

2320

LOCKWOOD GEOPHYSICAL SERVICES

REPORT ON
AIRBORNE GEOPHYSICAL SURVEY
SALMON RIVER MINING DISTRICT
BRITISH COLUMBIA

Carried out for
ATNA MINES LIMITED

By

LOCKWOOD SURVEY CORPORATION LIMITED
TORONTO CANADA

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ABSTRACT

An airborne in phase/out of phase E.M. and magnetometer survey was done by helicopter in the vicinity of the Salmon Glacier, northern British Columbia. The survey covered about 230 line miles at a spacing of 1/8 mile and at an altitude of 200 feet above ground (bird/ground clearance 100 feet).

With the aid of energy spectrum analysis it was possible to discern from the magnetic data contributions from 3 depth levels below ground

- (1) over 1000 feet
- (2) above 500 feet
- (3) within 100 feet of ground level.

From analyses of the separated effects it appears that the area has been profoundly affected by fault structures trending northeast-southwest, northwest-southwest and east-west. Several zones of high magnetization were discerned. Abnormally high magnetic activity was noticed at the contacts of intrusive granodiorite and surrounding rock, indicating marginal facies or zoning.

The electromagnetic survey was characterized by three main types of response;

- (a) discrete narrow anomalies consistent with virtually vertical conductors
- (b) discrete broad anomalies indicative of overburden
- (c) large areas of pronounced response, adjacent to Long Lake, that appear due to gently dipping conductors. In view of the lack of magnetic association, the response appears to be due to carbonaceous sedimentary material.

Sixteen localities are recommended for ground follow-up in the form of detailed mapping and geophysical surveying.

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In Pocket

<p>Department of Mines and Petroleum Resources ASSESSMENT REPORT NO. 2320 MAP.....</p>

1. THE AIRBORNE GEOPHYSICAL SURVEY

1.1 INTRODUCTION

Lockwood Survey Corporation Limited carried out an airborne magnetometer survey in the period of July 27 to July 28 inclusive, on behalf of Atna Mines Limited. The survey area is located at 56°N, 130°W and is bounded on the west by the Alaska/British Columbia boundary and on the east by the Bear River Ridge. A total of 233 line miles of magnetic and electro-magnetic survey were done in an area which includes 102 mining claims. The claims are shown in Figure 6 and are listed in Table I. The survey was based at Stewart, B.C.

1.2 INSTRUMENTATION

The following survey equipment was installed in a helicopter FH-111, with the registration of CF-XDS, and operated by Highland Helicopters Limited of Vancouver, B.C.

- (a) A Gulf Mark III Fluxgate Magnetometer
- (b) A Lockwood in-Phase/Out-of-Phase
EM System, operating at 4000 hertz.

Ancillary equipment consisted of the following:

<u>Radio Altimeter</u>	: APN-1
<u>Camera</u>	: C.A.R.L. Mark 8
<u>Magnetic Storm Monitor</u>	: Gulf Mark I Fluxgate Magnetometer

A description of this equipment is given in Addendum L of this report.

TABLE I : MINERAL CLAIMS

<u>Lease</u>	<u>Claim Numbers</u>
M234	1654
M232	1852, 1855, 1859, 1836
M203	1849 to 1851, 2313, 2314
M233	3220, 5523, 6522, 5521
M231	3223
M235	3219
M236	5540
M206	4042, 4043
--	3900 to 3906, 5213, 5218
M238	3684, 3685, 4176, 4448, 6204, 5196 to 5199 5206, 5207, 5209, 5210, 5220, 5223, 5222 5215 to 5217
M208	3687
M199	4035
M201	4617
M230	4615, 4616
M229	1523, 1522
M200	4178 to 4180
M202	4152 to 4162, 4166 to 4169, 4171 4177 to 4180, 5094, 5095
M204	4605
M237	5412
--	5418
M212	5429, 5527, 5528
M213	4601, 4602, 4190, 4191, 4193, 5428, 5430 4443 to 4445 2846 to 2849
M211	3624, 3625, 4189

1.3 SURVEY PERSONNEL

The survey was expedited by the following personnel:

R. H. Biggs	- Pilot
D. Steele	- Engineer
H. Sandau	- Instrument Operator/ Navigator
D. Webb	- Field Data Editor

The address of the pilot and engineer is 1409 West Pender Street, Vancouver, B.C. The address of the instrument operator and data editor is 1450 O'Connor Drive, Toronto 16, Ontario.

Personnel qualifications for the geophysical technicians involved in the survey; Mr. H. Sandau and Mr. D. Webb, are given in Addendum II of this report.

1.4 SURVEY FLIGHT PATTERN

Traverse lines were spaced at intervals of approximately 1/8 mile. As shown in Figure 1 and 2, lines in the central part of the area were flown in an east-west direction across the claim group area. A series of lines in the extreme southeast and in the extreme northwest parts of the survey area were in a northeast-southwest direction. In order to remove diurnal variations from the magnetic data and tie information between consecutive traverses, a control line (indicated as line CL-1 in Figures 1 and 2) was flown in a north-northeast direction across the traverse lines. The survey was conducted at an average terrain clearance of 200 feet.

1.5 POSITIONING

Photographs of the terrain below the aircraft were taken at intervals of 1.5 seconds on 35mm film. The 35mm film was used in conjunction with air photo mosaics to identify the position of the aircraft within the survey area.

1.6 COMPILATION, REDUCTION AND PRESENTATION OF DATA

(a) Aeromagnetic Data

The magnetic data is presented as contours of the earth's total magnetic field intensity at a basic contour interval of 20 gammas in Figure 1. The horizontal scale of this map is 1 inch = 1320 feet = 1/4 mile. In the reduction of the magnetic data, diurnal variation was compensated for by tying traverse line data to the data measured along the control line traverse, at the intersections of the traverses and the control line. This in effect corrects the survey data to a common datum, that measured along the control line. A linear datum was then extended along each traverse line. Magnetic field contours based on this datum were then intercepted and transferred to the base map using the camera exposures or fiducials for positioning control.

(b) Electromagnetic Data

The electromagnetic data includes (a) instrumental drift and (b) the response due to regional variations in ground conductivity. These components were corrected for by fitting to both the in-phase and out-of-phase records, a series of linear segments or datum lines, no longer than 1 mile in length, to approximate the broad or regional variations in the records.

The contours of the in-phase component record were then intercepted at intervals of 10 parts per million, above the assumed datum lines. In addition amplitudes of peak in-phase anomalies

and corresponding out-of-phase anomalies were measured. The intercepted in-phase contours and measured in-phase and out-of-phase peak amplitudes were then transferred to the base map along the positioned flight pattern using the photographic fiducials for positioning control.

The electromagnetic data is presented in Figure 2 as contours of the in-phase component relative to the assumed local background level at an interval of 10 parts per million of the primary field, with values of both in-phase and out-of-phase components annotated at locations of anomaly peaks along survey flight paths. The scale of presentation is 1" = 1320 feet = 1/4 mile.

1.7 GENERAL GEOLOGY

According to Gabrielse and Wheeler (1961) rocks of the Salmon Glacier area are Mesozoic in age. Three main lithological units are exposed in the area;

should be Mes + Tertiary

- (a) Bowser sedimentary rocks; greywacke and argillite exposed in the vicinity of Long Lake and the Salmon Glacier.
- (b) Granodiorite, exposed extensively in the western southwestern parts of the area and in a zone extending southeast from the northern part of Long Lake.
- (c) Volcanic Sequences:
 - (1) rhyolite breccia
 - (2) volcanic conglomerates, sandstone
 - (3) volcanic breccias, sandstones
 - (4) mylonitized volcanic rocks, schists, cataclasites

trending north-northwest in the southeast, central and northwest sectors of the map.

taken from Steward Map - Bull. 58

Two belts of granodiorite dykes are mapped in the area;

- (a) south-southeast of the Salmon Glacier, trending northwest and intruding granodiorite and mylonitized volcanic rock units
- (b) extreme north vicinity of Salmon Glacier and Long Lake, trending west-northwest across the volcanic conglomerates, and Bowser sedimentary rock units.

A number of major fault areas are indicated;

- (1) trending south-southwest from Long Lake
- (2) trending northeast between Salmon Glacier and Long Lake, in the northern quarter of the survey area.

2. PROCESSING AND ANALYSIS OF THE AEROMAGNETIC DATA

Aeromagnetic data often comprises effects or contributions from various depth levels. With the use of a rather new technique for analysis of magnetic data, identification and separation of contributions to the data originating from widely separated depths can be done. The technique involves energy spectrum analysis and matched filtering. A detailed description of this rather mathematical approach to the treatment of aeromagnetic data is given in Spector (1968). The primary objective in using this approach is to derive a more three dimensional geological picture from the magnetic data.

This chapter deals with the analysis of the aeromagnetic data; the application of matched filtering to separate near-surface effects from effects originating from much more deeply buried magnetization, and the analysis of these separated effects.

2.1 DIGITIZATION

The aeromagnetic map was digitized on a square grid at intervals of one-half the survey line spacing; i.e. at intervals of 330 feet. This involved interpolation of the map contours at points of a grid consisting of 76 points east-west and 129 points north-south; 9804 points in all. The data was digitized in units of 10 γ . The digitization was verified by visual inspection.

2.2 REGRESSION PLANE

In order to determine the geomagnetic gradient in the data, a tilted plane was fitted to the data using the method of least squares. The equation of this plane is

$$T_o(x,y) = C_1 + C_2x + C_3y$$

where x , y are distances in miles in the north and east directions respectively. The origin for the x - y axis is at the extreme southwest corner of the survey area. The computed values of the coefficients are as follows:-

$$C_1 = 4803.03 \text{ gammas}$$

$$C_2 = -0.52 \text{ gammas/mile}$$

$$C_3 = +2.06 \text{ gammas/mile}$$

The tilted plane was then subtracted from the data thereby removing the variations in the intensity of the main earth's field across the survey area.

2.3 ENERGY SPECTRUM ANALYSIS

Figure 3 shows the computed energy spectrum of the data. The spectrum shows the frequency or wavelength components in the data. The frequency axis is in units of cycles per mile (cpm). The most conspicuous feature in the curve is the rapid drop-off of the spectrum at low frequencies compared to the behaviour of the spectrum at higher frequencies.

Three components in the data can be distinguished in the spectral curve;

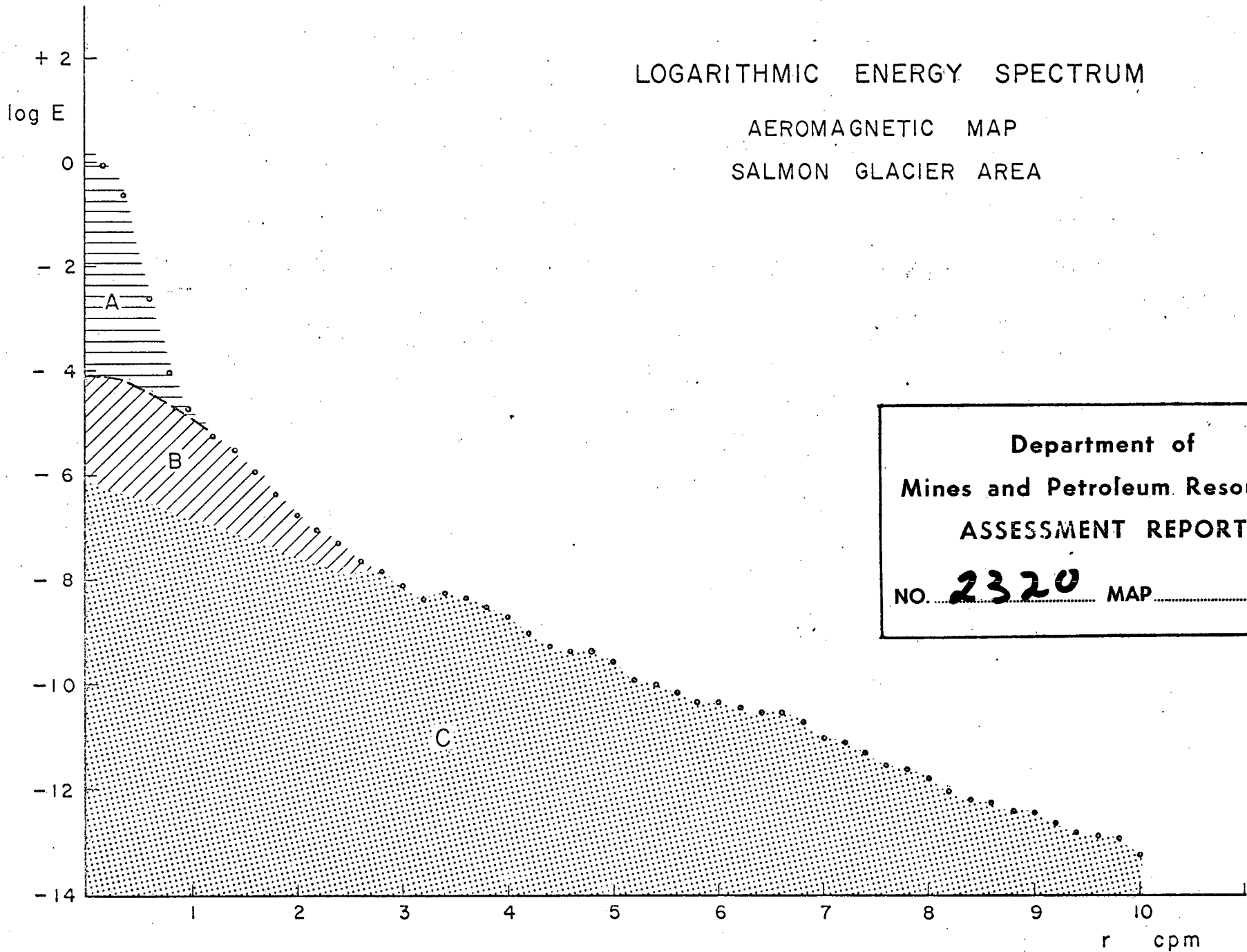


Figure 3

- component 'A' at frequencies less than .9 cpm,
- component 'B' which is evident in the frequency range 0.9 to 2.5 cpm,
- component 'C' which dominates the spectrum at frequencies greater than 3 cpm.

