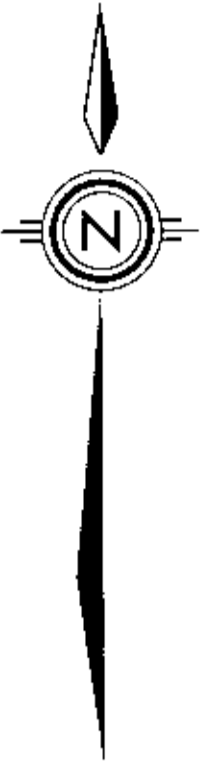
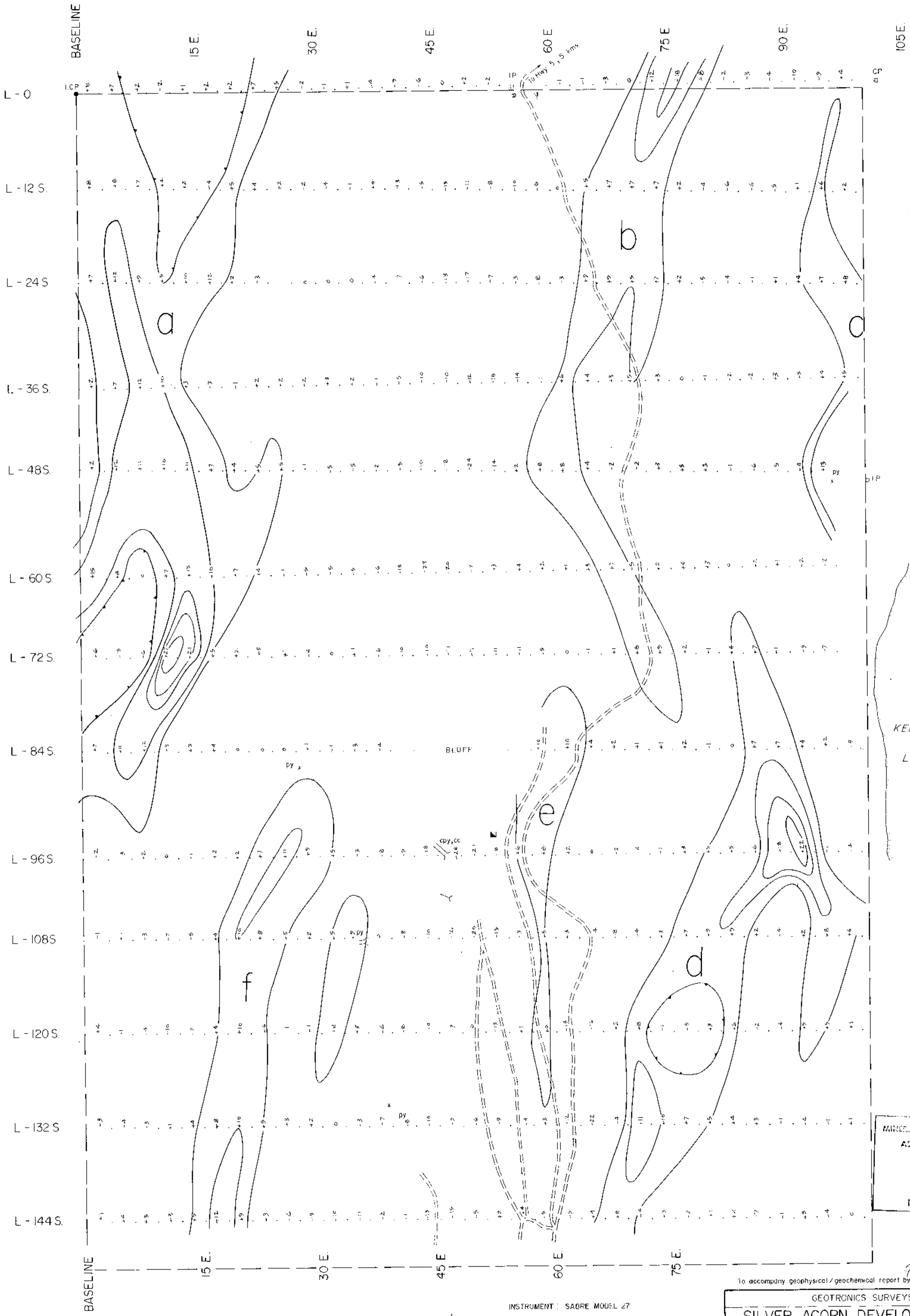
KENTUCKY LAKE, NICOLA, B.C.

