COMINCO LTD.

EXPLORATION

WESTERN DISTRICT

NTS: 104K-11 & 12

REPORT ON A DIGHEM HELICOPTER EM AND MAGNETIC SURVEY OVER THE TULSEQUAH PROPERTY TULSEQUAH AREA, ATLIN M.D., B.C.

LATITUDE : 58°42'N

LONGITUDE : 133°35'W

CLAIMS COVERED : BIG BULL EXT., BRUCE FR, BULL 2-4, 8, 9, BIRDS, PAT, ROSS, CO 1-5

OWNERS : COMINCO LTD.

OPERATOR : COMINCO LTD.

SURVEY DATES : May 29 - June 2, 1982

JULY 27, 1982

J. KLEIN

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REPORT ON A DIGHEM HELICOPTER EM AND MAGNETIC SURVEY OVER THE TULSEQUAH PROPERTY TULSEQUAH AREA, ATLIN M.D., B.C.

INTRODUCTION

During the period May 29 - June 2, 1982, a Dighem Ltd. helicopter crew completed an airborne EM and magnetic survey over parts of the Tulsequah property. The survey was on behalf of COMINCO Ltd. A total of approx. 180 line kilometers of data was collected. The survey was flown out of Atlin, B.C. with refueling near the survey area.

The objective of this airborne survey was to map conductive and/or magnetic materials present in the survey area.

This report describes briefly the procedures used for the survey, presents the data and briefly discusses the results.

HISTORY

The Volcanogenic massive sulphide deposit known as the Tulsequah Chief mine, was discovered by prospectors in 1923 (see Plate 1). The Big Bull, also a volcanogenic massive sulphide, was found by similar methods in 1929. COMINCO Ltd. acquired the two properties in 1946 and production was started by 1951, with an average of 530 tons/day mined. Between 1951 and 1957, production from both properties totalled 1 million tons. Between shutdown in 1957 and 1980, little work was done on the properties. Eighty-six units (the CO group) were acquired between the Big Bull and the Chief, and just north of the Chief in 1980 (see Plate 2).

LOCATION, ACCESS AND TOPOGRAPHY

NTS: 104K-11 & 12

Centered on Latitude: 58°42'N, Longitude: 133°35'W

Atlin Mining District

Distance to supply centres:

Atlin, B.C. - 100 km to the North
Juneau, Alaska - 64 km to the Southwest
Telegraph Creek, B.C. - 166 km to the Southeast

Located at the junction of the Tulsequah and Taku Rivers

Access to the area is gained either by air or water. Access by air to the actual mine sites is gained exclusively by helicopter. However, float planes can land on the Taku River (2 miles from Big Bull and 7 miles from Tulsequah Chief) and wheel-equipped planes up to DC-3, can land at an airstrip near the junction of the Taku and Tulsequah Rivers.

Access by water is gained by barge from Juneau, Alaska, up the Taku River, to the landing dock at the mouth of the Tulsequah River.

The east side of the Tulsequah River, along which the Tulsequah Chief, Big Bull and CO group properties are located, is a rugged mountainous area with slopes averaging 30°. The hillsides contain numerous small to large bluffs which impede, and sometimes prohibit, linecutting and traversing. The slopes are heavily forested up to an elevation of about 3,500' (the Tulsequah Chief is at approximately 500'), with thick growth of alder and devil's club on the lower portions of the slopes. These factors contribute to making field work in the area, especially where there are no cut lines, quite slow and difficult.

GEOPHYSICAL SURVEY

The Dighem II and magnetic survey was conducted along approx. 180 line kilometers of airborne traverse. The thirteen survey lines were approx. 200 m apart and up to 16 km long each.

A Lama turbine helicopter, Canadian registration C-GDEM, was used, flying at an average air speed of 100 km/hr, towing the EM bird at approx. 35 m above the ground. Ancillary equipment consisted of a Geometrics G803 magnetometer with its bird at an average height of 50 m, a Sperry radio altimeter, Geocam

sequence camera, RMS GR33 analog recorder, and a Sonotek SDS 1200 digital data acquisition system with a DigiData 1640 9-track 800-bpi magnetic tape recorder. The analog equipment recorded four channels of EM data at approximately 900 Hz, two ambient EM noise channels (for the coaxial and coplanar receivers), and one channel each of magnetics and radio altitude. The digital equipment recorded the EM data with a sensitivity of 0.2 ppm/bit and the magnetic field to gamma/bit.