The drop-off of the spectrum with frequency can be related to the depth of magnetized sources. The following are the average depth below ground to the sets of magnetized sources responsible for the three spectral components;

- component A : 1400 ± 400 feet
- component B : 500 ± 100 feet
- component C : 50 ± 50 feet

Besides this depth information, the excellent resolution of deep-seated and shallow effects in the spectrum provides the basis for the design of matched filters whereby the data can be analyzed into the three magnetic components.

2.4 MAGNETIC COMPONENT 'A'

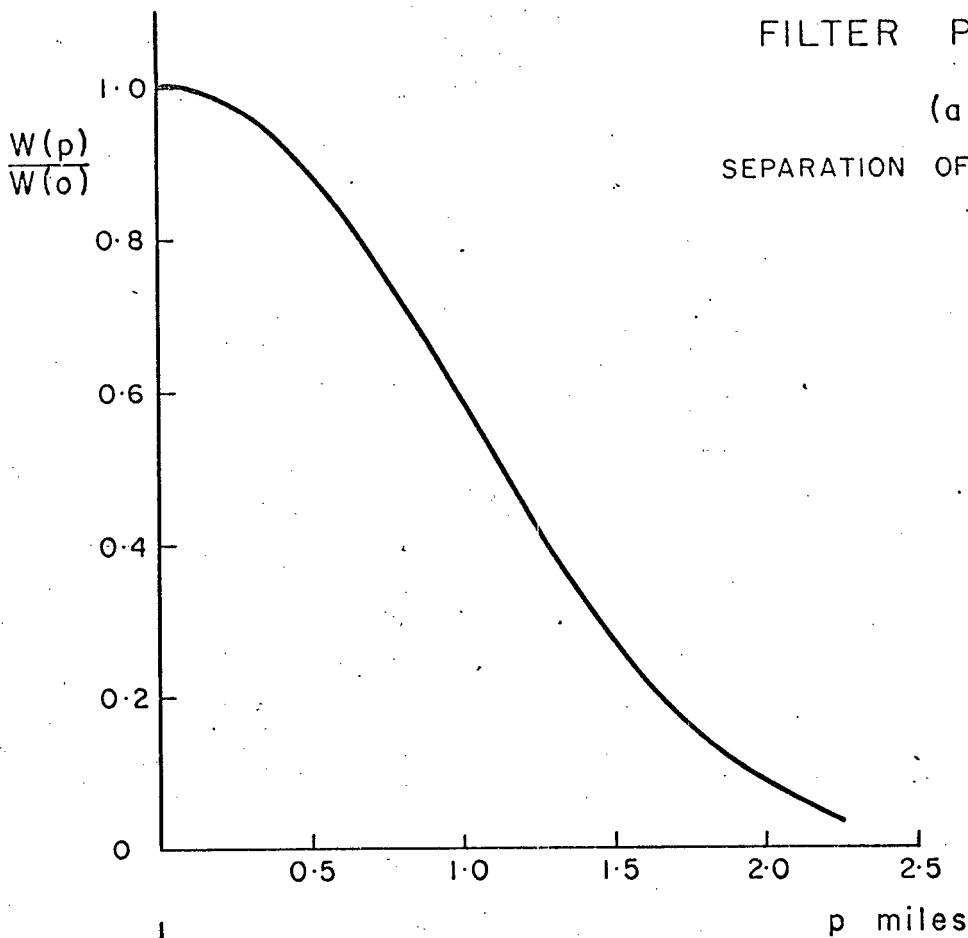
A filter was developed from the analysis of the energy spectrum to separate out component A. The design was based on the determined average depth of the causative sources responsible for this component; 1400 feet and the relative size of the contribution with respect to that in components B and C. A profile of this filter is shown in Figure 4a. We see that the width of this filter is about 2 miles. This is effectively the width of a zone along the boundaries of the survey map that filtering cannot be effected.

Map Figure 5 shows Magnetic Component A. The map is dominated by two northeast trending anomalies in the southcentral and east-central parts of the map area.

FILTER PROFILES

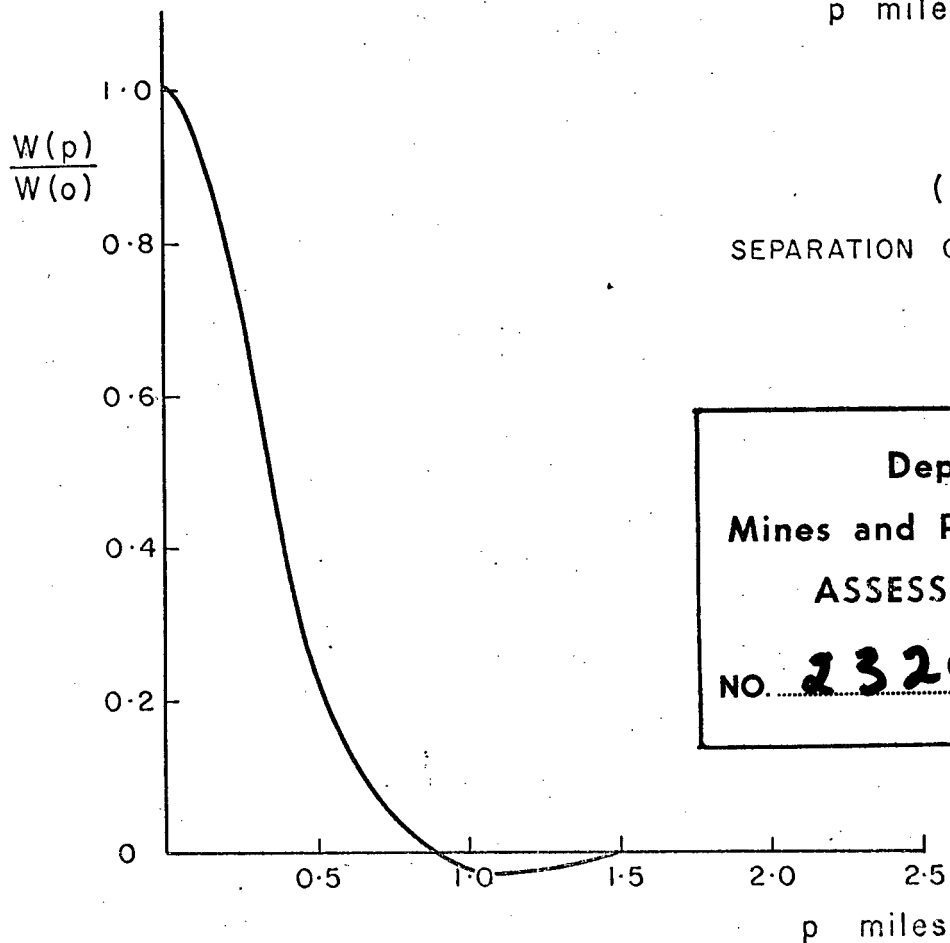
(a)

SEPARATION OF COMPONENT A



(b)

SEPARATION OF COMPONENT B



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Depth and Magnetization Determinations

Each resolvable anomaly in the Magnetic Component 'A' map was analyzed to determine depth and magnetization. The technique of analysis involves use of the 'Characteristic Curves' nomograms constructed by Luciano Martin of CASE, Toronto, and which are described by Grant and Martin (1966). Here parameters describing the shape and amplitude of an anomaly are measured and plotted onto charts from which depth and magnetization are determined. The prescribed model used to simulate a given anomaly was the bottomless prism, i.e. a body whose thickness is much greater than the depth to its top.

The assumptions of the 'characteristic curves' technique are as follows;

- (1) The anomaly is separable from surrounding anomalies.
- (2) The body is uniformly magnetized and the magnetization is mainly induced.
- (3) The body has vertical sides and a horizontal top.

Two anomalies were selected for analysis. As shown in Figure 5 the depths to the causative sources are 1100 and 1570 feet sub-ground.

The determined susceptibility contrasts are 690 and 910 ($\times 10^{-6}$ cgs. electromagnetic units). According to Grant and West (1965) the susceptibility of gabbro and granite are comparable to these values. A magnetite content in the order of 0.2 to 0.4 volume percent would give rise to the observed magnetic susceptibilities.

Two zones of anomalously high magnetization are outlined about the two anomalies. The zones appear to be flanked on the east side by a fault-like lineation. The zones may be associated with igneous intrusion. This is most likely the case for the east-central anomaly which is located in the vicinity of a granodiorite intrusion. To the southwest the zone of high magnetization is in an area of mylonitized volcanic rocks; schists and catacl^astics.

• From the lineation of the magnetic field contours in other parts of the map area, other magnetic faults or lineations are indicated. A major fault which trends northwest is seen in the northcentral map area. It coincides with a granodiorite dyke swarm which intrude the Bowser sedimentary rocks and mylonitized volcanics.

2.5 MAGNETIC COMPONENT 'B'

With the removal of the contributions from great depth (greater than 1000 feet) the opportunity presented itself to study magnetic features at more shallow depth; components B and C. Based again on the spectrum analysis a filter was designed to separate B from the residual remaining after Component A was resolved. A profile of the filter operator is shown in Figure 4b. The finite width of this filter; approximately 1.0 mile meant a further reduction in map size, to present components B and also C.

Map Figure 6 shows Magnetic Component B. A series of well defined northeast trending anomalies is again seen in the southeast and east-central map areas. These are most probably related to those anomalies

seen in Component A (Figure 5). In addition a series of well developed anomalies is seen further southwest, as well as in the northcentral map areas.

Anomaly Analysis

Anomalies in Component Map B were analyzed using the 'Characteristic Curves' approach described in Section 2.4. As shown in Figure 6, the depths associated with the Component B anomalies range from 40 feet to over 380 feet sub-ground. Susceptibility contrasts are relatively weak, 90 to 300×10^{-6} cgs units, i.e. less than 0.1% magnetite. There is one exception, anomaly number 11, for which the very high susceptibility contrast; 0.00173 relates to a magnetite content of almost 1%.

Geological Correlation

The lineation along the flanks of a number of anomalies were interpreted as indicative of faulting (or vertical contacts). The strongest of these is again seen as a northeast trending fault in the southeast corner of the area.

An east-west trending discontinuity across the centre part of the area effectively separates the north and south survey areas. A number of northeast trending lineations in the extreme northcentral map area correlate well with mapped faults.

Anomaly 11, is located near the contact of a granodiorite intrusion and the Bowser sedimentary rocks. It appears most likely that this anomaly is associated with a marginal facies of the granodiorite intrusion. The very high susceptibility contrast indicated by the anomaly may correspond with a more

ultra-basic phase or zoning at the contact between the granodiorite and the sedimentary rocks.

In general however there is little correlation between the anomaly patterns in the Magnetic Component A map and mapped geology. In some cases the volcanic-conglomerates-sandstones unit is somewhat more magnetic; e.g. anomalies 8, 2 and 3. In contrast, the mylonitized volcanic rocks, schists and cataclastics unit is generally non-magnetic. Particularly in association with faults, a number of important anomalies are located over the Bowser sedimentary rocks, witness anomalies 11, 6, 7, 10.

2.6 MAGNETIC COMPONENT 'C'

The contribution from bedrock magnetization close to ground level was resolved by subtracting Component A and B from the original data. Figure 7 shows Magnetic Component C; the near-surface component.

The following is a discussion of the significant anomalies in this map. Only anomalies greater than 30 gammas were considered as significant in terms of analysis. A great deal of the anomaly patterns in this map are due to topographic effects associated with the low altitude of the helicopter and great relief of the area's terrain.

Anomaly Analysis

Again using the 'Characteristic Curves' approach described in Section 2.4, i.e. the bottomless prism model, anomalies of Magnetic Component C were analyzed for depth and susceptibility contrast.

For the most part these anomalies originate within 100 feet of ground level and to a large extent may be

attributable to topographic influences. However in some areas the distribution of anomalies was indicative of changes in magnetite content associated with lithological variations. The range of computed susceptibility contrast is from 100 to 700×10^{-6} cgs units which corresponds with a magnetite volume content of from less than 0.1% to over 0.2%.

