

4054

REPORT ON THE
AIRBORNE MAGNETIC SURVEY
HIGHLAND VALLEY AREA
KAMLOOPS AND NICOLA MINING DIVISIONS
SOUTH CENTRAL BRITISH COLUMBIA
FOR
GEOPHYSICAL ENGINEERING AND SURVEYS LTD.
921/7E & W, 10 W, & 6 E
BY

A. W. MULLAN, P. Eng.

AND

PETER K. SMITH, B.Sc.

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **4054** MAP

NAME AND LOCATION OF PROPERTY
HIGHLAND VALLEY AREA
KAMLOOPS AND NICOLA MINING DIVISIONS
SOUTH CENTRAL B.C. 50°25'N - 120°50'W

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GENERAL NOTES ON
AIRBORNE MAGNETIC SYSTEM

A. EQUIPMENT

The proton precession magnetometer was employed in this airborne magnetic survey. Ancillary equipment consists of an altimeter, a frame camera, an intervalometer-fiducial numbering system and a light beam recorder.

Proton Magnetometer

A Varian V4937-A airborne proton precession magnetometer is used to record the variations in the earth's total magnetic field.

The proton free precession magnetometer operates on the principle of nuclear magnetic resonance to produce a measurement of the earth's total magnetic intensity, i. e., the scalar magnitude of the ambient field. In the proton magnetometer sensor, a uniform magnetic field is created by passing a few amperes of current through a coil about a small volume of proton-rich (hydrogen nuclei) hydrocarbon fluid such as kerosene. The spinning protons act as small magnetic dipoles and align themselves with the applied field. When the field is removed, the protons precess in phase about the direction of the earth's field at a rate proportional to the total magnetic intensity. This rate, or Larmor precession frequency, is determined by the value of the gyromagnetic ratio of the proton (23.4874 gamma per Hz) which is an atomic constant known to an accuracy of 7.5 parts per million. The precession frequency is independent of the direction of the spins with respect to the earth's field; only the signal amplitude varies, being maximum when the spins are normal, and zero when they are parallel to the direction of the earth's magnetic field.

The precession signal is induced by the motion of the precessing protons in the same coil used for polarizing the sample. Thermal agitation causes the signal to decay in a few seconds from its peak value of a few tens of micro-volts. The frequency of the precession signal, as determined by the gyromagnetic ratio, is approximately 0.04 Hz per gamma, or between 1250 and 3400 Hz, corresponding to an approximate range of 30,000 to 80,000 gammas in the earth's magnetic field.

This instrument has a sensitivity of one gamma when pulsed at one second intervals. The proton magnetometer has the advantage of reading the absolute value of the earth's magnetic field and is almost completely free of drift or variations due to temperature or environmental changes.

B. DATA RECORDING & COMPILATION

A light-beam recorder employing a photo-sensitive paper is used to record the data. High-sensitivity galvanometers give almost instantaneous response to the incoming signals and the recorder time lag is essentially zero. The recorder normally employed is the 14 channel Honeywell Visicorder.

With the actual flight record oriented so that the fiducial numbers increase from left to right, the 5.7 inch trace width has been divided by 15 major grid lines with zero at the bottom and 15 at the top. These major divisions are in turn divided by five division lines which appear as lighter lines on the chart. Except where noted on the individual records, the traces are identified as follows:

1) Magnetometer

The magnitude of the earth's total magnetic field is recorded on both a fine scale (0 to 200 gammas) and a coarse scale (0 to 2000 gammas).

Each scale is adjusted to provide a full scale deflection of ten major units on the recording chart. The position of the fine scale zero line is usually centred on grid Line 3 while the coarse scale zero is also positioned on grid Line 3. The exact zero and full scale deflection positions can be checked from the flight calibrations. Since the value of the earth's magnetic field is a five digit number, the operator records the value of the first two digits on the flight report.

ii) Fiducials

Fiducials are indicated by vertical lines appearing at the bottom of the chart. These lines are interpreted by a reversed marker to indicate every tenth fiducial. Each fiducial marking corresponds with a camera frame, so that the tracking film can be correlated with the data recorded on the chart.

iii) Altimeter

The trace appearing across the upper portion of the chart is a monitor of terrain clearance. The altimeter scale is non-linear. A calibration scale for this trace is recorded for each flight.