CUMULATIVE FREQUENCY GRAPH  
SOIL GEOCHEMISTRY  
COPPER

FIG. 3



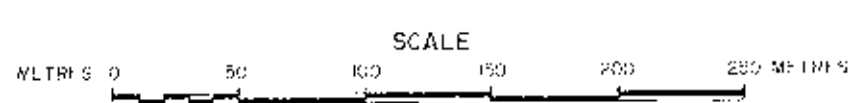
MINERAL RESOURCES ACT  
Accession No. 111  
N.O. 6821



SEATTLE TRANSMITTER  
18.6 KHZ

INSTRUMENT : SAGRE MODEL 27

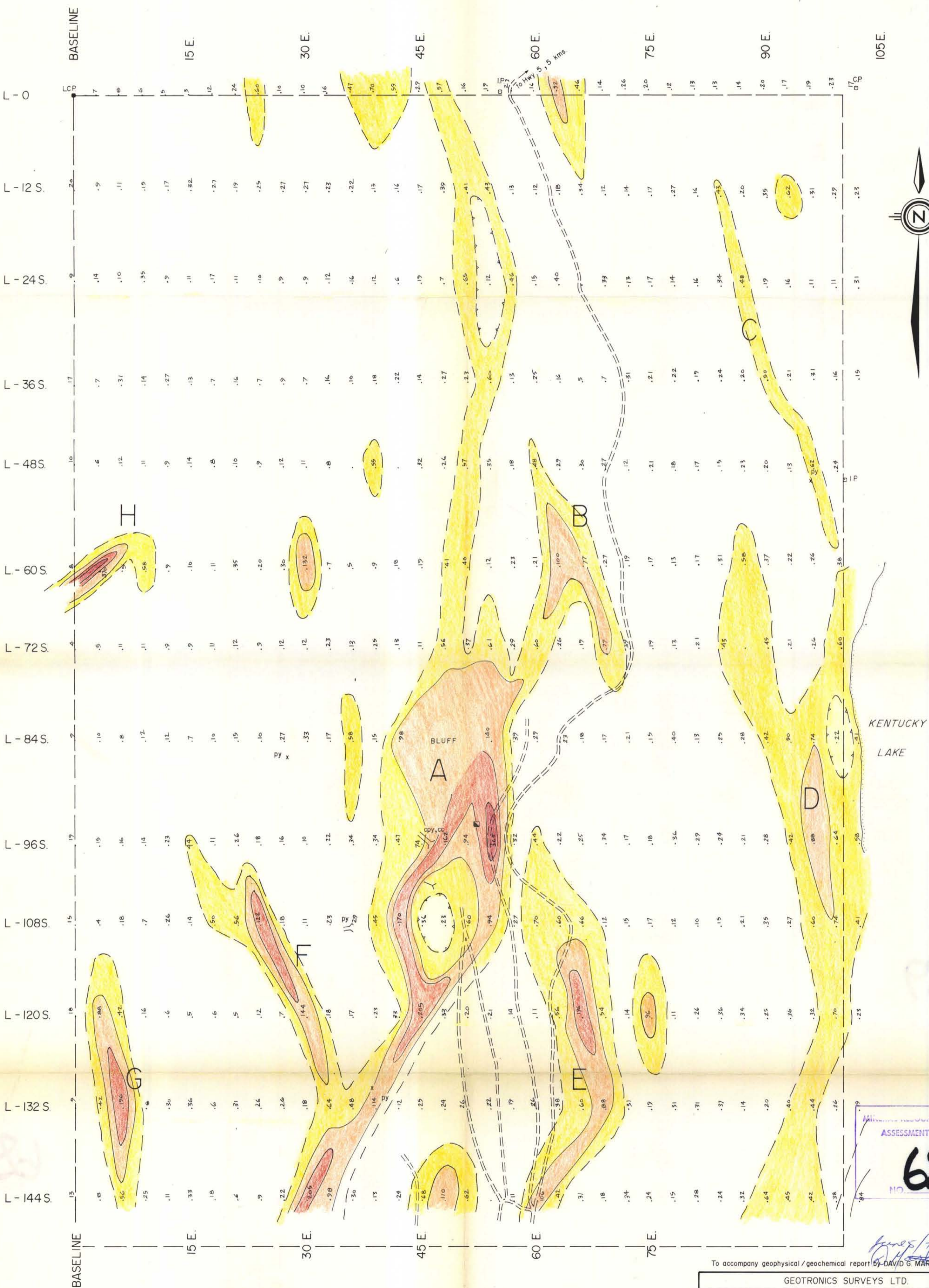
CONTOUR INTERVAL - 5°



MINERAL RESOURCES BRANCH  
ASSIGNMENT NO. 17  
**6821**  
NO.

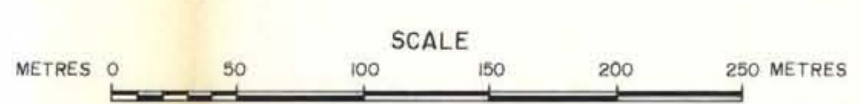
To accompany geophysical/geochemical report by DAVID S. MARK, geophysicist.

