

4685

REPORT ON THE
COMBINED AIRBORNE MAGNETIC
AND ELECTROMAGNETIC SURVEY
ON THE EBL AND KAJUN CLAIM GROUPS
June, Kojun, Brad IN THE
Rem, Spork KAMLOOPS MINING DISTRICT
BRITISH COLUMBIA
FOR WESTERN MINES LIMITED

82M/4W, 5W



BY

DR. D. J. MISENER, Ph. D.

AND

A. W. MULLAN, B.Sc.

NAME AND LOCATION OF PROPERTY:

EBL AND KAJUN CLAIM GROUPS, BARRIERE AREA
KAMLOOPS MINING DIVISION, BRITISH COLUMBIA
51 15'N LATITUDE, 119 45'W LONGITUDE

DATE STARTED: August 14, 1973.

DATE FINISHED: August 17, 1973.

Department of	
Mines and Petroleum Resources	
ASSESSMENT REPORT	
NO. 4685	MAP

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 (in pocket) AE 7316
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 (in pocket) AM 7316

McPHAR GEOPHYSICS

REPORT ON THE

COMBINED AIRBORNE MAGNETIC

AND ELECTROMAGNETIC SURVEY

ON THE EBL AND KAJUN CLAIM GROUPS

IN THE

BARRIERE AREA

KAMLOOPS MINING DISTRICT

BRITISH COLUMBIA

FOR

WESTERN MINES LIMITED

1. INTRODUCTION

At the request of Mr. C. H. Scott, exploration geologist for Western Mines Limited, we have completed a combined airborne electromagnetic and magnetic survey on the EBL and Kajun Claim Groups, in the Barriere area, Kamloops Mining Division British Columbia. The survey area is located approximately 20 miles west of Adams Lake, British Columbia and is situated at $51^{\circ} 15'$ Latitude and $119^{\circ} 45'W$ Longitude.

The area is underlain by late Paleozoic meta-sediments and meta-volcanics of the Cache Creek Group. Low grade disseminated mineralization occurs within the schists, and small pods of massive sulphides occur in skarn sequences as the intrusive contact is approached. Lenses of massive galena

also occur as veins and replacements in recrystallized limestone south of East Barriere Lake.

The purpose of the present survey, on a reconnaissance basis, was to locate any massive sulphide bodies within the area. Several conductive zones, which would warrant further ground investigations have been located by the airborne survey.

2. SURVEY DETAILS

Between August 14 and August 17, 1973, nineteen north-south flight lines spaced 1/6 mile apart were flown over the survey area. A tie-line paralleling the north shore of East Barriere Lake was also flown. Within topographic limitations, a standard mean terrain clearance of 450 feet was maintained over the survey area. A total of 20 lines was flown over the area, representing 132 miles of survey; 34.4 line miles were flown over the EBL Claim Group and 7.5 line miles were flown over the Kajua Group.

The following claims were covered in the survey:

EBL Group

<u>Claim Name</u>	<u>Claim Name</u>
Snark 1 Fr.	EBL 39 - 56
Snark 2 Fr.	EBL 55A
EBL 1 - 6	EBL 56A, 57 - 67
EBL 7 - 8	EBL 68
EBL 9 - 12	EBL 69-70, 75 81 - 82, 85

EBL Group (Cont'd)

<u>Claim Name</u>	<u>Claim Name</u>
EBL 13 - 18	
EBL 19 - 20	EBL 86, 89-90
EBL 21	Brad 1 - 6
EBL 22 - 28	REM 1 - 4
EBL 29	REM 5
EBL 30	REM 6
EBL 31, 32	REM 7 - 12
EBL 33	REM 13 - 14
EBL 34 - 36	REM 15 - 18
EBL 37 - 38	EBL 93 Fr.
	EBL 94 Fr.

Kajun Group

<u>Claim Name</u>
June #1
Kajun 1 - 14
Kajun 15 Fr.
Kajun 16 Fr.
Kajun 17, 18
Kajun 19 Fr.

A McPhar 400 Airborne electromagnetic and magnetic system was employed in carrying out the survey and is described in the notes preceding this report.

3. PRESENTATION OF RESULTS

The results of the combined electromagnetic and magnetic airborne survey are shown on the accompanying maps at a scale of 1 : 15,840. An index map at a scale of approximately 1 : 500,000 in the lower right hand corner of each map sheet indicates the relative location of the survey area. The location of the EBL and Kajun claim groups is shown on a plan map (Figure 1) at a scale of 1 : 50,000.