C. DATA PRESENTATION

Magnetometer Results

The magnetic data are presented in contour form. The contours represent lines of equal intensity of the earth's magnetic field. A contour interval of 20 gammas has been used where the gradient of the earth's magnetic field permits.

McPHAR GEOPHYSICS LIMITED

**REPORT ON THE
AIRBORNE MAGNETIC SURVEY
HIGHLAND VALLEY AREA
KAMLOOPS AND NICOLA MINING DIVISIONS
SOUTH CENTRAL BRITISH COLUMBIA
FOR
GEOPHYSICAL ENGINEERING AND SURVEYS LTD.**

1. INTRODUCTION

An airborne magnetic survey was carried out over part of the Highland Valley area for Geophysical Engineering and Surveys Ltd. The survey covered an area extending ESE from the Bethlehem Copper Mine area to beyond Mamit Lake. The geographical centre of the survey area is about 50°25' north latitude and 120°50' west longitude.

Road access is good with the Highland Valley-Merritt highway traversing the area. Numerous bush roads provide good access to all parts of the survey area from the main highway.

The geology of the area is described in Bulletin #56, B.C. Department of Mines, "Geology and Geochronology of the Guichon Creek Batholith".

2. SURVEY SPECIFICATIONS

A Varian Proton Magnetometer Model V4937A, Serial Number 66-101 was used for the survey. The sensitivity of the instrument is 1 gamma when read at 1 second intervals. This instrument was carried in a Bell G3 B1 helicopter provided by Okanagan Helicopters Ltd. and piloted by Mr. E. Veideman.

The McPhar operator-navigator was Mr. W. McGee.

The survey covered an area of about 88 square miles. Approximately 691 line miles were flown with a mean line spacing of 660 feet. The low-level survey was flown with a mean terrain clearance of 300 feet.

The survey was carried out during the latter part of May, 1972. The data was recovered and compiled during parts of June and July, 1972.

3. PRESENTATION OF RESULTS

The results of the airborne magnetic survey have been compiled on two adjoining map sheets Nos. AM 7207 and AM 7208 at a scale of 1:15,840 (approx.). The magnetic values have been contoured using a 20 gamma interval where the gradient permits.

4. DISCUSSION OF RESULTS

The low-level airborne magnetic survey shows good detail and good definition of anomalous magnetic highs and lows. The maximum magnetic relief recorded over the entire area was about 2,500 gammas. The various geological formations, phases and variations in general display characteristic magnetic levels. The Nicola volcanics and the Guichon variety of this Highland Valley phase show higher magnetic levels. The Chataway variety, the Gump Lake phase and the Nicola sediments display lower magnetic levels. A number of pronounced magnetic lineations or discontinuities are evident and suggest faulting or geological contacts.

The most obvious linear feature trends NNW through Mamit Lake and crosses the entire map sheet. Recent drilling evidence would suggest that

this feature represents a fault. Nicola volcanics occur east of the fault and west of the fault in the area from Mamit Lake south. Difference in magnetic levels on either side of the fault can possibly be explained by displacement along the fault. Higher magnetic levels in the section NE of the fault are explained by local capping with Kamloops volcanics.

The Gump Lake phase intrusive lies west of the above fault, north of Mamit Lake. It is quite low magnetically and shows little magnetic relief.

West of the Gump Lake phase occurs an area of higher magnetic levels in an area underlain by granitized sediments of probable Nicola age. It is postulated that the sediments occupy a basin overlying more magnetic Nicola volcanics.

The Chataway variety intrusive occupies the SW portion of the survey area. It displays a similar low magnetic level to the Gump Lake with little local relief.