GEOTRONICS SURVEYS LTD			
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KENTUCKY LAKE, NICOLA M.D., B.C.			
VLF-EM SURVEY FRASER FILTER DATA & CONTOURS			
DRAWN BY R R F	JOB No. 78-28	DATE MAY, 1978	SHEET No. 1
SCALE 1" = 3000'			



**CONTOURS**  
 - - - - - SUB - ANOMALOUS ( 40 ppm )  
 \_\_\_\_\_ ANOMALOUS ( 75, 150, 300ppm. )

**PARAMETERS**  
 20 ppm. .... MEAN BACKGROUND VALUE  
 40 ppm. .... SUB - ANOMALOUS THRESHOLD VALUE  
 75 ppm. .... ANOMALOUS THRESHOLD VALUE



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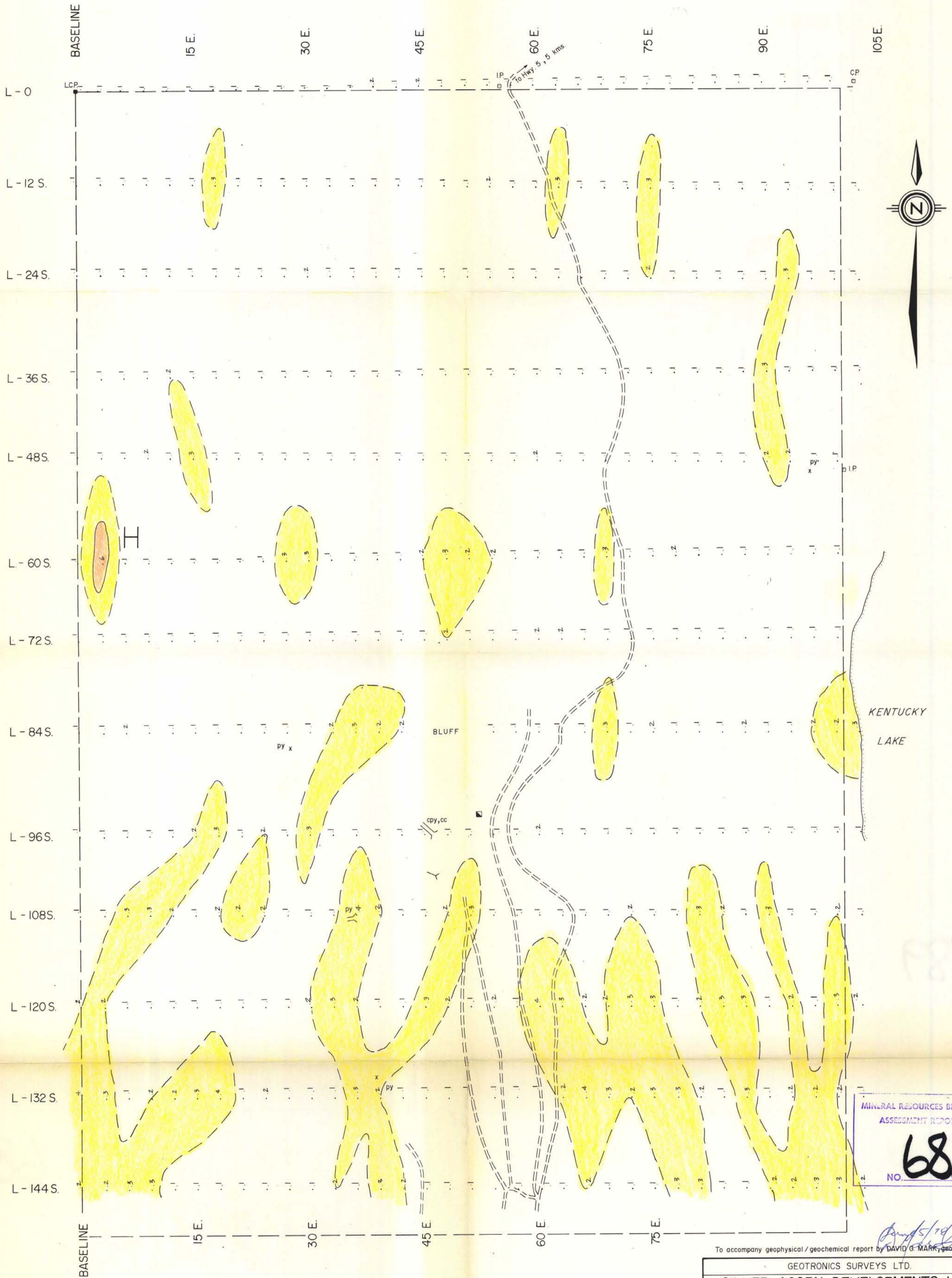
*James L...*

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 DATA & CONTOURS**

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CONTOURS

--- 0.2 ppm.  
 --- 0.4 ppm.

PARAMETERS

0.1 ppm. .... MEAN BACKGROUND VALUE  
 0.2 ppm. .... SUB- ANOMALOUS THRESHOLD VALUE  
 0.4 ppm. .... ANOMALOUS THRESHOLD VALUE

SCALE  
 METRES 0 50 100 150 200 250 METRES

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 DATA & CONTOURS

DRAWN BY: R.R.F.	JOB No. 78-28	DATE: MAY, 1978	SCALE: 1:3000	SHEET No. 3
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