Line-to-line correlation of conductor axes has been indicated by solid dashed or hatched lines depending upon their significance. Zones warranting further ground investigations have been indicated with circled numbers. In addition, discreet anomalies of interest have been marked with a star.

The magnetic results are presented in contour form at a contour interval of 20 gammas. Coincidence of magnetic and electromagnetic anomalies is indicated on the electromagnetic map.

4. DISCUSSION OF RESULTS

At the 20 gammas contour level, the magnetic map shows only moderate changes in relief across the survey area. The maximum anomalous values are approximately 200 gammas. The regional strike of the magnetics in the region of East Barriere Lake is northwest-southeast, changing to approximately west-northwest, east-southeast, in the region of North Barriere Lake.

One major magnetic anomaly occurs in the survey area. The anomaly is centred at Fiducial Mark 827, on Line 4N and extends northwest to the edge of the survey area and southeast to East Barriere Lake. An associated magnetic low is centred at Fiducial Mark 2319 on Line #7N. The maximum value of the anomaly is approximately 200 gammas. This anomalous zone may represent the contact between the limestone and schist rocks to the west and the diorite or granodiorite intrusive to the east.

The intrusive rocks are overlain by recent glacial deposit and alluvium. The many small magnetic features (20 - 100 gammas) between East Barriere Lake and North Barriere Lake may be a reflection of changes in the magnetic properties of the overburden.

The majority of the electromagnetic anomalies show weak to moderate response on the low frequency (340 Hz); however, the moderate-to-good conductivity ratios exhibited by many of these anomalies make them worthy of further investigation. In order to simplify the discussion of the survey, each numbered anomaly will be discussed separately.

Anomaly # 1

This weak to moderate zone is located approximately 4000' south of North Barriere Lake and is recorded on Line # 4N and Line #5N and Line # 6N. The zone exhibits moderate to good conductivity and strikes east-west with a minimum strike length of approximately 1300'.

Anomalies #2 and #2A

These two zones are located approximately 1 mile north of East Barriere Lake on Line # 8N and Line # 9N (Anomaly #2) and Line # 11S and Line # 12S (Anomaly # 2A). The zones strike east-west and northwest-southeast respectively and are marked by weak response and moderate conductivity.

Anomaly #3

This zone is located on the northern edge of East Barriere Lake and Line # 6N and Line TL-NE. The zone is marked by weak response and moderate-to-good conductivity. The zone strikes east-west with a minimum strike length of approximately 800 feet. This electromagnetic anomaly is probably related to the coincident northwest-southeast striking magnetic anomaly.

Anomaly #4

This zone is located approximately 2500' south of East Barriere Lake on Line #18S and Line # 19S. The anomaly strikes east-west, has moderate conductivity, and a strike length of approximately 1000'.

Discreet anomalies, exhibiting responses on only one flight line have been indicated with a star. Conductive anomalies of interest may have a strike length less than the line spacing and thus these anomalies must be investigated further. Four discreet anomalies have been located on the map Sheet:

Fiducial Mark 1408, Line # 11S

Moderate response, fair anomaly shape, good conductivity.

Fiducial Mark 1838, Line # 2S

Moderate response, good anomaly shape. This zone may extend to the west.

Fiducial Mark 564, Line # 3N

Weak response, good anomaly shape, moderate conductivity. Possibly related to the anomalous magnetic zone.

Fiducial Mark 2282, Line #7N

Moderate response, fair anomaly shape, good conductivity.

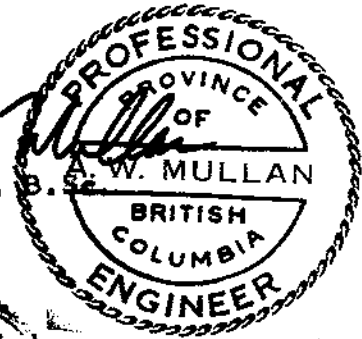
5. SUMMARY AND RECOMMENDATIONS

The airborne survey has been successful in locating a number of electromagnetic anomalies and in mapping the regional and detailed magnetic features. Although the anomalous zones outlined on the electromagnetic plot generally exhibit weak-to-moderate response, the good conductivity ratio and limited strike length increase the possibility that massive sulphide mineralization may be present in these areas. The four conductive zones detected by the airborne electromagnetic survey warrant further ground investigation. The discreet "one-line" anomalies all exhibit moderate to good conductivity and should also be investigated by means of ground exploration methods.

McPHAR GEOPHYSICS COMPANY.

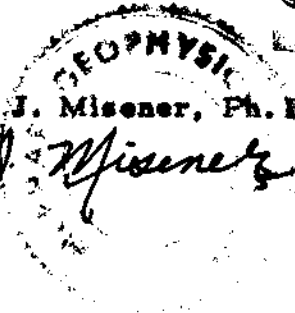
Ashton W. Mullan

Ash. W. Mullan, B.Sc.