The Guichen variety of the Highland Valley phase underlies most of the remaining area in the NW and central portions of the survey area. It generally shows higher magnetic levels with some interspersed lows. These lows could result from variations in the original intrusive, alteration or faulting and merit further investigation.

The contoured magnetic maps show numerous magnetic linears of varying strike and length. Some of these linears or discontinuities may represent geological contacts while others may indicate faults. In any particular area of interest the magnetic linears should be carefully correlated with known geology and in some cases investigated further in the field. Some of the more obvious magnetic lineaments are listed below:

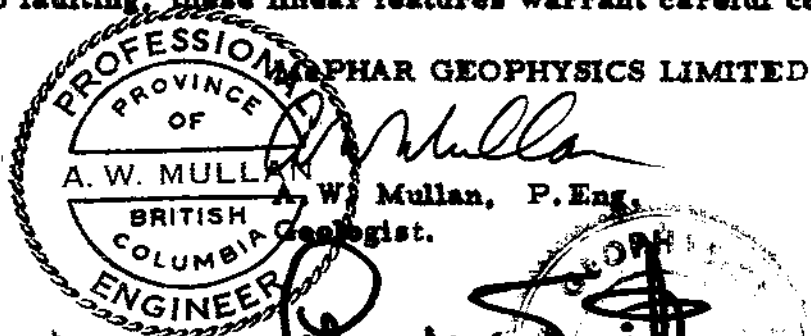
- NNW trending Mamit Lake linear feature, previously discussed.
- Both NNE and N trending lineaments extend north from the bend in the Highland Valley road, about 5 miles east of Bethlehem Copper.
- A north trending linear magnetic feature can be traced through Antler Lake and Tupper Lake.
- A strong E-W linear feature parallels Witches Brook in an area where several mineral deposits have been discovered.
- An E-W linear feature extends east from the road about 8,000' north of Mamit Lake.

5. SUMMARY

The low-level airborne magnetic survey shows good magnetic detail and definition. Most of the known geological formations show a characteristic magnetic level and can be roughly delineated magnetically.

Within the various formations occur numerous anomalous magnetic highs and lows. Most of these probably indicate variations within the intrusive. Some of these features could reflect alteration phenomena or later intrusive activity and thus merit further investigation.

Some of the numerous magnetic linear features will be reflections of fault structures. Since most of the economic sulphide deposits in the Highland Valley are related to faulting, these linear features warrant careful consideration.



A. W. Mullan
A. W. Mullan, P. Eng.

Geologist.

Peter K. Smith
Peter K. Smith,
Geophysicist.

Dated: December 27, 1972

STATEMENT OF COST

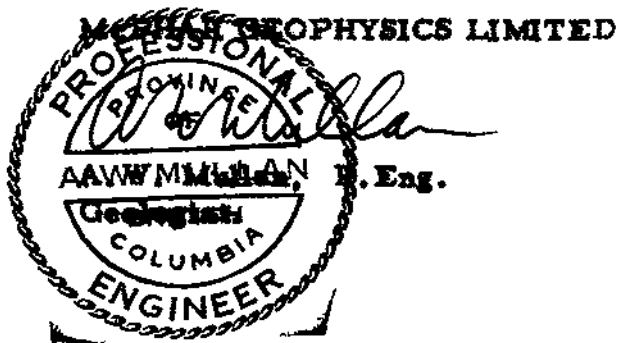
**Geophysical Engineering and Surveys Ltd. - Airborne Magnetic Survey
Highland Valley Area - Kamloops & Nicola Mining Division, South Central B. C.**

Period: May 13th - 26th, 1972

Technician: W. Magee

Consulting Geologist: A. W. Mullan

691 line miles	@ \$ 11.50 per mile	\$7,946.50
Data Compilation	@ \$ 2.00 per mile	1,382.00
1 1/2 days Reporting	@ \$150.00/day	225.00
		<u>\$9,553.50</u>



Dated: December 27, 1972

(over)

EXHIBIT OF

Geophysical Engineering and Survey Ltd. - Victoria Magnetic Survey
Highland Valley Area - Karriakoo & Nicola Mountain Division, South Central B.C.