Geological Correlation

Based on the lineation of contours and the apparent dislocation of anomalies, faulting was interpreted from the Component C map. Three distinct fault systems are apparent according to trend;

- (a) northeast-southwest; dominant fault trend in central map area
- (b) northwest-southeast; conspicuous in central and northern parts of area
- (c) east-west; quite noticeable in south half of map sheet.

In the west central part of the area there is strong correlation between magnetic anomalies and mapped geological contents particularly at contacts between the granodiorite and mylonitized volcanic rocks (anomalies 1, 9, 10, 21 and 22). Good correlation is again seen at the contact of a granodioritic intrusion northeast of Long Lake. The granodiorite here can be mapped as a magnetic low. The above zones of high magnetization may be indicative of more ultra-basic zones associated with igneous intrusion or the development of metamorphic zones enriched in magnetite by the granodiorite intrusion.

The magnetic map is in general characterized by a series of thin sinuous zones of magnetic anomalies (see southcentral and northcentral map areas). These zones do not correlate with any particular rock unit, but rather they seem to extend in some instances across two or three mapped units. However certain rock units are significantly more magnetic than others. In the northcentral map area, the volcanic conglomerates and sandstones unit is characterized by a series of intense magnetic anomalies, i.e. 28, 29 and 31. In addition this is an area where this rock unit has been subjected to a great deal of deformation by a series of northeast-southwest faults. In the central map area, the mylonitized volcanic rock unit is host to a number of strong anomalies, e.g. 2, 3a, 10, 11, 12, 21, 23 and 26.

3. ANALYSIS OF THE ELECTROMAGNETIC DATA

3.1 General Observations

The results of the combined survey divide the area into several distinct geophysical units of contrasting magnetic and electromagnetic character.

The Magnetic Component C Map shows a number of small anomalies, some of which will probably be topographic effects, however the grouping of these anomalies is such that several magnetic units can be defined. The characteristics of the magnetics suggests that the area has been subjected to profound structural activity.

The electromagnetic survey data is characterized by three main types of response; discrete narrow anomalies consistent with essentially vertical conductors, broad "overburden" anomalies, and large areas of response typical of horizontal conductors.

The locations of the electromagnetic anomalies discussed below are shown in the Composite Interpretation Map, Figure 8. The map also shows depth and conductivity-width determinations determined from those anomalies that could be analyzed in terms of vertical conductors. Mineral claim locations are shown for reference.

In terms of depth, magnetic anomalies of shallow origin would appear most likely to have the closest association with electromagnetic anomalies. This is because the effective depth of exploration with the 30 foot electromagnetic system is about 200 feet or in this case 100 feet below ground. Based on this premise, zones of high magnetization as well as interpreted faults or lineaments, discerned from Magnetic Component C (Figure 7) are also shown in the Composite Interpretation Map. The purpose of this action is to help in

establishing whether or not there exists a correlation between electromagnetic anomalies and areas where magnetic mineralization has developed, i.e. to provide a criterion for establishing whether an indicated conductor may be associated with base metal mineralization or associated with carbonaceous material. However in view of the possibility that base metal mineralization may have been controlled by deep-seated structure, the locations of electromagnetic anomalies were also compared with features resolved in Magnetic Component B and A.

3.2 Individual Anomaly Analysis

As seen in the Electromagnetic Map, Figure 2, the area immediately to the west of Long Lake is one of exceptionally high electromagnetic activity. This zone lies wholly within the mapped Bowser sedimentary rocks; the line of the lake marks a distinct contrast in electromagnetic character demonstrating that the rocks to the west of the lake are different in terms of electrical conductivity, from those to the east, though mapped as the same rock unit. The western edge of this activity coincides almost exactly with the western edge of the Bowser sedimentary unit as mapped. This suggests that the character is derived from the rocks and not overburden. In the interpretation map, Figure 8, the central areas of these conductive 'bodies' are labelled A to F inclusive. Within these areas the electromagnetic response is typical of virtually horizontal sheets of good conductivity; Area A dips slightly to the west, Area D to the east whilst the remaining areas are essentially horizontal. Normally the characteristic shape of the anomalies indicates a horizontal sheet-like body suggestive of overburden, but in this instance where the outline of the electromagnetic response coincides almost exactly with the limits of the mapped Bowser

sedimentary unit, it is considered that the cause of the anomalies must be from within the sediments, i.e. graphitic layers within the argillite. The conspicuous absence of magnetic activity supports this conclusion. The abnormally high in-phase amplitudes and the associated high quadrature amplitudes precludes the presence of multiple vertical conductors, which is the alternate interpretation. This area is, however, electromagnetically complex therefore it should be examined on the ground to determine the true nature of the conductors and check for associated mineralization, particularly at those few localities where magnetic anomalies are present.

The discrete narrow, large amplitude electromagnetic anomalies are numbered 1 to 14 inclusive. This order should not be taken as indicative of grade.

Anomaly 1.

One of the few responses believed to be caused by a near vertical conductor, unfortunately it was only recorded on one line implying short strike length. The response is equivalent to a vertical half plane at a depth of 115 ft. below the detector (which identifies the causative feature as at ground surface), with a conductivity width of 50 mho. There is a flanking magnetic anomaly of 40 gamma. It is in the immediate vicinity of the intersection of an east-west fault and a north-northeast trending fault interpreted from the magnetics. The EM anomaly is located in the volcanic conglomerates-sandstone unit.

Anomaly 2.

This anomaly has a short trend and is located within the high E.M. activity area, at the south extremity of Long Lake. The form of the anomaly is compatible with multiple vertical conductors but may result from a compounding of the effects from the lake and horizontal conductors. The anomaly is characterized by an in-phase to quadrature ratio of 3:2, compatible with a conductivity width of 4 mhos. It is located within the Bowser sedimentary unit and is at the southeast corner of claim 5211.

Anomaly 3.

This anomaly is located immediately northwest of Anomaly 2 and is also located within the area of pronounced E.M. response. It could be interpreted as two parallel vertical conductors but in view of the nature of surrounding responses it is not thought to be so. The anomaly extends across the boundary between claims 5209 and 5211 and it is located within the Bowser sedimentary unit.

Anomaly 4.

This anomaly is found on the east bank of Long Lake and trends parallel to the lake. The large width of the anomaly as measured on line 35 makes it appear to be due to overburden, but in its favour are the following points;

- (a) an exceptionally long strike length; 0.5 mile
- (b) the fact that the in-phase to quadrature ratio is greater than unity, indicates a minimum conductivity-width of 3 mho.
- (c) it is adjacent to and parallels the granodiorite/Bowser sedimentary rock contact.

Anomaly 5.

The anomaly is located near the northern end of Long Lake. The ratio of in-phase to quadrature response indicates a conductivity-width of 5 mho. The anomaly is in close proximity to an interpreted magnetic fault (discerned from Magnetic Component B). The anomaly is found in the vicinity of the area of high E.M. response interpreted as due to carbonaceous material in the Bowser sedimentary unit. The lack of magnetic signature lessens the significance of this anomaly.

Anomaly 6.

This denotes a zone of pronounced E.M. anomalies located northwest of Long Lake, which are characteristically narrow with comparatively small half-width and ratio of in-phase to quadrature response greater than unity. These anomalies have a good appearance and are of the right form i.e. they suggest vertical conductors, yet they are situated within the conductive belt running north-south, west of Long Lake. They are however in proximity to a series of faults interpreted from the Magnetic Component B, and seen in the geological mapping, particularly in claim 4155.

Anomaly 7.

Two isolated E.M. anomalies are indicated in the north-central part of the map. They are wide yet have no indicated continuous length. They are coincident with only minor magnetic activity. Because of the indicated low conductivity-width these anomalies are attributed to local conductivity associated with the Salmon Glacier.

Anomaly 8.

This rather pronounced anomaly is located near the western boundary of the survey area. It was detected in the north-south line 66, but it is not observed in the east-west line 43. The negative quadrature response identifies the anomaly as perhaps due to topographic influences and perhaps conductivity located near the glacier/bedrock interface. No significant magnetic signature was recorded.

Anomaly 9.

This anomaly is located adjacent to a geologically mapped contact, between the volcanics-conglomerates-sandstones unit and the mylonitized volcanics-schists-cataclastics unit, in the south-central part of the map sheet. The E.M. anomaly consists of a negative in-phase response which may be due to the high permeability of magnetite. That magnetite is the cause of the anomaly is greatly substantiated by the association of a 200 gamma magnetic anomaly with the E.M. anomaly. The E.M. anomaly lies close to a number of northwest trending faults interpreted from Magnetic Component B.

Anomaly 10.

The anomaly is located southwest of Cooper Creek in the extreme south-central part of the area. An artificial baseline was used in the reduction of the E.M. data along this line (as well as in line 14 in the vicinity of anomaly 9) and has resulted in the appearance of two large in-phase anomalies. In fact the anomaly is composed of a narrow, low amplitude negative in-phase anomaly which

Anomaly 10 (continued)

could be attributed to magnetite. The E.M. anomaly is associated with a magnetite concentration. To a large extent however both the E.M. and magnetic anomalies are associated with a decrease in helicopter altitude above ground. However because the E.M. anomaly is situated on the north side of an east-west magnetic fault and is in an area of substantial magnetic relief (within mylonitized volcanic rock unit) further ground investigation is suggested.

Anomalies 11 and 12.

These anomalies are located in the extreme northwestern corner of the survey, in an area mapped as volcanic conglomerates and sandstones. The characteristics of the anomalies indicate that they are due to bedrock conductors rather than overburden, particularly in view of the indicated conductivity width in excess of 50 mhos. The anomalies are wider than is desirable from the standpoint of being vertical plane conductors, but depth determinations place the conductors effectively at ground surface. Anomaly 11 is located on the flank of an 80 gamma magnetic anomaly.

Anomaly 13.

This anomaly is similar in gross form to Anomaly 1. Although it perhaps does not have as direct a magnetic signature as Anomaly 1, it lies very close to a westerly trending fault interpreted from the magnetics. This structural association makes both Anomaly 1 and 13 worth further attention. Anomaly 13 is located within the volcanics-breccias-sandstone unit.

Anomaly 14.

This anomaly is located on the west bank of Long Lake. Although the anomaly is situated along the eastern margin of the zone of pronounced response attributed to gently dipping conductors, the prominent magnetic high that is associated with it makes this anomaly rather interesting and worth ground follow-up. The anomaly appears to be close to or at the contact between the granodiorite intrusive and surrounding Bowser sedimentary rock.

In addition to the anomalies discussed above, a large number of low amplitude E.M. anomalies were mapped. In some instances these anomalies have favourable shapes in terms of being associated with bedrock conductors rather than overburden. The lower amplitude of the anomalies might in some cases be explained as due to altitude attenuation, viz. the bird-ground clearance was greater than 100 feet. The anomalies were screened in order to determine whether or not altitude attenuation (or large depth of burial) was a factor or conversely whether the anomalies were due to terrain effects; lower than average clearance. The discrete low amplitude anomalies are numbered from 20 to 30 in Figure 8. In most instances there was inadequate definition of the anomaly to permit quantitative analysis for depth and conductivity-width determinations.

Anomaly 20, (claim L165, M234); located near the southwest survey boundary, on the flank of a prominent magnetic anomaly, in an area mapped as granodiorite, within a granodiorite dyke swarm.

- Anomaly 21; located southeast of Long Lake, on the flanks of strong magnetic anomalies, the E.M. anomaly is detected in lines 27 and 28, area mapped as Bowser sedimentary unit.
- Anomaly 22; an isolated anomaly in the vicinity of the contact between the volcanic conglomerates-sandstone unit and the mylonitized volcanic rock unit. The E.M. anomaly is located immediately north of an easterly trending fault interpreted from the magnetics.
- Anomaly 23; located immediately east of Long Lake, close to an area of pronounced magnetic anomalies which are interpreted as due to a marginal facies associated with granodiorite intrusion. The anomaly is adjacent to a north-northeast trending magnetic fault.
- Anomaly 24; located northeast of Long Lake in the same apparent environment as anomaly 23. The broadness of the anomaly however suggests that it is due to overburden but this might be due to the azimuth of survey line 46.
- Anomalies 25 and 26; located in the northwestern part of the area, close to the Salmon Glacier. Both anomalies are associated with a magnetic lineament in the volcanics-conglomerates-sandstones unit. The broadness of the anomalies could be the result of depth.
- Anomaly 27; located in the southcentral map area, southwest of Cooper Creek. The anomaly is close to an interpreted east-west trending magnetic fault. Bedrock is mapped as mylonitized volcanics and schists.

Anomalies 28 and 29; located in the northwest corner of the map sheet, both show good in-phase to quadrature ratios in an area mapped as sediments, conglomerates and volcanics. Although the intercepts are only a little more than background geological and instrument noise levels, the shapes of the anomalies indicate discrete conductors.

Anomaly 30; located at the extreme northcentral part of the map sheet at an interpreted magnetic fault. The anomaly suffers from a lack of sharpness to be associated with a vertical conductor, it appears most likely to be due to overburden.