The digitally recorded data was processed and merged with the recovered flight path of the helicopter. The results are presented on plans showing the flight path superimposed on a mosaic base (scale 1:20,000). Plate 3 shows the properly graded conductors. Plate 4 shows the magnetic results with contours every 25 gammas.

GEOPHYSICAL RESULTS

The electromagnetic map shows the locations of conductors and their interpreted conductance (= conductivity - thickness product) and depth. Their strike direction and length are also shown when anomalies can be correlated from line to line.

The area is quite active magnetically, but appears to be without clearly defined magnetic rock units (see Plate 4).

The EM anomalies appear to cluster near the river valleys and most likely indicate saline waters in the valley sediments (see Plate 3 and Table 1). A single weaker conductor (labelled 30A) falls outside the area of conductive valley fill.

CONCLUSIONS

A helicopter-borne EM and magnetic survey over the Tulsequah and Big Bull areas detected strong conductivities related to the sediments in the Taku and Tulsequah Rivers. No important anomalies were detected outside these low lying areas.

No recommendations for follow-up can be made based on this data.

Report by: J. Klein
Chief Geophysicist

Approved for Release: W. J. Mealpe for
G. Harden
Manager, Exploration
Western District

JK/jel

Distribution:

Mining Recorder	(2)
Western District	(1)
Geophysics File	(1)
Administration	(1)
Tulsequah Project File	(1)

TABLE I

EM ANOMALY STATISTICS OF THE TULSEQUAH AREA

CONDUCTOR GRADE	CONDUCTANCE RANGE	RESPONSES
6	> 99 MHOS	4
5	50-99 MHOS	1
4	20-49 MHOS	14
3	10-19 MHOS	10
2	5- 9 MHOS	4
1	< 5 MHOS	2
X	INDETERMINATE	2
TOTAL		37

APPENDIX I

IN THE MATTER OF THE B.C. MINERAL ACT

AND IN THE MATTER OF A GEOPHYSICAL PROGRAM

CARRIED OUT ON THE BIG BULL EXTENSION, BRUCE (FR),

BULL 2 to 4, 8 and 9, BIRDS, PAT, ROSS, AND CO 1 to 5 CLAIMS

LOCATED IN THE TULSEQUAH AREA

IN THE ATLIN MINING DIVISION, B.C.

OF THE PROVINCE OF BRITISH COLUMBIA, MORE PARTICULARLY

N.T.S.: 104/K-11 & 12

S T A T E M E N T

I, JAN KLEIN, OF THE CORPORATION OF RICHMOND, IN THE PROVINCE OF BRITISH COLUMBIA, MAKE OATH AND SAY:-

1) THAT I am employed as a geophysicist by Cominco Ltd. and, as such have a personal knowledge of the facts to which I hereinafter depose;

2) THAT the annexed hereto and marked as "Appendix II' to this statement is a true copy of expenditures incurred on geophysical survey in the TULSEQUAH area;

3) THAT the said expenditures were incurred for the purpose of mineral exploration of the above-noted claims during period May 29 to June 2, 1982.

Signed: _____

J. Klein
Chief Geophysicist

July 27, 1982

APPENDIX II

STATEMENT OF EXPENDITURES

TULSEQUAH AREA

AIRBORNE EM AND MAGNETIC SURVEY

MAY 29 - JUNE 2, 1982

1.	Contract Geophysical Services by DIGHEM LIMITED of Toronto approx. 180 line kilometers	$ 18,194.40
2.	J. Klein, Geophysicist, two days @ $ 245/day	490.00
		$ 18,684.40

APPENDIX III

CERTIFICATION

I, JAN KLEIN, of 4371 Coventry Drive, in the Corporation of Richmond, in the Province of British Columbia, do hereby certify:-

1) THAT I graduated from the Technological University of Delft Netherlands in 1965 with a M.Sc. in Geophysics;