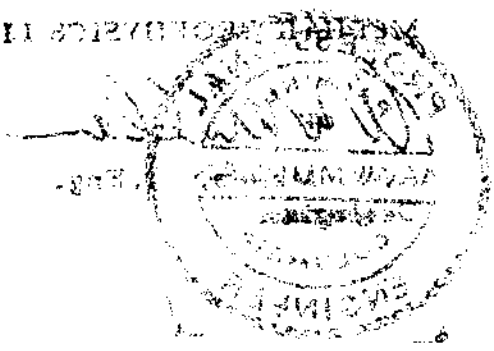
Declared before me at the City
of Vancouver, in the
Province of British Columbia, this 16
day of January, 1973, A.D.

[Signature]
Notary Public

[Signature]

A Commissioner for the Province of British Columbia
A Notary Public in and for the Province of British Columbia

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00.000000
00.000000
00.000000
00.000000



Notary Public

CERTIFICATE

I, Ashton W. Mullan, of the City of Vancouver, in the Province of British Columbia, hereby certify:

1. That I am a geologist and a fellow of the Geological Association of Canada with a business address at Suite 811, 837 West Hastings Street, Vancouver B.C.
2. That I am registered as a member of the Association of Professional Engineers of the Provinces of Ontario and British Columbia.
3. That I hold a B.Sc. degree from McGill University.
4. That I have been practising my profession as a geologist for about twenty years.
5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Geophysical Engineering and Surveys Ltd. or any affiliate.
6. The statements made in this report are based on a study of published geological literature and unpublished private reports.
7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto

This 27th day of December 1972


A. W. Mullan, B.Sc., P. Eng.

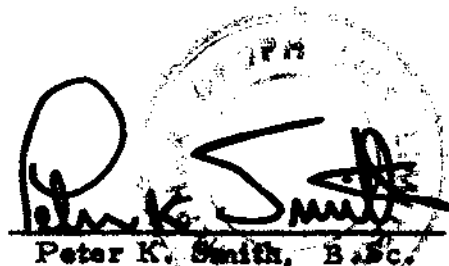
CERTIFICATE

I, Peter K. Smith, of the City of Toronto, in the Province of Ontario, hereby certify:

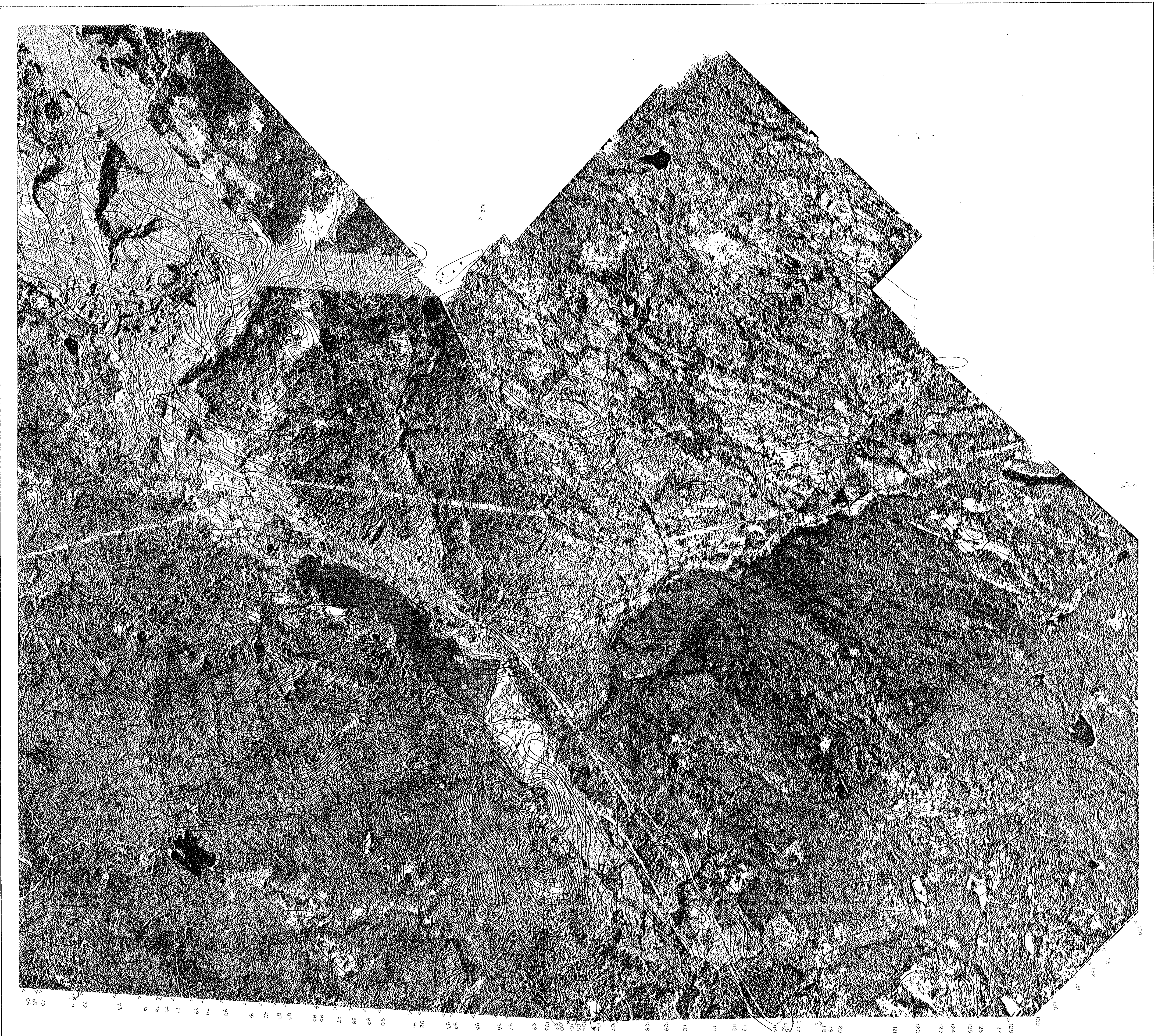
1. That I am a geologist/geophysicist with a business address at 139 Bond Avenue, Don Mills, Ontario.
2. I am a graduate of the University of British Columbia with a B.Sc. Degree in Honours Geology and Geophysics (1970).
3. I am a member of the Society of Exploration Geophysicists.
4. I have been practising my profession for 2 years.
5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Geophysical Engineering and Surveys Ltd. or any affiliate.
6. The statements made in this report are based on a study of published geological literature and unpublished private reports.
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Dated at Toronto

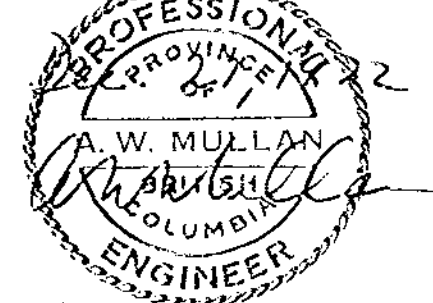
This 27th day of December 1972

A handwritten signature of Peter K. Smith is written over a circular stamp. The stamp contains the text "SOCIETY OF EXPLORATION GEOPHYSICISTS" around the perimeter and "1972" in the center. Below the signature, the name "Peter K. Smith, B.Sc." is printed.

Peter K. Smith, B.Sc.