3.3 Recommendations

On the basis of anomalous electromagnetic response, apparent magnetic association and suitable geological environment, a number of localities in the survey area merit more detailed investigation. These localities are found in the vicinity of the following E.M. anomalies;

- 1,
- 4,
- 6 (M202, claim 4155),
- 9,
- 10,
- 11 and 12 (M213, claim 4443),
- 13 (M237, claim 5412),
- 14,
- 20 (M234, claim 1654),
- 21,
- 22,
- 23,
- 24,
- 25,
- 26 (M213, claim 4602),
- 27.

Suggested ground follow-up approaches are

- (1) detailed geological mapping and rock sampling
 - (2) induced polarization surveying for detection of disseminated sulfide mineralization
 - (3) vertical loop electromagnetic surveying for detection of deeply buried massive sulfide mineralization
- and (4) gravity surveying in areas of moderate topographic relief.

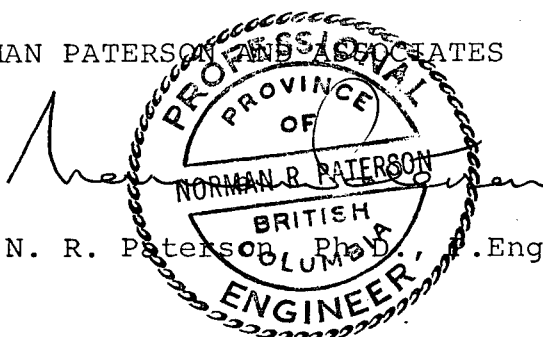
The interpretation of the survey data embodied in this report is essentially a geophysical appraisal of the area; as such it can incorporate only as much geological and geophysical information as the interpreter has available at the time. It should be judiciously used, therefore, as a guide only by geologists thoroughly familiar with the area and who are in a better position as time passes to evaluate the geological significance of any particular feature. With additional information such as that provided by further geological and geophysical surveying, it may be possible to down- or up-grade features discussed or identified in this report that take on lesser or greater significance than was first apparent to the interpreter.

Respectfully submitted,
LOCKWOOD SURVEY CORPORATION LIMITED



Allan Spector, Ph.D., P.Eng., (Ontario)
Director, Analytical Methods Section.

NORMAN PATERSON PROFESSIONAL ASSOCIATES



NORMAN R. PATERSON
BRITISH COLUMBIA
ENGINEER

N. R. Paterson, Ph.D., P.Eng., (B.C.)

Expiry Date: September 24, 1970

4. REFERENCES.

- Gabrielse, H., and Wheeler, J.O. 1961 "Tectonic Framework of Southern Yukon and Northeastern British Columbia"
G.S.C. Paper 60-24
- Grant, F.S., West, G.F. 1965 "Interpretation Theory in Applied Geophysics"
McGraw Hill, New York, p 366 - 369.
- Grant, F.S., Martin, L. 1966 "Interpretation of Aeromagnetic Anomalies by Use of Characteristic Curves"
Geophysics, Vol. 31, pp 135-148
- Spector, A., 1968 "Spectral Analysis of Aeromagnetic Maps"
Ph.D. Thesis,
University of Toronto

HELICOPTER GULF MK III AIRBORNE MAGNETOMETER

This is a saturable core fluxgate magnetometer with an accuracy of approximately 1 gamma.

The magnetometer head consists of two saturable core orienting fluxgates whose axes are at right angles to one another. The axis of the measuring fluxgate is normal to the plane containing the two orienting fluxgates.

In operation with orienting fluxgates are maintained by servomotors in a position of minimum coupling with the earth's magnetic field; the measuring fluxgate is then in a position of maximum coupling with the earth's field.

The instrument was housed in the centre section of the towed bird, the controls and recorder being housed in the helicopter.

Output from the magnetometer was recorded in analog form in red ink on a moving chart paper. Operating range was 1200 gammas across a chart width of 10 inches. Chart speed was 3 inches per minute.

THE HELICOPTER IN-PHASE/OUT-OF-PHASE E.M. SYSTEM

The helicopter-borne E.M. system used for this survey was developed by Lockwood Survey Corporation. This system measures the in-phase and out-of-phase components of the secondary electromagnetic field, in terms of the primary field at the receiver, viz., in parts per million of the primary field. The frequency of the alternating electromagnetic field is 4,000 cycles per second. Receiving and transmitting coils are held vertical and coaxial in a towed "bird", a distance of 30 feet apart and 100 feet below the helicopter. The sensitivity of the measuring system is such that the minimum recognizable in-phase anomaly is about 8 parts per million. Noise on the in-phase profile is usually less than 5 parts per million.

This equipment is operated at a "bird" height of 100 feet. Full scale deflection on the data record is 400 parts per million across a 4 inch chart.

Harold J. Sandau - Navigator, Electronic Technician

For the past twenty-two years, Harold Sandau has been involved in the geophysical survey business. During that time he has installed, maintained and operated magnetometers, electromagnetometers and scintillation equipment based in Lockwood's survey aircraft. His experiences cover the whole of Canada, Alaska, the United States and the Far East. He has been employed on jobs totalling approximately 50,000 line miles of production.

Douglas M. Webb - Data Technician

This man has been employed as a Data Technician on geophysical surveys for the last three years. His responsibility is to ensure that the client's areas are completely covered by the geophysical flying. He has operated in Northern Ontario, British Columbia and the Arctic mainly on work for the Federal Government. He has been employed on approximately 50,000 line miles of magnetometer, electromagnetometer and scintillation surveys.

A D D E N D U M I I

P E R S O N N E L Q U A L I F I C A T I O N S

A D D E N D U M I

Description of Instrumentation

• Ass. Rpt. 2320

Use these for list and index cards.

Boundary No. 1 (L. 2314)

Packers Fr. (L. 5540)

~~Bar Silver (L. 4193)~~

Silver Bars (L. 4191)

Montana (L. 5092)

start No. 3 (L. 5207)

Note

Listing on mineral lease does not
always agree with listing in report.

Acreage..... 2.53

Annual rental \$ 1.50
(First ten years, 50c per acre per year)

Annual rental \$ 3.00
(Balance of term \$1.00 per acre per year)

Annual work \$ 12.00
(First ten years \$4.00 per acre per year)

Annual work \$ 18.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M. 199

Map No. 4 T 269

Min. Div. Skeena

Land District Cassiar

Date of lease October 26, 1967

MINERAL LEASE

Name of claim(s) Occidental Fr.

Record Nos.

Lot Nos. 4035

Lessee(s) Willard D. Tompson

Address 3950 Bayridge Court, West Vancouver, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: Salmon River Valley.

Provisos: (1) The surface of this Mineral Claim is partly covered by the waters of an unnamed creek, and this Lease, therefore excludes any surface rights over that portion of the Mineral Claim covered by the waters of the unnamed creek. (2) The surface of this Mineral Claims lies within a map reserve established for the proposed route of the Stewart Tide Lake Road and this Lease therefore excludes any surface rights located within the said map reserve.

*W.D.T.
D.P.P.*

IN WITNESS WHEREOF the lessor and lessee have herunto set their hands and seals the day and year first above written.

Douglas P. Brooks
Witness.

Willard D. Tompson
Lessee.

[Signature]
Witness.

D.W. Buchanan
Minister of Mines and Petroleum Resources, Lessor.

Acreage 24.19
Annual rental \$ 47.50
(First ten years, 50c per acre per year)
Annual rental \$ 95.00
(Balance of term \$1.00 per acre per year)
Annual work \$ 300.00
(First ten years \$4.00 per acre per year)
Annual work \$ 570.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M 200
Map No. 4 T 269
Min. Div. Skeena
Land District Cassiar
Date of lease October 25, 1967

MINERAL LEASE

Name of claim(s) Montana No. 1 Fr., Montana No. 2 Fr., Tip Top Fr.
Record Nos.
Lot Nos. 4178, 4179, 4180
Lessee(s) Willard D. Tompson
Address 3950 Bayridge Court, WEST VANCOUVER, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: Salmon Glacier.

*W.D.T.
S.P.D.*
Provisos: The surface rights of all of the Mineral Claims in this Lease are within a reserve established for the proposed route of the Granduc Mines Ltd., Stewart Tide Lake Road, and the surface is not, therefore, included in this Lease.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

Douglas P. Brooks
Witness

Willard D. Tompson
Lessee

John R. [Signature]
Witness

D. B. Brattin
Minister of Mines and Petroleum Resources, Lessor.

Acreage 29.78

Annual rental \$ 15.00
(First ten years, 50c per acre per year)

Annual rental \$ 30.00
(Balance of term \$1.00 per acre per year)

Annual work \$ 120.00
(First ten years \$4.00 per acre per year)

Annual work \$ 180.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M 101

Map No. 4 T 269

Min. Div. Skeena

Land District Cassiar

Date of lease October 26, 1967

MINERAL LEASE

Name of claim(s) Galena Fraction

Record Nos.

Lot Nos. 4617

Lessee(s) Willard D. Tompson

Address 3950 Bayridge Court, Vancouver, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: N.W. of Long Lake.

WDT G.W.H.A.

Provisos: (1) The surface of this Mineral Claim is partly covered by the waters of an unnamed creek and this lease, therefore, excludes any surface rights over that portion of the Mineral Claim covered by the waters of the unnamed creek. (2) The surface of this Mineral Claim lies within a map reserve established for the proposed route of the Stewart Tide Lake Road and this lease, therefore excludes any surface rights located within the said map reserve.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

G.W.H.A.
Witness.

Willard D. Tompson
Lessee.

Jerry Ralfe
Witness.

D.W. Brothman
Minister of Mines and Petroleum Resources, Lessor.

Acreage 772.02
Annual rental \$ 316.50
(First ten years, 50c per acre per year)
Annual rental \$ 773.00
(Balance of term \$1.00 per acre per year)
Annual work \$ 3002.00
(First ten years \$4.00 per acre per year)
Annual work \$ 4731.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M. 21
Map No. 4 T 269
Min. Div. Keena
Land District Cassiar
Date of lease 1957

MINERAL LEASE

Name of claim(s) See Schedule "A" attached
Record Nos. _____
Lot Nos. See Schedule "A" attached
Lessee(s) Willard D. Tompson,
Address 1950 Bayridge Court, West Vancouver, B.C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: Upper Salmon River Valley

- 9/1/57 WDT*
Provisos:
1. The surface of the Montana, Montana #1, Montana #2, Montana #3, and Lion Fraction Mineral Claims lie within a Map Reserve established for the proposed route of the Stewart/Tide Lake Road and this Lease therefore excludes the surface rights of these Claims.
 2. The surface of the Tiger, Argentite, Stephanite, Native, Hessite, Cerargyrite, Stroncyerite and Silver Crest Fraction Mineral Claims included in this Lease are partly covered by the waters of unnamed creeks and this Lease therefore excludes the surface rights over those portions of the Mineral Claims covered by the waters of the unnamed creeks.
- 9/1/57 WDT*

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written:

W. H. Shear
Witness.

Willard D. Tompson
Lessee.

George Relfe
Witness.

D. W. Buchanan
Minister of Mines and Petroleum Resources, Lessor.

SCHEDULE "A" AS REFERRED TO IN MINERAL LEASE ATTACHED.

9/9/68
WPT

Name of Claim(s) Montana, Montana No. 1, Montana No. 2,
Montana No. 3, Lion No. 1, Lion No. 2, Lion
No. 3, Lion Fraction, Tiger, Argentite,
Polybasite, Pyragyrite, Poustite, Stephanite,
Native, Hessite, Corargerite, Stromeyrite,
Silver Crest Fraction and Ag. Fraction.

Lot Nos. 5092, 5093, 5094, 5095, 4166, 4167, 4168,
4169, 4152, 4153, 4154, 4155, 4156, 4157,
4158, 4159, 4160, 4161, 4162, 4171.

Acreage.....
 Annual rental \$ ~~XXXXXX~~ 104.00
 (First ten years, 50c per acre per year)
 Annual rental \$ ~~XXXXXX~~ 208.00
 (Balance of term \$1.00 per acre per year)
 Annual work \$ ~~XXXXXX~~ 832.00
 (First ten years \$4.00 per acre per year)
 Annual work \$ ~~XXXXXX~~ 1248.00
 (Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
 AND
 PETROLEUM RESOURCES
 "MINERAL ACT"

Mineral Lease No. M. 202.....
 Map No. 4 T 269.....
 Min. Div. Skeena.....
 Land District. Cassiar.....
 Date of lease. December 11, 1967.

MINERAL LEASE

Name of claim(s) Boundary No. 4, Boundary No. 1, Glacier, Glacier No. 1, Glacier No. 2
 Record Nos.....
 Lot Nos. 2312, 2314, 1849, 1850, 1851
 Lessee(s) Mr. W. E. Tompson
 Address 3250 Bayridge Court, West Vancouver, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **Head of Salmon River**

Provisos:

WPT
G. H.

The Boundary No. 1, Lot 2314 and Glacier, Lot 1849 included in this lease are partly covered by the waters of the Myrtle Creek and an unnamed creek and this lease, therefore, excludes any Surface Rights over those portions of the Mineral Claims covered by the waters of Myrtle Creek and the unnamed creek.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

Alan Huck
 Witness.

Willard D. Tompson
 Lessee.

John R. [Signature]
 Witness.