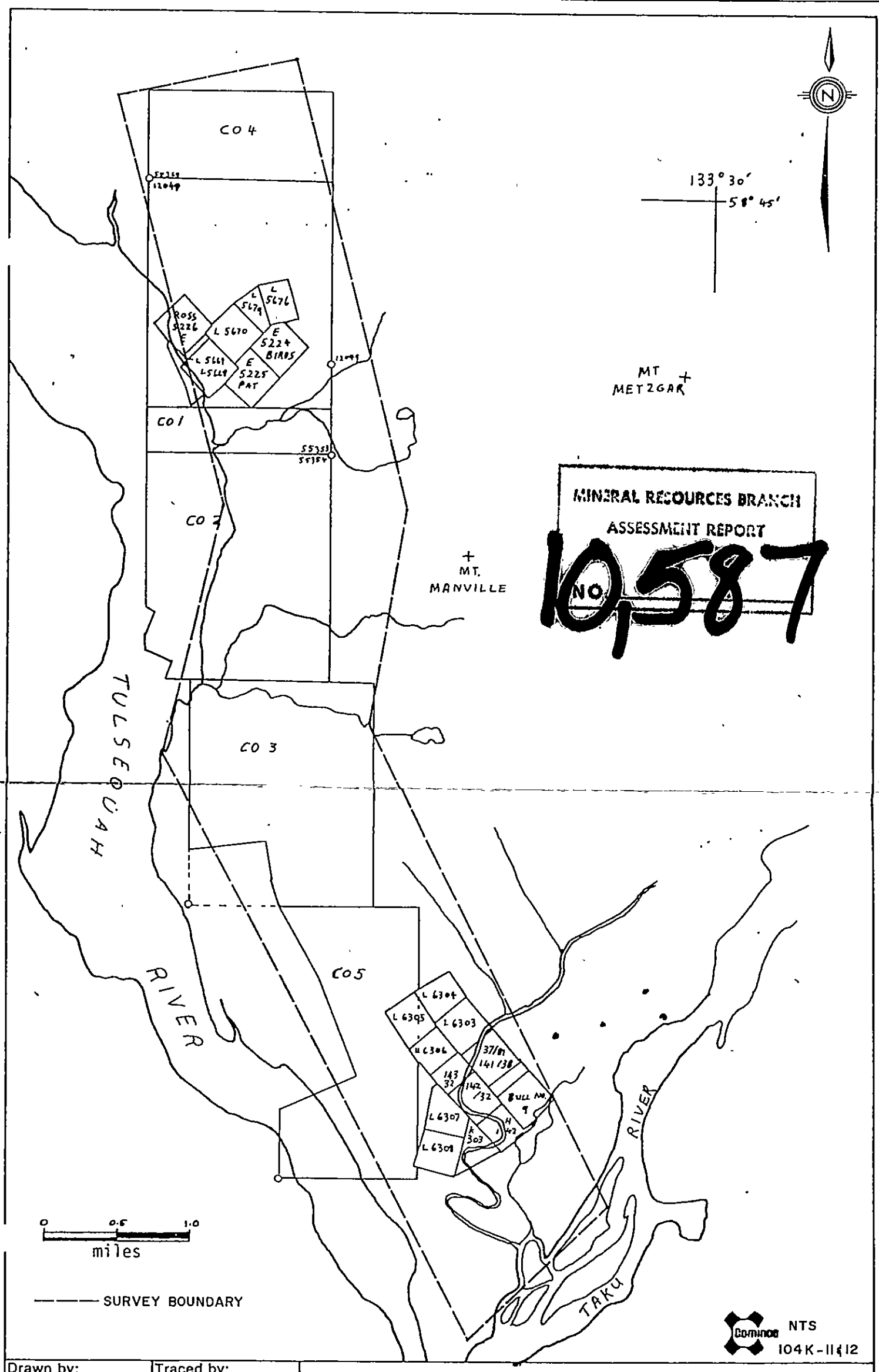
2) THAT I am a member of the Association of Professional Engineers of the Province of British Columbia, the Society of Exploration Geophysicists of America, and the British Columbia Geophysical Society;

3) THAT I have been practising my profession for the past seventeen years.