D. J. Misener, Ph. D.

D. J. Misener



ASSESSMENT DETAILS

PROPERTY:	EBL & Kajun Claim Groups	MINING DIVISION:	Kamloops
SPONSOR:	Western Mines Ltd.	PROVINCE:	British Columbia
LOCATION:	Barriere Lakes	DATE STARTED:	August 14, 1973.
		DATE FINISHED:	August 17, 1973.

TYPE OF SURVEY: Combined Airborne Electromagnetic
and Magnetic Survey

MEAN FLIGHT LINE DIRECTION: North-south

MILES OF LINE FLOWN: 132

MEAN FLIGHT LINE SPACING: 880 feet

MILES OF LINES INSIDE AREA:

MEAN TERRAIN CLEARANCE: 450 feet

EBL - 34.4

Kajun - 7.5

AIRCRAFT: Jet Ranger 206B
Registration CF-QAP
Okanagan Helicopters

NUMBER OF MINING CLAIMS:

EBL - 108

Kajun - 207

CONSULTANTS:

A. W. Mullan, P. Eng., 1449 Sandhurst Place, West Vancouver, B.C.

Dr. D. Jim Misener, Geophysicist, 208 Lord Seaton Road, Willowdale, Ontario.

TECHNICIANS:

P. McDougall, 650 Parliament Street, Apt. 2212, Toronto, Ontario.

DRAUGHTSMEN:

Mr. C. May, 5 Eastmoor Crescent, Scarborough, Ontario.

Mr. M. Slaven, 23 Lascelles Blvd., Toronto, Ontario.

Mrs. M. Kimmerer, 5 Brookbanks Drive, Apt. 1105, Don Mills, Ontario.

McPHAIL GEOPHYSICS COMPANY,

Dr. D. Jim Misener
Geophysicist.

Dated: September 28, 1973.


A. W. Mullan, P. Eng.
C. BRITISH COLUMBIA
ENGINEER

STATEMENT OF COST

Western Mines Limited, EBL and Kajun Claim Groups -
Airborne Electromagnetic and Magnetic Survey
Barriere Lakes Area
Kamloops Mining Division, British Columbia.

Technician: P. McDougall

Consulting Geophysicist: Dr. D. J. Misener

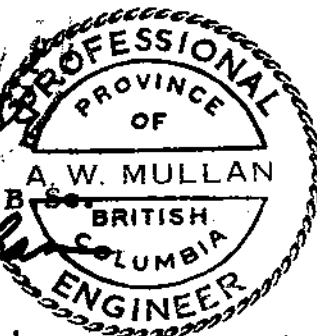
To: Flying 132 lines miles x 41.59	=	\$5,489.88
Compilation of data 132 x \$5.00	=	660.00
Reporting 2 days @ \$150.00	=	300.00
		<hr/>
	Total	\$6,449.88
		<hr/> <hr/>

McFAR & GEOPHYSICS COMPANY.

D. J. Misener
Geophysicist.

Dated: September 28, 1973.

D. J. Misener
A. W. Mullan, B.Sc.



CERTIFICATE

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

1. That I am a geologist and a fellow of the Geological Association of Canada with a business address at Suite 811, 837 West Hastings Street, Vancouver, B.C.

2. That I am registered as a member of the Association of Professional Engineers of the Provinces of Ontario and British Columbia.

3. That I hold a B.Sc. degree from McGill University.

4. That I have been practising my profession as a geologist for about twenty years.

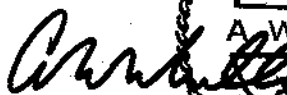
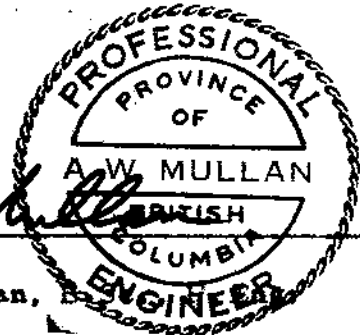
5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Western Mines Limited, or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto

This 28th day of September, 1973.


A. W. Mullan, 
The seal is circular with a double-line border. The outer ring contains the text 'PROFESSIONAL ENGINEER' at the top and 'BRITISH COLUMBIA' at the bottom. The inner circle contains 'PROVINCE OF' at the top, 'A. W. MULLAN' in the center, and 'BRITISH COLUMBIA' at the bottom.