D. W. Bratton
 Minister of Mines and Petroleum Resources, Lessor.

Acreage 43.45
Annual rental \$ 21.50
(First ten years, 50¢ per acre per year)
Annual rental \$ 63.00
(Balance of term \$1.00 per acre per year)
Annual work \$ 172.00
(First ten years \$4.00 per acre per year)
Annual work \$ 251.00
(Balance of term \$6.00 per acre per year)



Mineral Lease No. M. 202
Map No. 4-1-160
Min. Div. 10000
Land District Cassiar
Date of lease December 11, 1967

DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

MINERAL LEASE

Name of claim(s) High Grade
Record Nos. _____
Lot Nos. 4503
Lessee(s) Willard D. Tompson,
Address 3950 Bayridge Court, West Vancouver, B.C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location:
Salmon River Valley

Provisos: **"The surface of this Mineral Claim is partly covered by the waters of unnamed creeks and this Lease therefore excludes any surface rights over that portion of the Mineral Claim covered by the waters of the unnamed creeks."**

WDT
G.H.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

[Signature]
Witness.

Willard D. Tompson
Lessee.

[Signature]
Witness.

D.W. Bouchart
Minister of Mines and Petroleum Resources, Lessor.

Acreage..... 31.11
Annual rental \$ 12.50
(First ten years, 50c per acre per year)
Annual rental \$ 31.00
(Balance of term \$1.00 per acre per year)
Annual work \$ 140.00
(First ten years \$4.00 per acre per year)
Annual work \$ 210.00
(Balance of term \$6.00 per acre per year)



Mineral Lease No. M. 205
Map No. 41269
Min. Div. Mineralia
Land District. Cassiar
Date of lease. December 11, 1967

DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

MINERAL LEASE

Name of claim(s)..... Polybacita Fr.
Record Nos.....
Lot Nos..... 4177
Lessee(s)..... Mr. Willard D. Tompson
Address..... 3950 Hastings Court, West Vancouver, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **Silver Creek**

Provisos:

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

[Signature]
Witness.

Willard D. Tompson
Lessee.

[Signature]
Witness.

D. W. Brotherton
Minister of Mines and Petroleum Resources, Lessor.

Acreage 59.15

Mineral Lease No. M. 206

Annual rental \$ 30.00
(First ten years, 50¢ per acre per year)

Map No. 4T 269

Annual rental \$ ~~30.00~~ 60.00
(Balance of term \$1.00 per acre per year)

Min. Div. Skeena

Annual work \$ ~~240.00~~ 240.00
(First ten years \$4.00 per acre per year)

DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES

Land District Cassiar

Annual work \$ ~~160.00~~ 360.00
(Balance of term \$6.00 per acre per year)

Date of lease December 27, 1967

"MINERAL ACT"

MINERAL LEASE

Name of claim(s) Double O No. 6, Money

Record Nos. _____

Lot Nos. 4042, 4043

Lessee(s) Mr. Willard D. Tompson

Address 3950 Bayridge Court, West Vancouver, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location:

Salmon River Valley

Provisos:

WDT
J.H.

The Mineral Claims included in this Lease are partly covered by the waters of of Cascade River in respect to the Money Mineral Claim and Silver Creek over the Double O No. 6 Mineral Claim and this Lease, therefore, excludes any Surface Rights over those portions of the Mineral Claims covered by the waters of Cascade River and Silver Creek.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

[Signature]
Witness.

Willard D. Tompson
Lessee.

Witness.

Lessee.

[Signature]
Witness.

D.L. Brothman
Minister of Mines and Petroleum Resources, Lessor.

168
Acreage 51.65

Annual rental \$ 26.00
(First ten years, 50c per acre per year)

Annual rental \$ 52.00
(Balance of term \$1.00 per acre per year)

Annual work \$ 200.00
(First ten years \$4.00 per acre per year)

Annual work \$ 312.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M 208

Map No. LT269

Min. Div. Skeena

Land District Cassiar

Date of lease February 2, 1968

MINERAL LEASE

Name of claim(s) Lois

Record Nos.

Lot Nos. 3687

Lessee(s) Mr. Willard D. Tompson

Address 3950 Bayridge Court, Vancouver 1, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: East of Long Lake

Provisos: This lease is issued and accepted subject to any and all prior rights acquired under the provisions of the "Water Act".

WDT

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

Valerie A. Lloyd
Witness.

W.D. Tompson
Lessee.

W. Burton
Witness.

D. L. Brattin
Minister of Mines and Petroleum Resources, Lessor.

Acresage..... 91.71

Annual rental \$..... 46.00
(First ten years, 50c per acre per year)

Annual rental \$..... 92.00
(Balance of term \$1.00 per acre per year)

Annual work \$..... 360.00
(First ten years \$4.00 per acre per year)

Annual work \$..... 552.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M. 211

Map No. 4T269M

Min. Div. Skeena

Land District Cassiar

Date of lease April 19, 1968

MINERAL LEASE

Name of claim(s) Lens, Mineral Zone, Mons, Mountain Girl

Record Nos.

Lot Nos. 3624, 4189, 3625, 4190

Lessee(s) Willard D. Tompson

Address. 3950 Bayridge Court, West Vancouver, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: vicinity of Salmon Glacier

Provisos:

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

Paul S. Hanger
.....
Witness.

Willard D. Tompson
.....
Lessee.

[Signature]
.....
Witness.

[Signature]
.....
Lessee.
Dep. - Minister of Mines and Petroleum Resources, Lessor.

Acreage..... 99.04

Annual rental \$..... 50.00
(First ten years, 50c per acre per year)

Annual rental \$..... 100.00
(Balance of term \$1.00 per acre per year)

Annual work \$..... 400.00
(First ten years \$4.00 per acre per year)

Annual work \$..... 600.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M..... 212

Map No..... 4T269A

Min. Div..... Skeena

Land District..... Cassiar

Date of lease..... April 19, 1968

MINERAL LEASE

Name of claim(s)..... Native Silver Fr., Ruby Silver Fr., Hibbard C.

Record Nos.....

Lot Nos..... 5527, 5528, 5429

Lessee(s)..... Willard D. Tompson

Address..... 3950 Bayridge Court, West Vancouver, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his seryants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **vicinity Salmon River Valley**

Provisos:

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

Paul S. Hagen
.....
Witness.

Willard D. Tompson
.....
Lessee.

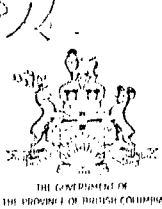
.....
Witness.

.....
Lessee.

[Signature]
.....
Witness.

[Signature]
.....
Minister of Mines and Petroleum Resources, Lessor.

Acreage 179.20
 Annual rental \$ 310.00
 (First ten years, 50c per acre per year)
 Annual rental \$ 420.00
 (Balance of term \$1.00 per acre per year)
 Annual work \$ 1600.00
 (First ten years \$4.00 per acre per year)
 Annual work \$ 2520.00
 (Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
 AND
 PETROLEUM RESOURCES
 "MINERAL ACT"

Mineral Lease No. M. 213
 Map No. 457671
 Min. Div. 20000
 Land District Coastar
 Date of lease April 22, 1971

MINERAL LEASE

Name of claim(s) Eldorado, Eldorado No. 2, Eldorado No. 3, Silver Bars, Silver Thought Fr., Silver Thought No. 2 Fr., Viny No. 1, Alno, Alno fr., Jay A. Madona Fr., Bar Cross, Bar Silver, Ida O.
 Record Nos. _____
 Lot Nos. 2846, 4444, 4443, 4191, 2848, 2849, 3623, 2847, 4445, 5430, 4601, 5428, 4193, 4602
 Lessee(s) Mr. Willard D. Tompson
 Address 3950 Cayridge Court, West Vancouver, B. C.

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **Salmon Glacier**

Provisos:

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

Robert Robinson
 Witness.

Willard D. Tompson
 Lessee.

Jay Ralfe
 Witness.

D. H. Broughton
 Minister of Mines and Petroleum Resources, Lessor.

Acreage..... 13.50
Annual rental \$ 22.00
(First ten years, 50c per acre per year)
Annual rental \$ 44.00
(Balance of term \$1.00 per acre per year)
Annual work \$ 176.00
(First ten years \$4.00 per acre per year)
Annual work \$ 264.00
(Balance of term \$6.00 per acre per year)

14/2/69



Mineral Lease No. M..... 229
Map No. 4T269M
Min. Div. Skeena
Land District. Cassiar
Date of lease. November 15, 1968

DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

MINERAL LEASE

Name of claim(s)..... Cornelius, Empire
Record Nos.....
Lot Nos..... 1523, 1524
Lessee(s)..... Willard Dudley Tompson
Address..... 3950 Bayridge Court, West Vancouver, British Columbia

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **Salmon River**

WPT
Provisos: (1) The surface of these Mineral Claims are partly within a reserve established for the proposed route of Granduc Mines Ltd. Stewart-Tide Lake road and this lease, therefore, excludes any surface rights over that portion of the Mineral Claim covered by this right of way.
(2) The surface of this Mineral Claim (Cornelius) is partly covered by the waters of an unnamed creek and this lease, therefore, excludes any surface rights over that portion of the Mineral Claim covered by the waters of the said creek.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

[Signature]
.....
Witness.

Willard P. Tompson
.....
Lessee.

[Signature]
.....
Witness.
[Signature]
.....
Witness.

Frank Richter
.....
Lessee.
Minister of Mines and Petroleum Resources, Lessor.

14/2/69

Acreage..... 102.52
Annual rental \$ 51.50
(First ten years, 50c per acre per year)
Annual rental \$ 103.00
(Balance of term \$1.00 per acre per year)
Annual work \$ 412.00
(First ten years \$4.00 per acre per year)
Annual work \$ 618.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M..... 230
Map No..... 4T269M
Min. Div..... Skeena
Land District..... Cassiar
Date of lease..... November 15, 1968

MINERAL LEASE

Name of claim(s)..... Galena, Galena No. 1
Record Nos.....
Lot Nos..... 4615, 4616
Lessee(s)..... Willard Dudley Tompson
Address..... 3950 Bayridge Court, West Vancouver, British Columbia

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **N. W. of Long Lake**

W.D.T.
TSM
Provisos: (1) Portions of the surfaces of the Galena and Galena No. 1 Mineral Claims are within a reserve established for the proposed route of the Granduc Mines Ltd Stewart - Tide Lake Road and the surface rights affected by this right of way are excepted from this leasehold.
(2) The surface of the Galena No. 1 Mineral Claim is partly covered by the waters of an unnamed creek and this lease, therefore, excludes any surface rights over that portion of the Mineral Claim covered by the waters of the unnamed creek.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

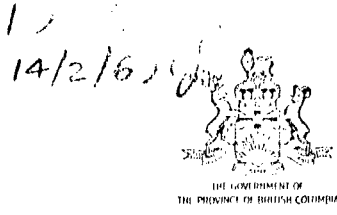
[Signature]
Witness.

Willard P. Tompson
Lessee.

Joyce Rolfe
Witness.

Frank Richter
Minister of Mines and Petroleum Resources, Lessor.

Acreage..... 43.92
Annual rental \$..... 22.00
(First ten years, 50c per acre per year)
Annual rental \$..... 44.00
(Balance of term \$1.00 per acre per year)
Annual work \$..... 176.00
(First ten years \$4.00 per acre per year)
Annual work \$..... 264.00
(Balance of term \$6.00 per acre per year)



Mineral Lease No. M..... 231
Map No..... 4T269M
Min. Div..... Skeena
Land District..... Cassiar
Date of lease..... November 15, 1969

DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

MINERAL LEASE

Name of claim(s)..... Falls View
Record Nos.....
Lot Nos..... 3223
Lessee(s)..... Willard Dudley Tompson
Address..... 3950 Bayridge Court, West Vancouver, British Columbia

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **Salmon River**

WDT
Provisos: (1) The surface of this Mineral Claim is partly within a reserve established for the proposed route of Granduc Mines Ltd. Stewart - Tide Lake road and this lease, therefore, excludes any surface rights over that portion of the Mineral Claim covered by this right of way.
(2) The surface of this Mineral Claim is partly covered by the waters of an unnamed creek and this lease, therefore, excludes any surface rights over that portion of the Mineral Claim covered by the waters of the said creek.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

[Signature] Witness
Willard Tompson Lessee
[Signature] Witness
Frank Richter Minister of Mines and Petroleum Resources, Lessor

Acreage..... 74.30

14/2/69

Mineral Lease No. M..... 237

Annual rental \$ 37.50
(First ten years, 50c per acre per year)

Map No..... 4T269M

Annual rental \$ 75.00
(Balance of term \$1.00 per acre per year)

Min. Div..... Skeena

Annual work \$ 300.00
(First ten years \$4.00 per acre per year)

DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES

Land District..... Cassiar

Annual work \$ 450.00
(Balance of term \$6.00 per acre per year)

"MINERAL ACT"

Date of lease..... November 15, 1968

MINERAL LEASE

Name of claim(s)..... Glacier No. 4, H. E. Fraction, Red Rock, Glacier End Fr.

Record Nos.....