Signed: Jan Klein

J. Klein, M.Sc., P.Eng.
Chief Geophysicist

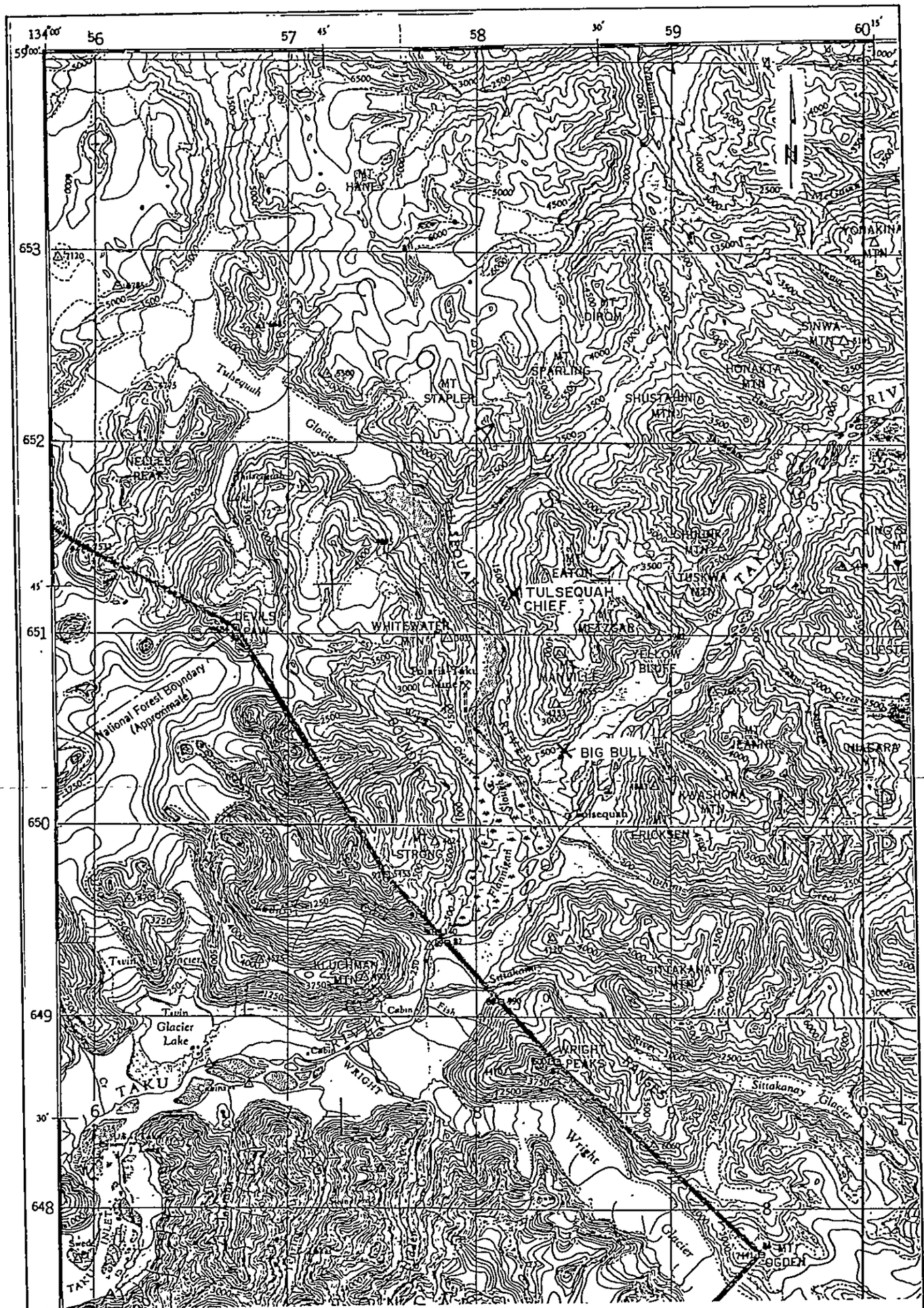
July 27, 1982



Drawn by:		Traced by:		TULSEQUAH PROPERTY CLAIM BLOCK and SURVEY BOUNDARY ATLIN M.D., B.C.		
Revised by	Date	Revised by	Date			
				Scale: 1:50,000	Date: JUNE 1982	Plate: 228-82-2

NCI 112A - CL

210-0610



Drawn by:		Traced by:	
Revised by	Date	Revised by	Date

TULSEQUAH PROPERTY
GENERAL LOCATION MAP
ATLIN M.D., B.C.