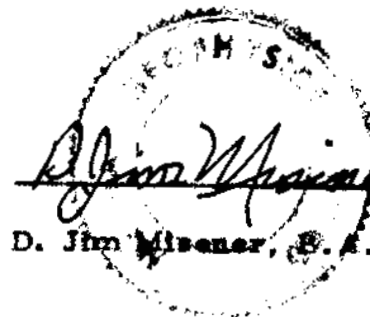
CERTIFICATE

I, D. Jim Misener, of the City of Toronto, Province of Ontario do hereby certify that:

1. I am a geophysicist, residing at 208 Lord Seaton Road, Willowdale, Ontario.
2. I am a graduate of the University of Toronto with a B.A.Sc. in Engineering Physics, Geophysics Option (1967) and a M.A.Sc. Degree in Geophysics (1971) and a Ph. D. Degree in Geology and Geophysics (1973) from the University of British Columbia.
3. I have no direct, or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Western Mines Limited, or any affiliate.
4. The statements made in this report are based on a study of published geological literature and unpublished private reports.
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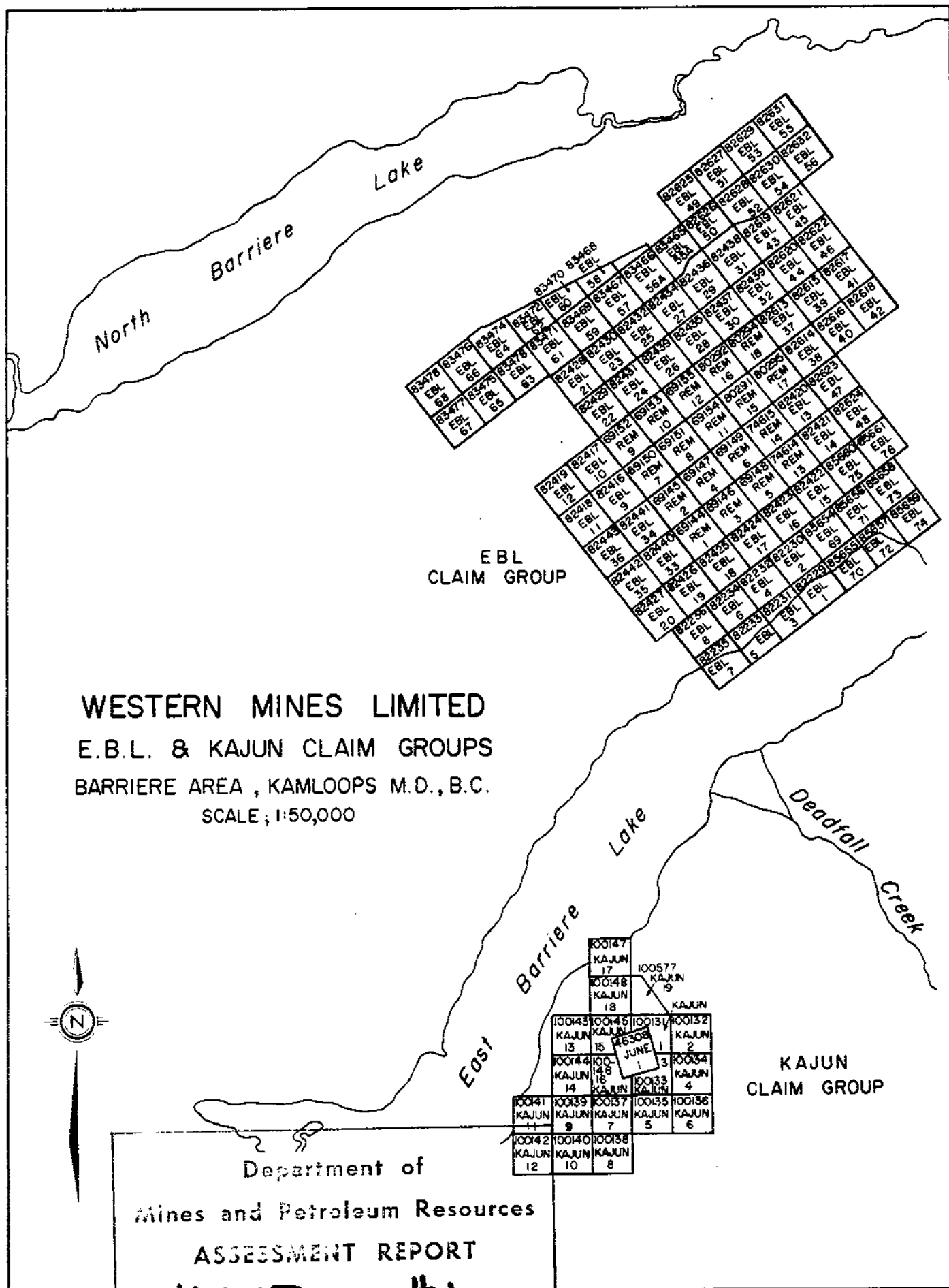
Dated at Toronto

This 28th day of September, 1973.