Lot Nos..... 1852, 1853, 1855, 1856

Lessee(s)..... Willard Dudley Tompson

Address..... 3950 Bayridge Court, West Vancouver, British Columbia

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **Salmon River Glacier**

Provisos: (1) The surface of the Red Rock Mineral Claim is partly covered by the waters of Salmon Creek and this lease, therefore, excludes any part of the surface affected by the waters of the said Creek.

WDT
JBN

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

[Signature]
Witness.

Willard D. Tompson
Lessee.

[Signature]
Witness.

Frank Reiter
Minister of Mines and Petroleum Resources, Lessor.

Acreage..... 163.11
Annual rental \$ 82.00
(First ten years, 50c per acre per year)
Annual rental \$ 164.00
(Balance of term \$1.00 per acre per year)
Annual work \$ 656.00
(First ten years \$4.00 per acre per year)
Annual work \$ 984.00
(Balance of term \$6.00 per acre per year)

175000
14/2/69



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M..... 233
Map No..... 4T269M
Min. Div..... Skeena
Land District Cassiar
Date of lease..... November 15, 1962

MINERAL LEASE

Name of claim(s)..... Knob Hill, Boston Fraction, Bean Fraction, Boston Fraction No. 2
Record Nos.....
Lot Nos..... 3220, 5521, 5522, 5523
Lessee(s)..... Willard Dudley Tompson
Address..... 3950 Bayridge Court, West Vancouver, British Columbia

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **Salmon River**

Provisos: (X) Portions of the surfaces of the Boston Fraction, Bean Fraction, and Boston Fraction No. 2 Mineral Claims are within a reserve established for the proposed route of the Granduc Mines Ltd. Stewart - Tide Lake Road and the surface rights affected by this right of way are excepted from this leasehold.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

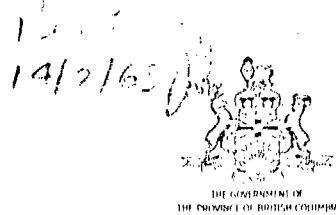
[Signature]
.....
Witness.

Willard D. Tompson
.....
Lessee.

Joyce Dolfe
.....
Witness.

Frank Richter
.....
Minister of Mines and Petroleum Resources, Lessor.

Acreage..... 45.67
Annual rental \$..... 23.00
(First ten years, 50c per acre per year)
Annual rental \$..... 46.00
(Balance of term \$1.00 per acre per year)
Annual work \$..... 184.00
(First ten years \$4.00 per acre per year)
Annual work \$..... 276.00
(Balance of term \$6.00 per acre per year)



Mineral Lease No. M..... 234
Map No..... 4T269M
Min. Div..... Skeena
Land District..... Cassiar
Date of lease..... November 15, 1968

DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

MINERAL LEASE

Name of claim(s)..... Bill Fr.
Record Nos.....
Lot Nos..... 1854
Lessee(s)..... Willard Dudley Tompson
Address..... 3950 Bayridge Court, West Vancouver, British Columbia

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **Northwest of Stewart**

Provisos:

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

.....
Witness.

Willard D. Tompson
.....
Lessee.

Jayce R. [Signature]
.....
Witness.

Frank Richter
.....
Minister of Mines and Petroleum Resources, Lessor.

1227
14/2/68



Acres.....
Annual rental \$ 37.29
(First ten years, 50c per acre per year)
Annual rental \$ 19.00
(Balance of term \$1.00 per acre per year)
Annual work \$ 38.00
(First ten years \$4.00 per acre per year)
Annual work \$ 152.00
(Balance of term \$6.00 per acre per year)
Annual work \$ 228.00
(Balance of term \$6.00 per acre per year)

Mineral Lease No. M..... 235
Map No..... LT269M
Min. Div..... Skeena
Land District..... Cassiar
Date of lease..... November 15, 1968

DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

MINERAL LEASE

Name of claim(s)..... **Dauntless**
Record Nos.....
Lot Nos..... **3219**
Lessee(s)..... **Willard Dudley Tompson**
Address..... **3950 Bayridge Court, West Vancouver, British Columbia**

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **Northwest of Stewart**

WDT
Provisos: **(1) The surface of this Mineral Claim lies within a reserve established for the proposed route of the Granduc Mines Ltd. Stewart to Tide Lake road and this lease, therefore, excludes any portion of the road covered by this Mineral Claim.**

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

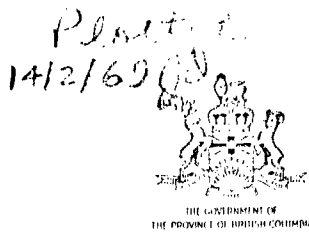
[Signature]
Witness.

Willard Tompson
Lessee.

[Signature]
Witness.

Frank Richter
Minister of Mines and Petroleum Resources, Lessor.

Acresage..... 51.64
Annual rental \$..... 26.00
(First ten years, 50c per acre per year)
Annual rental \$..... 52.00
(Balance of term \$1.00 per acre per year)
Annual work \$..... 208.00
(First ten years \$4.00 per acre per year)
Annual work \$..... 312.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M..... 236
Map No..... 4T269M
Min. Div..... Skeena
Land District..... Cassiar
Date of lease..... November 15, 1968

MINERAL LEASE

Name of claim(s)..... Packers Fr.
Record Nos.....
Lot Nos..... 5540
Lessee(s)..... Willard Dudley Tompson
Address..... 3950 Bayridge Court, West Vancouver, British Columbia

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: Northwest of Stewart

WDT
TD
Provisos: (1) The surface of this Mineral Claim lies within a reserve established for the proposed route of the Granduc Mines Ltd. Stewart to Tide Lake Road and this lease, therefore, excludes any portion of the road covered by this Mineral Claim.

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

[Signature]
Witness.

Willard D. Tompson
Lessee.

[Signature]
Witness.

Frank Reebter
Minister of Mines and Petroleum Resources, Lessor.

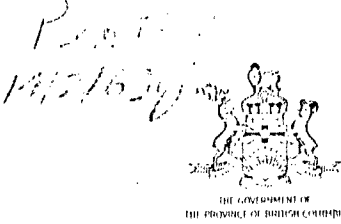
Acreege 101.42

Annual rental \$ 51.00
(First ten years, 50c per acre per year)

Annual rental \$ 102.00
(Balance of term \$1.00 per acre per year)

Annual work \$ 408.00
(First ten years \$4.00 per acre per year)

Annual work \$ 612.00
(Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
AND
PETROLEUM RESOURCES
"MINERAL ACT"

Mineral Lease No. M. 237

Map No. 4T269M

Min. Div. Skeena

Land District Cassiar

Date of lease November 15, 1968

MINERAL LEASE

Name of claim(s) Silver Dollar, Munro

Record Nos. _____

Lot Nos. 5418, 5412

Lessee(s) Willard Dudley Tompson

Address 3950 Bayridge Court, West Vancouver, British Columbia

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: **West side of Salmon River Glacier**

Provisos:

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

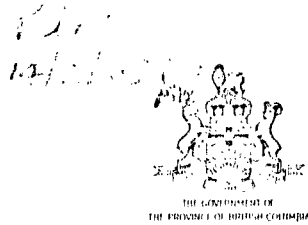
[Signature]
Witness.

Willard D. Tompson
Lessee.

[Signature]
Witness.

Frank Richter
Minister of Mines and Petroleum Resources, Lessor.

Acreage..... 522.67
 Annual rental \$ 466.50
 (First ten years, 50c per acre per year)
 Annual rental \$ 933.00
 (Balance of term \$1.00 per acre per year)
 Annual work \$ 3,732.00
 (First ten years \$4.00 per acre per year)
 Annual work \$ 5,558.00
 (Balance of term \$6.00 per acre per year)



DEPARTMENT OF MINES
 AND
 PETROLEUM RESOURCES
 "MINERAL ACT"

Mineral Lease No. M.....
 Map No. LT265A
 Min. Div. Sherna
 Land District Cassiar
 Date of lease

MINERAL LEASE

Name of claim(s) Sullivan, Vandal Fr., Daly, Valley Fr., Lake Shore, Bush No. 1, Bush No. 2,
 Bush No. 3, Bush No. 4, O. B. Fr., O. B. No. 1, O. B. No. 2, O. B. No. 1 Fr.,
 Maple Leaf No. 4, Start Fr., Start No. 2, Start No. 3, Start No. 6 Fr.,
 Record Nos. Start No. 5, Star Extension, Star Extension No. 1, O. B., O. B. No. 2 Fr.,
 O. B. No. 4
 Lot Nos. 3604, 3705, 3605, 6204, 4176, 5196, 5197, 5198, 5199, 5219, 5215, 5216
 5220, 4448, 5222, 5206, 5207, 5210, 5209, 5211, 5212, 5214, 5223, 5217
 Lessee(s) Willard Dudley Tompson
 Address 3950 Bayridge Court, West Vancouver, British Columbia

The lessor, in accordance with and subject to the provisions of the "Mineral Act," doth hereby demise unto the lessee, for a term of twenty-one years from the date first above written, all Crown minerals available under the terms of the "Mineral Act" in the mining property herein described, and the lessee doth hereby covenant and agree at all times to perform, observe, and comply with the provisions of the said Act and any regulations which may from time to time be made under the authority thereof.

The lessee shall keep the lessor indemnified against all actions, claims, and demands that may be brought or made against the lessor by reason of anything done by the lessee, his servants, workmen, or agents, in the exercise or purported exercise of the rights, powers, and privileges hereby granted.

Description of location: Northwest of Stewart

Provisos: (See Schedule A Attached)

IN WITNESS WHEREOF the lessor and lessee have hereunto set their hands and seals the day and year first above written.

 Witness.

Willard D. Tompson

 Lessee.

 Witness.

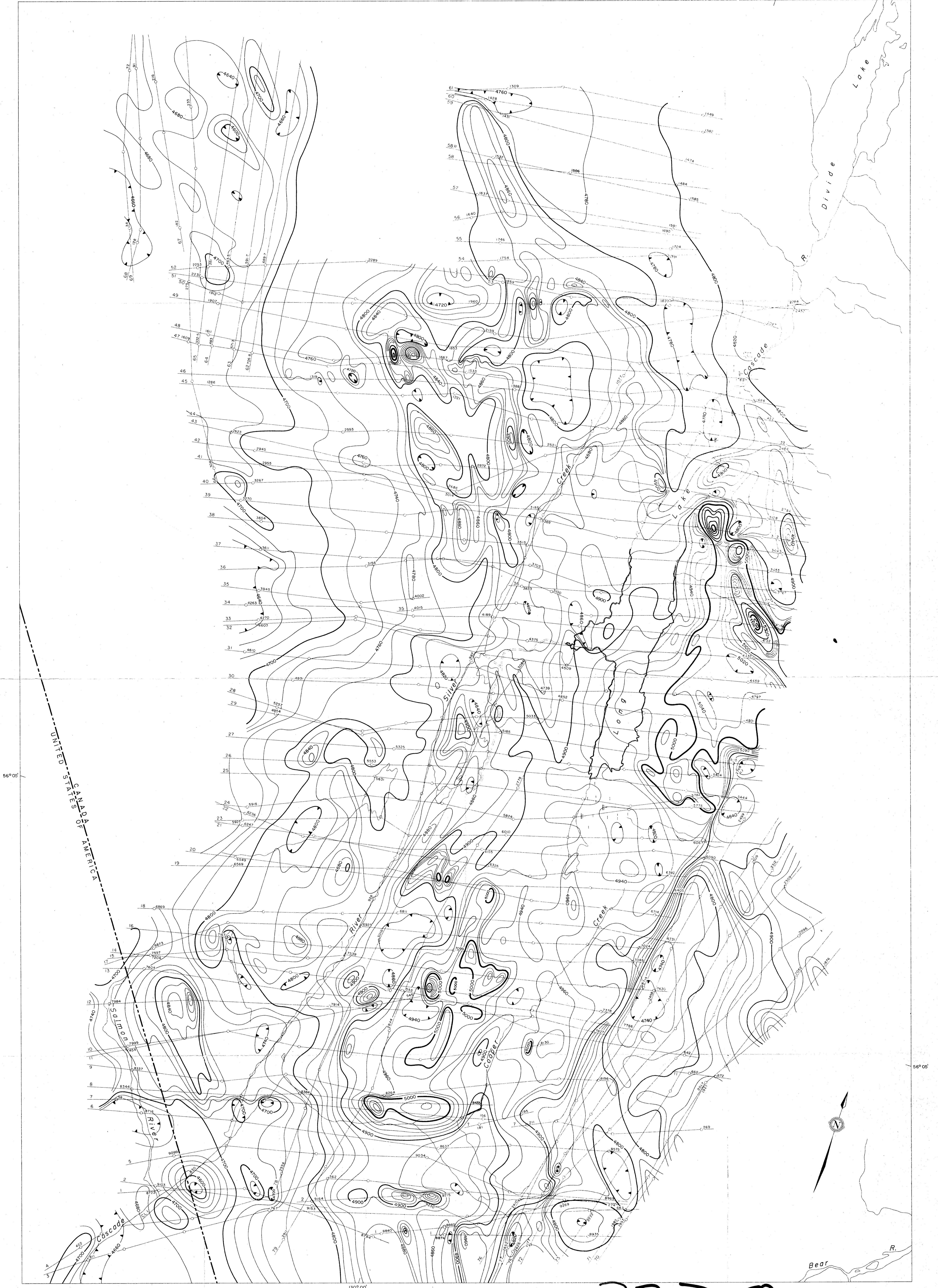
 Witness.