Scale: 1:250,000 | Date: JUNE 1982 | Plate: 228-82-1

BCIL-2187-C

210-0610

DIGHEM^{II} SURVEY

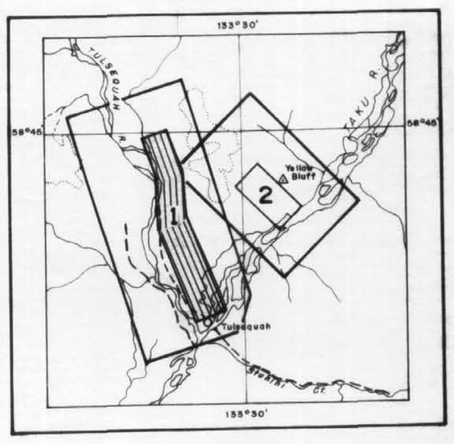
TULSEQUAH AREA, B.C.

MAGNETICS

FOR

COMINCO LTD.

LOCATION MAP



Scale 1 : 250,000

SCALE 1:20,000

0 1 2 Kilometres

1/2 0 1/2 1 Miles

Flight line

Fiducials and numbers

ISOMAGNETIC LINES

(total field)

1000 ..... 1000 gammas

200 ..... 200 gammas

50 ..... 50 gammas

..... 25 gammas

..... magnetic depression

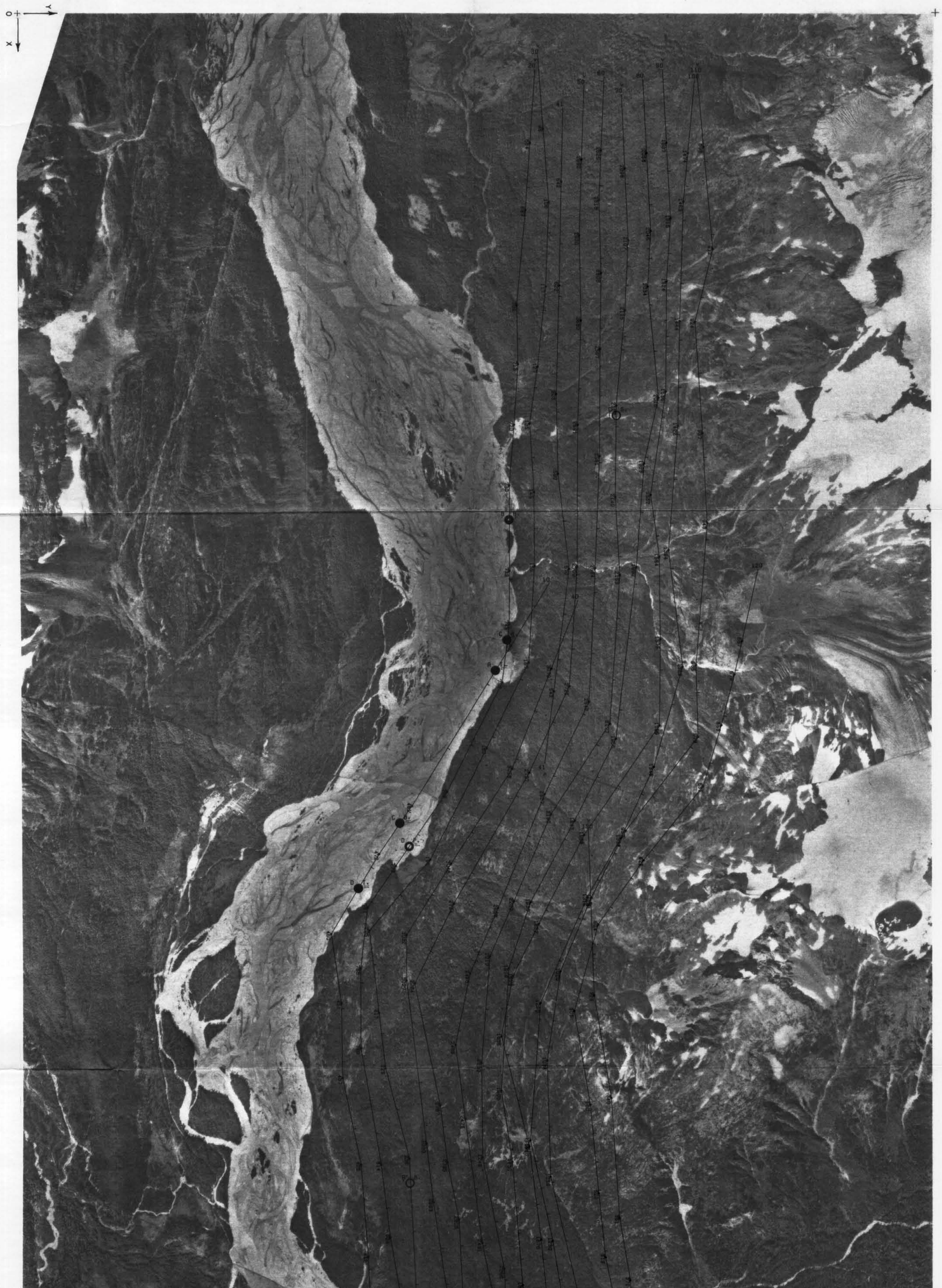
Magnetic Inclination within the survey area: 75°