D. Jim Misener, B. A. Sc. M. A. Sc. Ph. D.

LOCATION MAP



WESTERN MINES LIMITED
E.B.L. & KAJUN CLAIM GROUPS
BARRIERE AREA , KAMLOOPS M.D., B.C.
SCALE ; 1:50,000

GENERAL NOTES ON
AIRBORNE ELECTROMAGNETIC
AND MAGNETIC SYSTEMS

A. EQUIPMENT

The electromagnetic and magnetic units are the primary instruments used in the McPhar combined survey system which is designed for use in a Bell Jet Ranger 206B Helicopter. Ancillary equipment consists of a radio altimeter, a frame camera, an intervalometer-fiducial numbering system and a light beam recorder.

I) H-400 Electromagnetic Unit

The H-400 is a sequential transmission dual frequency (340 Hz and 1070 Hz) electromagnetic unit that measures the quadrature response of a conductor. In the absence of a conductor, the quadrature response is zero. Two iron-cored coils mounted in specially design fiberglass landing skids are used to create the primary field which is essentially a horizontal dipole. A fiberglass airfoil containing the receiver coil is towed behind and below the aircraft giving a transmitter-receiver separation of approximately 400 feet. The dipole axis of the receiver system is vertical and is flown in a position to be maximum coupled to the primary field. A vertical axis was chosen for the receiving coil since the vertical component of the atmospheric noise is usually an order of magnitude lower than the horizontal component. Sequential dual-frequency EM operation is employed together with time sharing for a proton magnetometer. The cycle consists of one third second at each frequency followed by an additional one third second for a magnetic readout. The quadrature response at each frequency is recorded on two channels of the recorder.

II) Proton Magnetometer

A Geometrics G806 airborne proton precession magnetometer is used to record the variations in the earth's total magnetic field. The sensing head of this unit is mounted in a second airfoil towed approximately 50 feet beneath the helicopter. This instrument has a sensitivity of one gamma when pulsed at one second intervals. The proton magnetometer has the advantage of reading the absolute value of the earth's magnetic field and is almost completely free of drift or variations due to temperature or environmental changes. The magnetic data are recorded on the same chart as the electromagnetic response for ease of correlation.

III) Ancillary Equipment

A Bonzer doppler radio altimeter provides a continuous ground clearance profile. Flight path coverage is obtained by a frame camera driven by the intervalometer-fiducial unit which synchronizes the individual frames with the time events on the recorder. At the standard flying height of 450 feet, the intervalometer is programmed to provide 20% overlap on each camera frame. This results in a continuous record of the flight path. At greater heights, there is proportionally more overlap.

B. DATA RECORDING & COMPILATION

A light-beam recorder employing a heat-sensitive paper is used to record the data. High-sensitivity galvanometers give almost instantaneous response to the incoming signals and the recorder time lag is essentially zero. The recorder normally employed is the 6 channel Century 444 Recorder.

With the actual flight record oriented so that the fiducial numbers increase from left to right, the 4.1 inch trace width has been divided by 10 major grid lines with zero at the bottom and 10 at the top. These major divisions are in turn divided by five division lines which appear as lighter lines on the chart. Except where noted on the individual records, the traces are identified as follows:

I) 340 & 1070 Hz Quadrature EM Response

The EM transmitting coils in the 400 Series EM System are operated at two frequencies, 340 Hz and 1070 Hz, on a time share basis. A double-tuned receiving coil mounted in the towed receiver bird detects both frequencies. The quadrature or out-of-phase response detected at each frequency is recorded on the analogue strip chart and positive out-of-phase response, normally indicative of the presence of a conductor, is indicated by an upward excursion of the trace.

These two primary information traces are centred on the one and the two unit grid lines respectively.

The values of the out-of-phase EM response at the two frequencies is recorded in parts per thousand (ppt) of the primary field at the receiver. Anomalies of 1000 ppm (parts per million) or 1 ppt are easily recognized in most conditions. The amount of deflection on the recorder chart which corresponds to 1 ppt is dependent upon the sensitivity setting of the receiver. Sensitivity settings of 5 ppt, 10 ppt, 20 ppt and 40 ppt can be employed depending upon the "geologic noise" in the area surveyed. In most survey operations, a sensitivity of 10 ppt is used. The higher sensitivity setting, 5 ppt, may be used under low noise conditions where relatively small anomalous responses may be significant. Less sensitive settings, 20 ppt or 40 ppt, can be used where the opposite conditions are anticipated. The sensitivity setting is recorded on the flight report and the amplitude of the positive deflection representing a quadrature response of 10 ppt is recorded on the flight calibration for each frequency.