Frank Richter

 Minister of Mines and Petroleum Resources, Lessor.

ATNA MINES LIMITED
AIRBORNE GEOPHYSICAL SURVEY

130° 00'



CONTOUR INTERVAL 20 GAMMA
MEAN FLIGHT LINE SPACING 660 FEET
MEAN TERRAIN CLEARANCE 200 FEET
500 GAMMA CONTOUR
100 GAMMA CONTOUR
20 GAMMA CONTOUR
MAGNETIC LOW
FIDUCIAL POINTS
FLIGHT LINES
O 5890

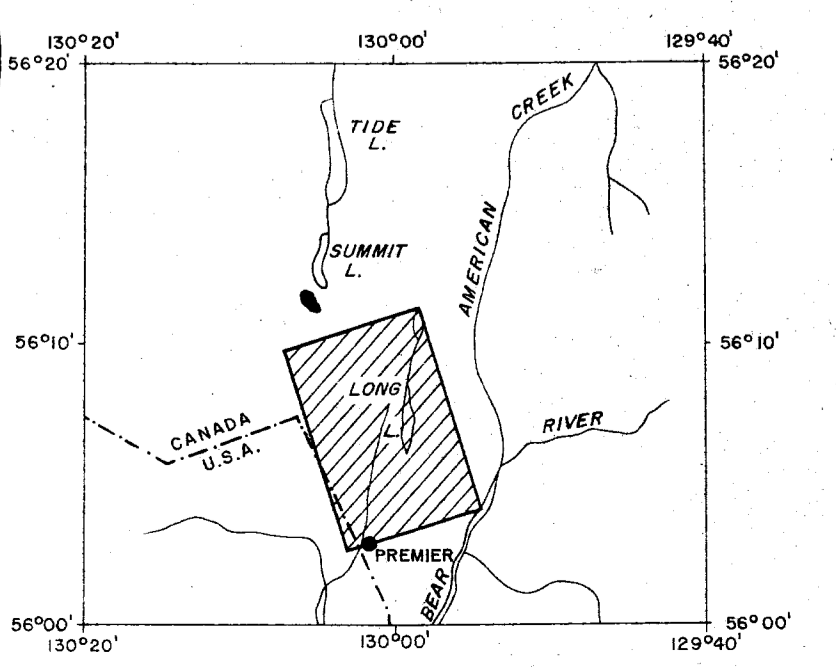
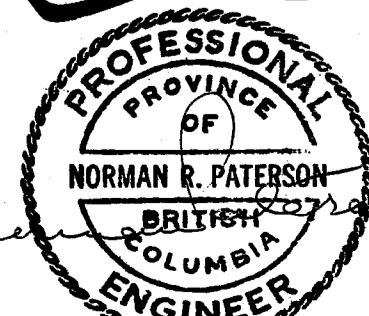
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2320 MAP #1

TOTAL FIELD INTENSITY MAGNETIC MAP
SALMON GLACIER AREA
BRITISH COLUMBIA

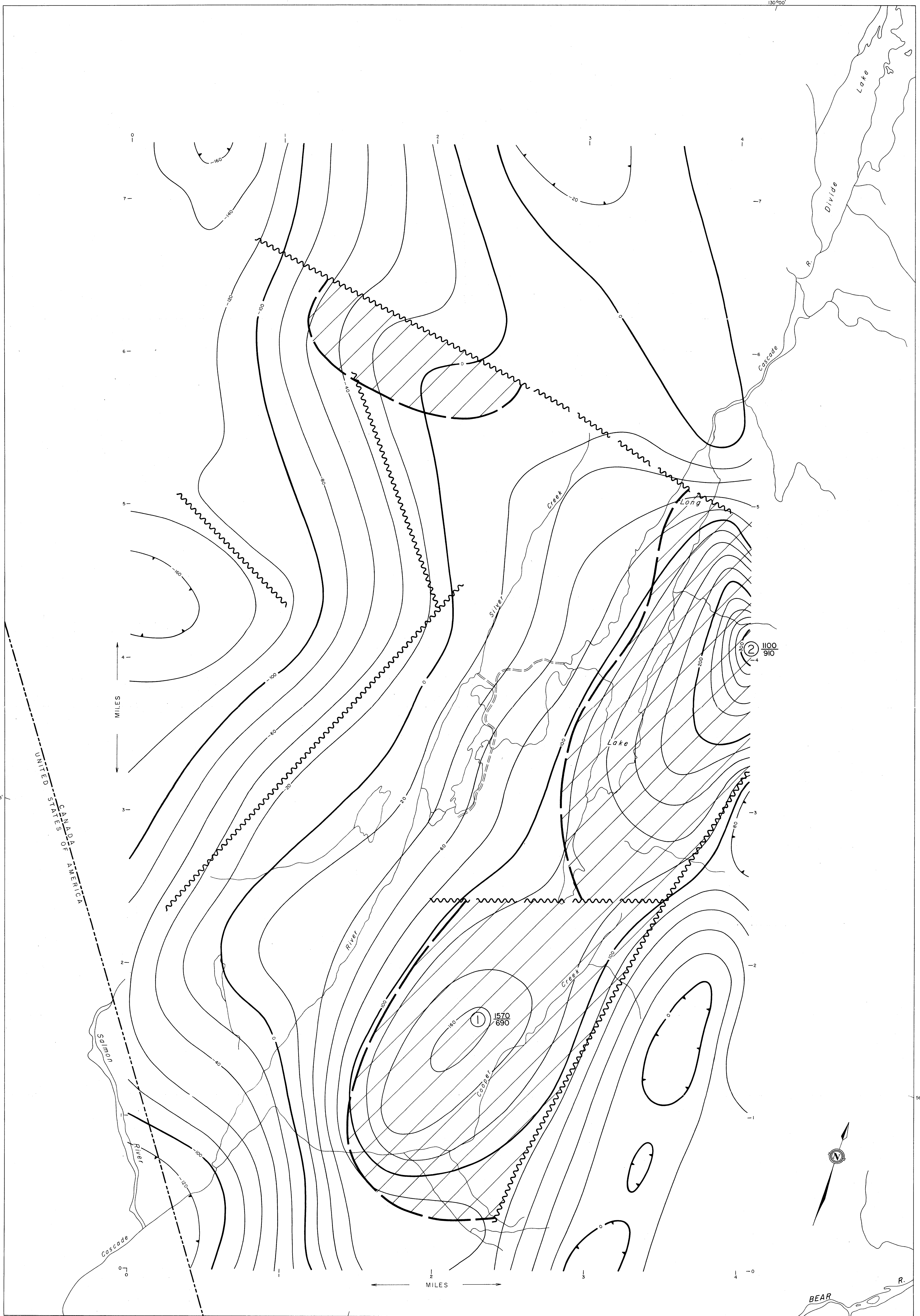
SCALE 1 inch to 1320 Feet
1000 0 1000 2000 3000 4000 5000
FEET FEET

Flown and Compiled by
LOCKWOOD SURVEY CORPORATION LIMITED
1969

2320



ATNA MINES LIMITED



CONTOUR INTERVAL ----- 20 GAMMA
 0, ±100, ±200, etc. GAMMA CONTOUR -----
 ±20, ±40, etc. GAMMA CONTOUR -----
 MAGNETIC LOW -----

ANOMALY ANALYSIS (4) 280 --- DEPTH BELOW GROUND
 250 --- SUSCEPTIBILITY CONTRAST (10⁶ cgs. emu)
 ANOMALY NUMBER

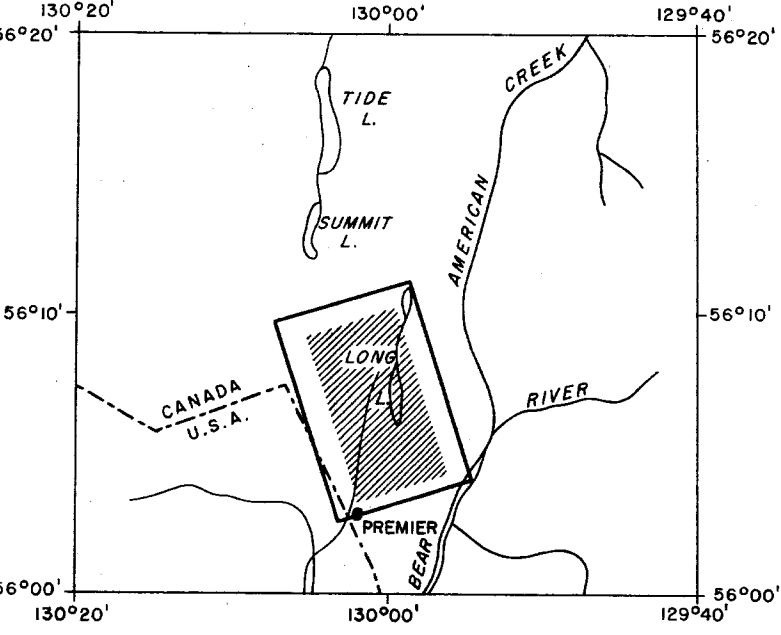
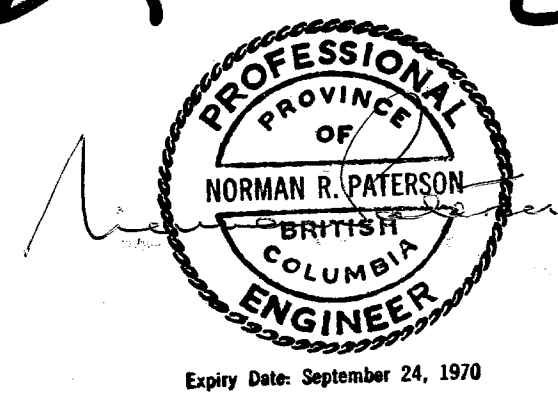
INTERPRETED MAGNETIC FAULT -----
 INFERRED FAULT -----
 CORRELATION WITH MAPPED GEOLOGY ----- G

ZONE OF HIGH MAGNETIZATION -----

Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. 2320 MAP #5

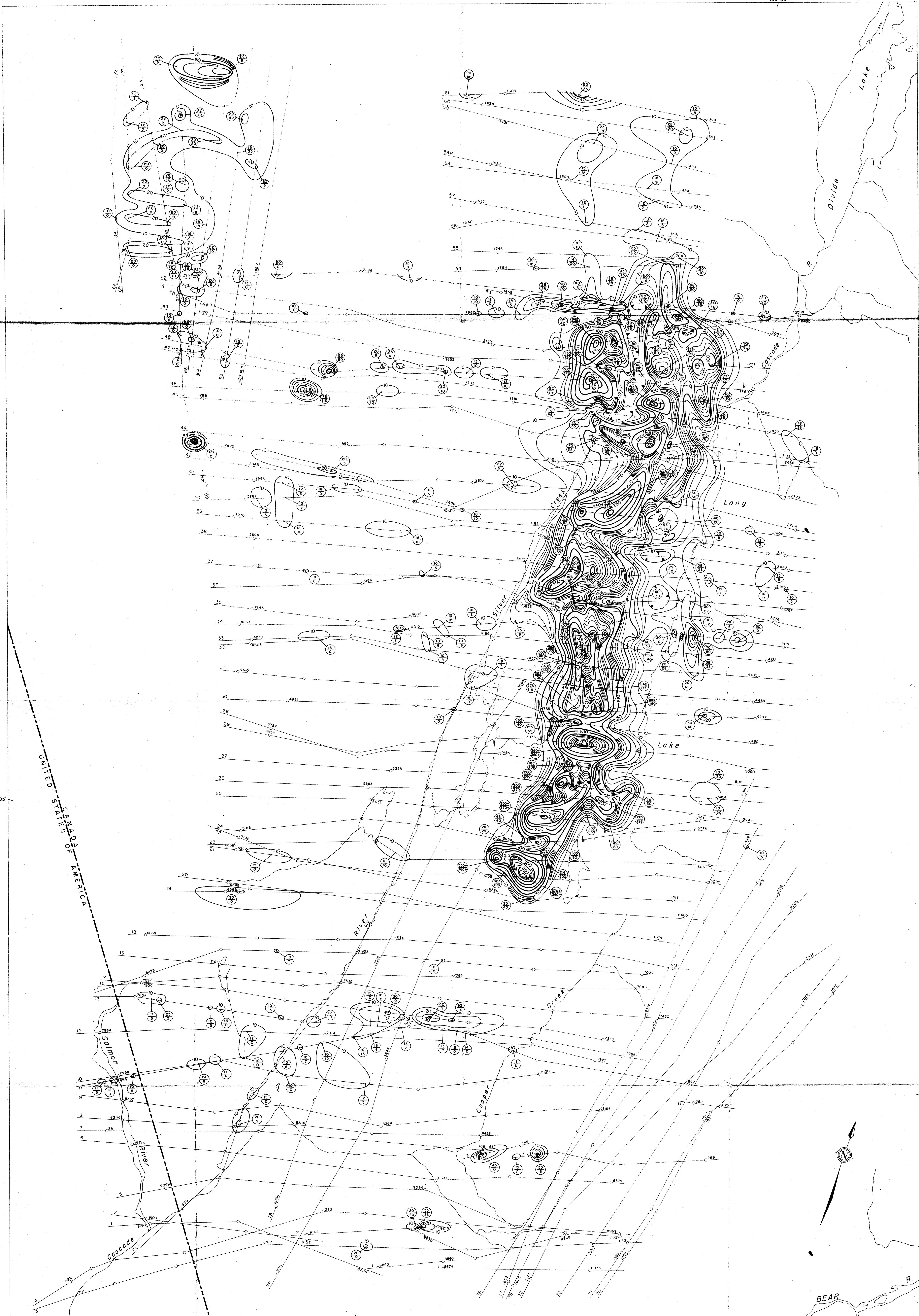
MAGNETIC COMPONENT "A"
 SALMON GLACIER AREA
 BRITISH COLUMBIA