TULSEQUAH PROPERTY				NTS 104K-11W12
Drawn by:		Traced by:		MAGNETIC CONTOUR PLAN
Revised by	Date	Revised by	Date	ATLIN M.D., B.C.
				Scale: 1:20,000 Date: JULY 1982 Plate: 228-82-4

JOB	DATE	DRAWN BY	CHECKED BY
165	JULY, 1982	S.S.	

REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

SHEET 1



LOCATION MAP

Scale 1 : 250,000

DIGHEM^{II} SURVEY

TULSEQUAH AREA, B.C.

ELECTROMAGNETICS

FOR

COMINCO LTD.

SCALE 1 : 20,000

2 Kilometres

1/2 0 1/2 1 Miles

SHEET 1

REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

Flight line

Fiducials and numbers

ANOMALY GRADE	EM GRADE SYMBOL	CONDUCTANCE RANGE (MHOS)
6	●	> 99
5	✸	50 — 99
4	●	20 — 49
3	◎	10 — 19
2	○	5 — 9
1	○	< 5
—	×	Indeterminate

DIGHEM anomalies are divided into six grades of conductivity - thickness product. This product in mhos is the reciprocal of resistance in ohms. The mho is a measure of conductance, and is a geologic parameter.

identifier name — interpretive symbol

Depth is greater than: 15 m, 30 m, 45 m, 60 m

Inphase and Quadrature of Coaxial Coil is greater than: 5 ppm, 10 ppm, 15 ppm, 20 ppm

Refer to list of anomalies in survey report for the actual ppm values for all coils, and for conductor depths.

The interpretation is shown by the interpretive symbol (see legend below). The left letter is the anomaly identifier. The horizontal rows of dots indicate anomaly amplitude on the flight record, and the vertical column gives the estimated depth. This depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or conductive overburden effects

SYMBOL	GEOPHYSICAL MODEL	BEDROCK CONDUCTOR	or	NON-BEDROCK CONDUCTOR	MOST LIKELY
D, (< 2)	steeply-dipping thin dike or dip direction	steeply-dipping planar conductor	or		discrete bedrock conductor
T.	thick dike	thick conductor, with thickness greater than 30 m.	or	metal culture which contacts conductive ground	
B.	indeterminate	bedrock conductor	or		
P.	conductor to one side of flight line	flight line passed off the end or side of conductor	or	flight line passed off the end or side of culture	
H.	half space (close to surface)	conductive rock unit	or	deep conductive weathering or thick conductive cover	conductive rock or cover
G.	buried half space	conductive rock unit, buried under non-conductive cover or under a dense forest canopy	or	deep conductive weathering or thick conductive cover, buried under a dense forest canopy	
S.	horizontal sheet	weak bedrock conductor masked by conductive cover	or	thin conductive cover or, occasionally, culture which contains conductive cover	
R	horizontal ribbon	flatly-dipping narrow conductor	or	narrow surface conductor, e.g., stream sediments, or large fenced area	culture
O.	sphere, horizontal disk	steeply-plunging compact conductor	or	metal roof or fenced yard	
L.	line	--		fence, pipeline, power line	

"a" is one of the above symbols; "a?" means that the correct identification of the geophysical model is only a reasonable possibility, rather than being a reasonable probability

? probable aerodynamic noise, meaning that conductive material may, in fact, not exist

TULSEQUAH PROPERTY

NTS 104K-11E 12

Drawn by: | Traced by:

Revised by	Date	Revised by	Date

EM CONDUCTOR PLAN

ATLIN M.D., B.C.

Scale: 1:20,000 | Date: JULY 1982 | Plate: 228-82-3

JOB	DATE	DRAWN BY	CHECKED BY
165	JULY, 1982	S.S.	