II) Magnetometer

The magnitude of the earth's total magnetic field is recorded on both a fine scale (0 to 100 gammas) and a coarse scale (0 to 1000 gammas). Each scale is adjusted to provide a full scale deflection of the ten major units on the recording chart. The position of the coarse and fine scale lines is usually centred on grid Line 0. The exact zero and full scale

deflection positions can be checked from the flight calibrations. Since the value of the earth's magnetic field is a five digit number, the operator records the value of the first two digits on the flight report.

III) Fiducials

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

IV) Altimeter

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

C. DATA PRESENTATION

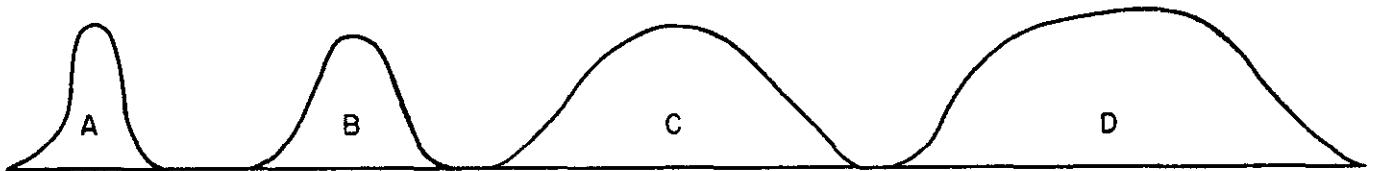
I) H-400 Frequency EM Results

Electromagnetic anomalies result from areas on, or in, the ground which are electrical conductors. Geological sources of conductivity include sulphide mineralization, graphitic formations and fault or shear zones which often contain electrolytes. Other sources of conductivity include poorly conductive surficial materials such as saline waters, swamps and wet clays. The surficial anomalies sometimes extend over large areas and may obscure responses from underlying mineralized zones.

The presentation used on the plan maps has been developed to show the three primary characteristics of each individual response. This accomplished by the numerals and letters adjacent to each anomaly symbol. For most purposes, these characteristics are sufficient to describe the anomaly, but for detailed interpretation, it is best to study the actual flight trace.

a) Width, Shape and Peak

The letters 'A', 'B', 'C' and 'D' are used to illustrate the recorded shape of the EM response which approximates on the following curve types. The bar coinciding with the flight line represents the half-height width of the EM response on the 340 Hz trace and the circle symbol represents the position of the anomaly peak. The symbols used are illustrated in the map legends.



b) Amplitude

The amplitude of the peak response at 340 Hz is shown in parts per thousand (ppt). Although various sensitivity settings may be used, resulting in various amounts of deflection on the trace representing 1 ppt, the amplitude indicated on the map is always in units of parts per thousand.

c) Apparent Conductivity Ratio

The ratio of the response at 340 Hz compared to the response at 1070 Hz is shown as the third parameter. Generally, ratios less than 0.5 indicate poor conductivity while those greater than 1.0 indicate good to excellent conductivity. However, it should be noted that this ratio is a measure of the 'Apparent Conductivity' and varies with the product of the size and conductivity, where the size is usually a squared function. The significance of the calculated ratio is obviously dependent upon the amplitude of the response, with the reliability decreasing with very low amplitudes.

d) Evaluation

The response obtained from a conductive body is influenced by a variety of factors which include its conductivity, permeability, size,

depth and attitude. In addition, the angle at which the flight lines cross the body (angle of attack) is an important variable. Consequently, the amplitude and shape of the response cannot be regarded as an absolute interpretational grading or classification. However, they are of definite interpretational value as illustrated in the following examples.

- i) A vertical sheet of good conductivity material (such as a vein of massive sulphides), striking perpendicular to the flight line, would give rise to a strong, sharp response with a high conductivity ratio. A typical characteristic would be: A, 10, 1.2.
- ii) As the angle of attack decreases, the shape of the response from a vertical sheet would change from A to B to C; the magnitude of response could increase while the ratio may decrease (i.e. C, 11, 1.0).
- iii) An extensive flat horizontal sheet will show a response of C or D category. The amplitude and 'Apparent Conductivity' will be a function of the size-conductivity product and can vary over a wide range. A typical response from poorly conductive overburden would be: D, 4, 0.3.