2320

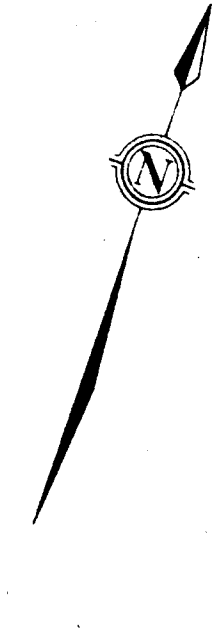


ATNA MINES LIMITED
AIRBORNE GEOPHYSICAL SURVEY

130°00'



UNITED STATES OF AMERICA

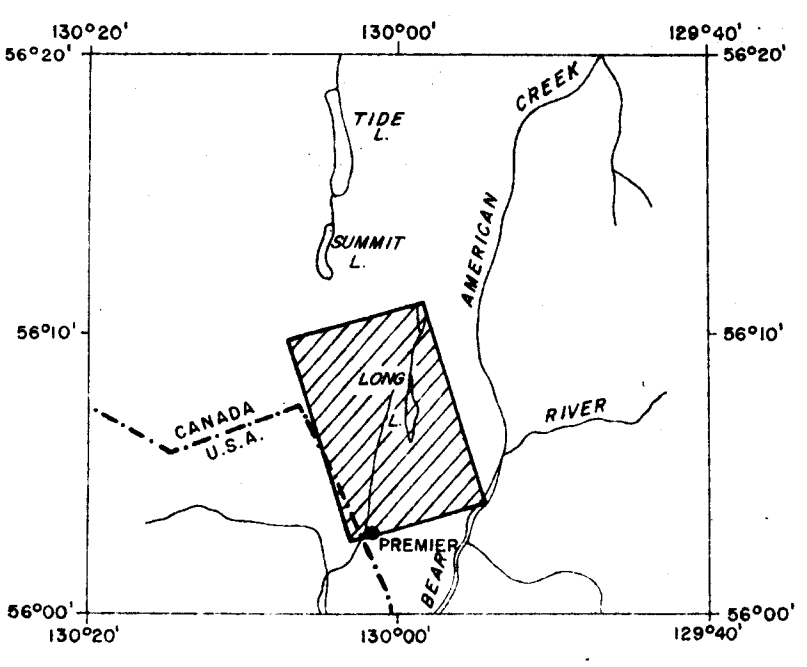
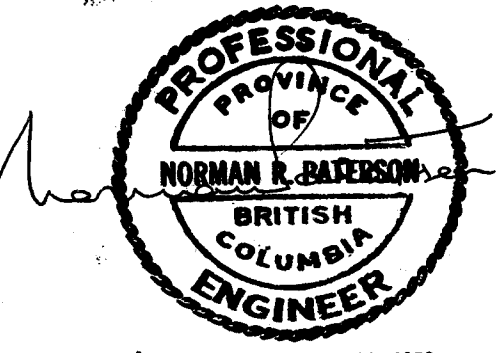


MEAN FLIGHT LINE SPACING ----- 660 FEET
 MEAN TERRAIN CLEARANCE ----- 200 FEET
 FIDUCIAL POINTS ----- O 3690
 FLIGHT LINES -----
 ELECTROMAGNETIC CONTOURS 50-100 etc.
 10 - 20 etc.
 THE CONTOURS REPRESENT THE ELECTROMAGNETIC RESPONSE
 OF THE IN PHASE COMPONENT OF THE SECONDARY FIELD IN
 UNITS OF 10 PARTS PER MILLION.
 (⊕) REPRESENTS IN PHASE COMPONENT OF SECONDARY FIELD
 (⊖) REPRESENTS OUT OF PHASE COMPONENT

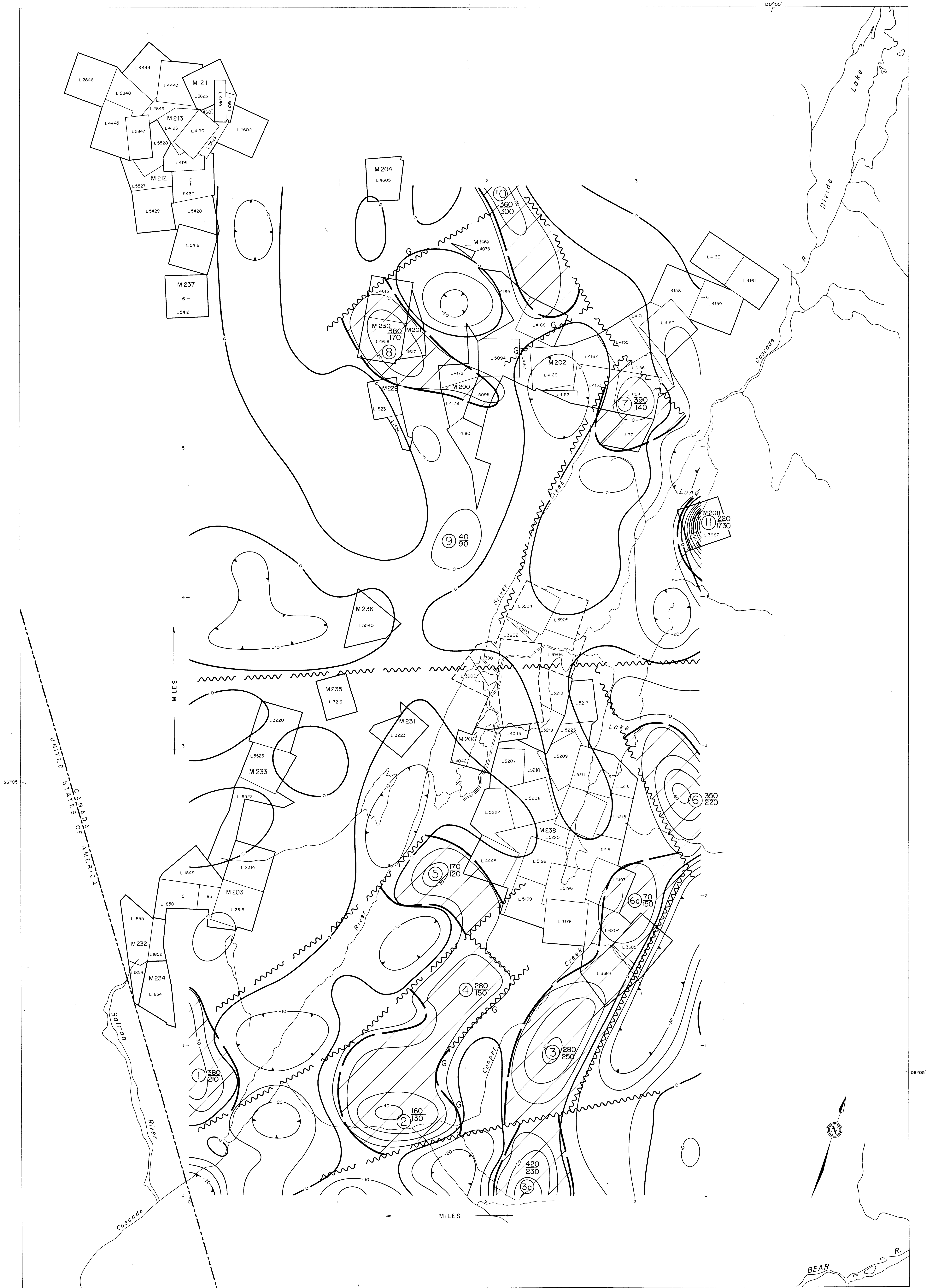
Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. 2320 MAP #1

ELECTROMAGNETIC MAP
 SALMON GLACIER AREA
 BRITISH COLUMBIA
 SCALE 1 inch to 1320 Feet
 1000 0 1000 2000 3000 4000 5000
 FEET FEET
 Flown and Compiled by
 LOCKWOOD SURVEY CORPORATION LIMITED
 1969

2320



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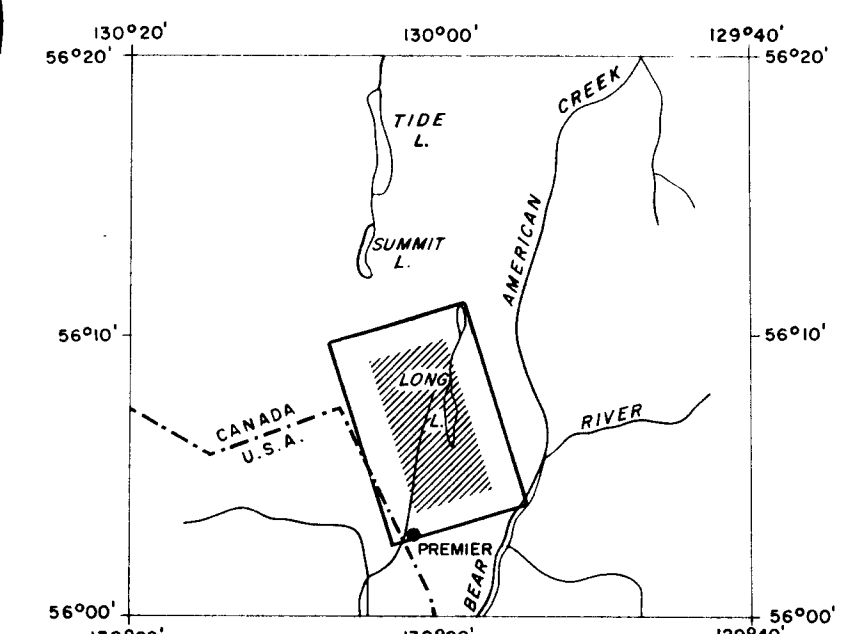
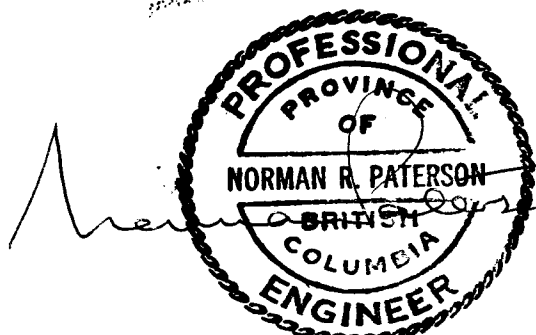


CONTOUR INTERVAL - - - - - 10 GAMMA
 0, ±50, ±100 etc. GAMMA CONTOUR - - - - -
 ±10, ±20 etc. GAMMA CONTOUR - - - - -
 MAGNETIC LOW - - - - -
 ANOMALY ANALYSIS - - - - - ④ 280
 - - - - - 250 - - - - - DEPTH BELOW GROUND
 - - - - - SUSCEPTIBILITY CONTRAST (10⁶ cgs. emu)
 - - - - - ANOMALY NUMBER
 INTERPRETED MAGNETIC FAULT - - - - -
 INFERRED FAULT - - - - -
 CORRELATION WITH MAPPED GEOLOGY - - - - - G
 ZONE OF HIGH MAGNETIZATION - - - - -

Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. 2320 MAP #6

MAGNETIC COMPONENT "B"
 SALMON GLACIER AREA
 BRITISH COLUMBIA

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CONTOUR INTERVAL ----- 10 GAMMA
 0, ± 50, ± 100 etc. GAMMA CONTOUR -----
 ± 10, ± 20 etc. GAMMA CONTOUR -----
 MAGNETIC LOW -----
 ANOMALY ANALYSIS --- (4) 280 --- DEPTH BELOW GROUND
 250 --- SUSCEPTIBILITY CONTRAST (10⁻⁶ cgs emu)
 4 --- ANOMALY NUMBER
 INTERPRETED MAGNETIC FAULT -----
 INFERRED FAULT -----
 CORRELATION WITH MAPPED GEOLOGY ----- G
 ZONE OF HIGH MAGNETIZATION -----

Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. 2320 MAP #7

MAGNETIC COMPONENT "C"
 SALMON GLACIER AREA
 BRITISH COLUMBIA

2320

PROFESSIONAL
 PROVINCE OF
 NORMAN R. PATERSON
 BRITISH
 COLUMBIA
 ENGINEER
 Supply Date: September 24, 1978