MUSIC COMPILED BY LOCKWOOD, LINDSEY AND WILSON ENGINEERS LIMITED, TORONTO



LEGEND

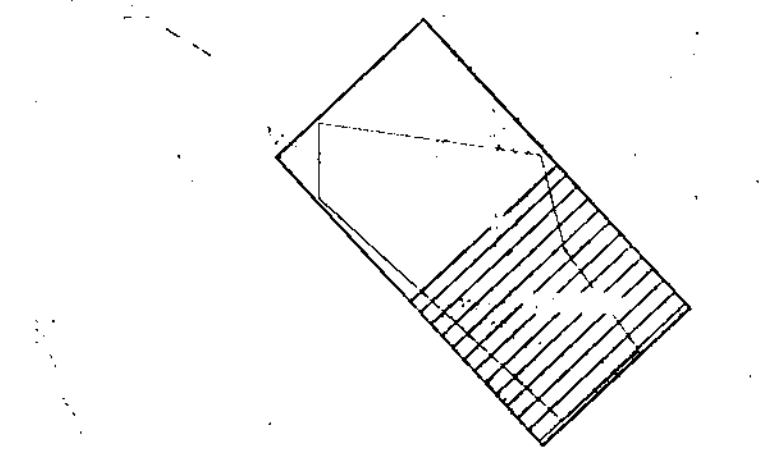
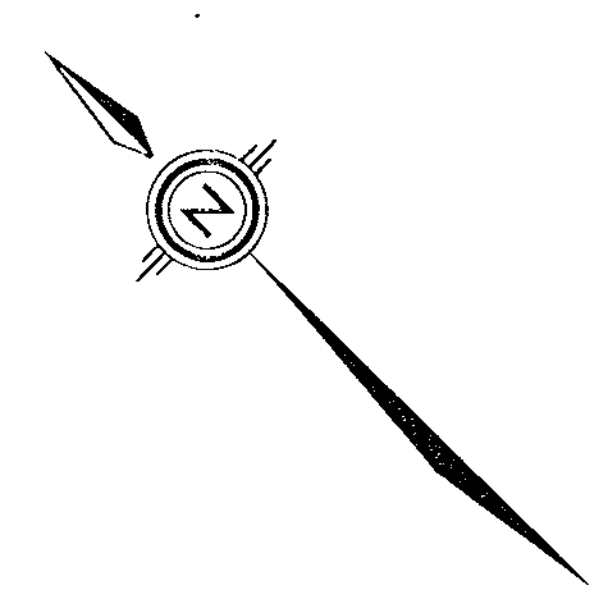
- CONTOUR INTERVAL ----- 20 gammas
- 20 GAMMA CONTOUR -----
- 100 GAMMA CONTOUR -----
- 500 & 1000 GAMMA CONTOUR -----
- MAGNETIC LOW -----
- MEAN FLIGHT LINE SPACING ----- 660'
- MEAN TERRAIN CLEARANCE ----- 300'
- FLOWN AND COMPILED ----- MAY-JULY 1972

GEOPHYSICAL ENGINEERING AND SURVEYS LIMITED

HIGHLAND VALLEY EAST

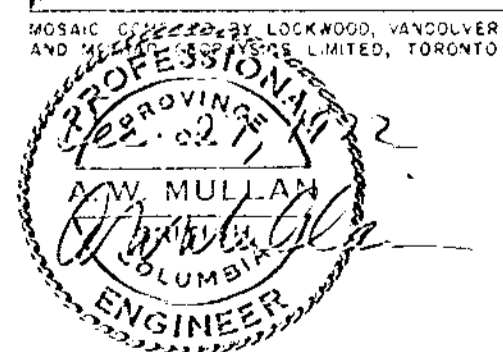
BRITISH COLUMBIA Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4054 MAP #2

SCALE 1:15,840 (Approximately)





4054



LEGEND

- CONTOUR INTERVAL - - - - - 20 gammas
- 20 GAMMA CONTOUR - - - - -
- 100 GAMMA CONTOUR - - - - -
- 500 & 1000 GAMMA CONTOUR - - - - -
- MAGNETIC LOW - - - - -
- MEAN FLIGHT LINE SPACING - - - - - 660'
- MEAN TERRAIN CLEARANCE - - - - - 300'
- FLOWN AND COMPILED - - - - - MAY-JULY 1972

GEOPHYSICAL ENGINEERING AND SURVEYS LIMITED

HIGHLAND VALLEY EAST

BRITISH COLUMBIA

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4054 MAP 111

SCALE 1:15,840 (Approximately)