Because of the large number of parameters that influence EM response, the anomalies obtained from airborne surveys should be evaluated in the light of all geological, geophysical and physiographical data before embarking on field investigations and follow up work.

II) Magnetometer Results

The magnetic data usually are presented in contour form. The contours represent lines of equal intensity of the earth's magnetic field. In this way, regional structures as well as local electromagnetic correlations can easily be recognized.



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4685 MAP #2

LEGEND

E.M. SYMBOLS

- A SYMBOLS SHOW LENGTH, SHAPE AND PEAK OF ANOMALY
- B 340 Hz AMPLITUDE
- C ANOMALY SHAPE
- D RATIO - 340/1070 Hz

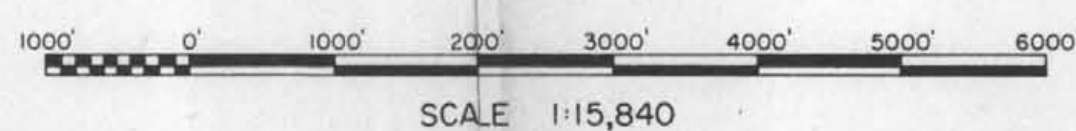
MAGNETIC CORRELATION

- DIRECT CORRELATION
- FLANK CORRELATION
- FIDUCIAL

CONDUCTOR AXIS

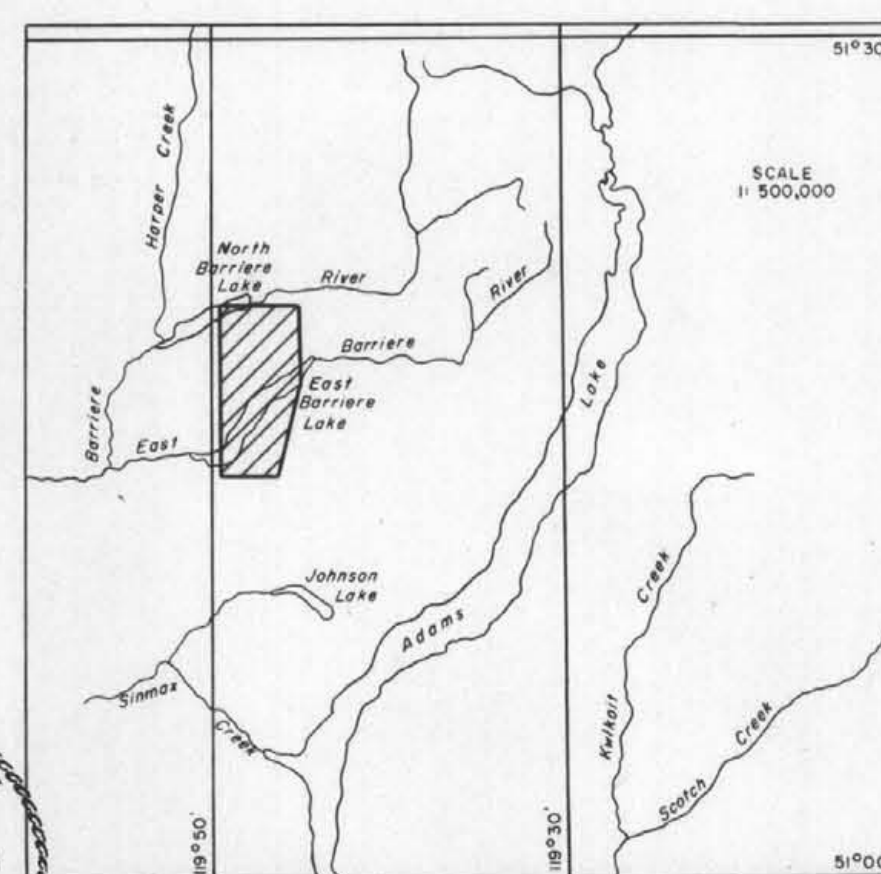
- DEFINITE
- PROBABLE
- POSSIBLE
- MEAN TERRAIN CLEARANCE --- 880 FEET
- MEAN FLIGHT LINE SPACING --- 450 FEET
- FLOWN AND COMPILED --- AUG - SEPT.

WESTERN MINES LIMITED
E.B.L. & KAJUN CLAIM GROUPS
BARRIER AREA, KAMLOOPS M.D., B.C.



NOTE TO ACCOMPANY GEOPHYSICAL
REPORT FOR WESTERN MINES
LTD., E.B.L. AND KAJUN CLAIM
GROUPS, KAMLOOPS MINING
DIVISION, B.C. BY A.W. MULLAN
(P. Eng.) AND Dr. J. MISENER
(Geophysicist)

Dated *08-27-73*
Approved *[Signature]*
PROFESSIONAL
OF
A. W. MULLAN
BRITISH
COLUMBIA



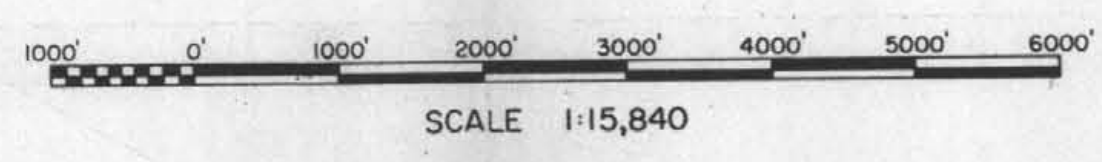
4685-M2



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **4685** MAP #3

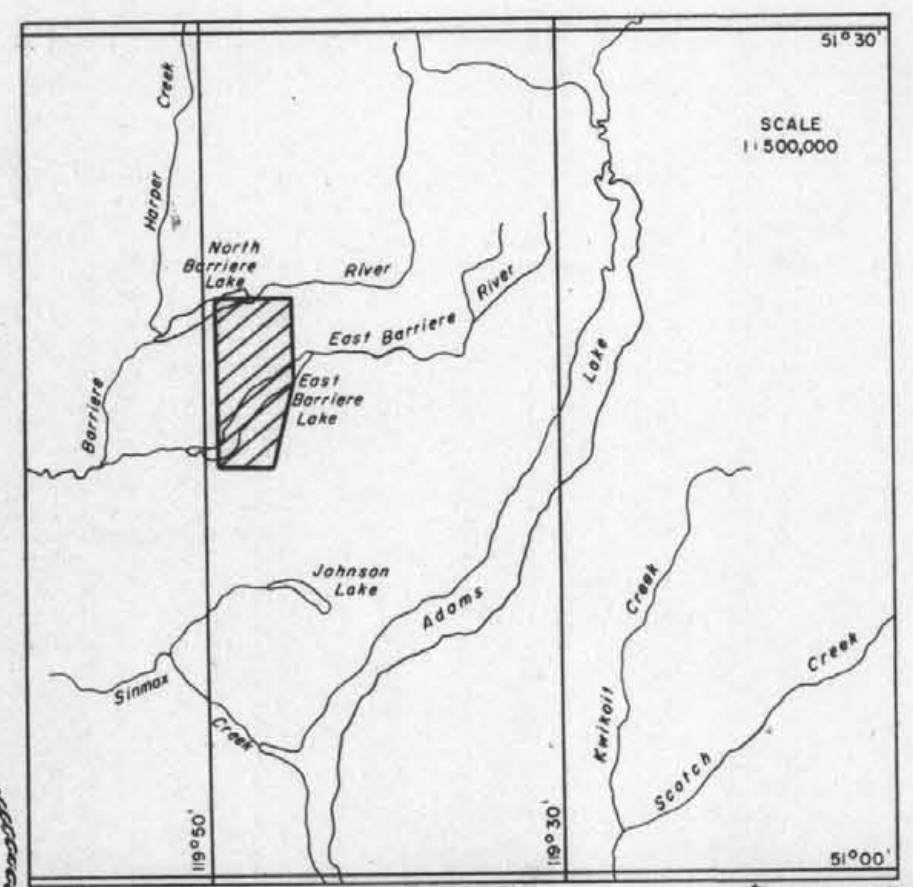
LEGEND
 CONTOUR INTERVAL ----- 20 gammas
 20 GAMMA CONTOUR -----
 100 GAMMA CONTOUR -----
 500 & 1000 GAMMA CONTOUR -----
 MAGNETIC LOW -----
 MEAN FLIGHT LINE SPACING ----- 880 FEET
 MEAN TERRAIN CLEARANCE ----- 450 FEET
 FLOWN AND COMPILED ----- AUGUST TO SEPTEMBER

WESTERN MINES LIMITED
E.B.L. & KAJUN CLAIM GROUPS
BARRIERE AREA, KAMLOOPS M.D., B.C.



NOTE: TO ACCOMPANY GEOPHYSICAL
REPORT FOR WESTERN MINES
LTD., E.B.L. AND KAJUN CLAIM
GROUPS, KAMLOOPS MINING
DIVISION, B.C. BY A.W. MULLAN
(P. Eng.) AND Dr. J. MISENER
(Geophysicist)

Dated *08/21/74*
Approved *[Signature]*



4685-M3