ASSESSMENT REPORT

EXPLORATION WESTERN CANADA

COMBINED HELICOPTER-BORNE MAGNETIC AND ELECTROMAGNETIC SURVEY

YUKON TERRITORY

BRUIN PROPERTY
NTS 116 C/7
LAT. 64°19'N: LONG. 140°41'W
(BRUIN 1-48: YB53138-YB53185)

FOR

COMINCO LTD.
JUNE 11, 1995

BY

AERODAT INC.
3883 NASHUA DRIVE
MISSISSAUGA, ONTARIO
CANADA L4V 1R3

R.W. WOOLHAM, P.ENG
CONSULTING GEOPHYICIST

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I BLACK LINE MAPS: (Scale 1:20,000)

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1-2	TOTAL FIELD MAGNETIC CONTOURS; with base map and flight lines.
1-3	HEM OFFSET PROFILES; coaxial 935 Hz data with flight lines, base map and EM anomaly symbols.
1-4	HEM OFFSET PROFILES; coaxial 4,600 Hz data with flight lines, base map and EM anomaly symbols
1-5	**CLAIM MAP (SCALE 1:50,000)**

1. INTRODUCTION

This report describes an airborne geophysical survey flown for Cominco Exploration by Aerodat Inc. (Aerodat) under a contract dated April 18, 1995. Principal geophysical sensors include a five frequency electromagnetic system and a high sensitivity cesium vapour magnetometers. Ancillary equipment consists of a colour video tracking camera, a Global Positioning System (GPS) for navigation, a radar altimeter and a base station magnetometer.

Block No.	Date Flown	No. of Flights	Line Direction	Area km^2	Line km.	NTS
5	June 11	2	135°	21	70	116 C/7

2. SURVEY AREA

The survey block is located approximately 68 km west-northwest of Dawson.

Topography is shown on the 1:50,000 scale NTS map sheets listed on the previous table. Local relief is generally rugged. Elevations range from 600 m to over 1,250 m for block 5.

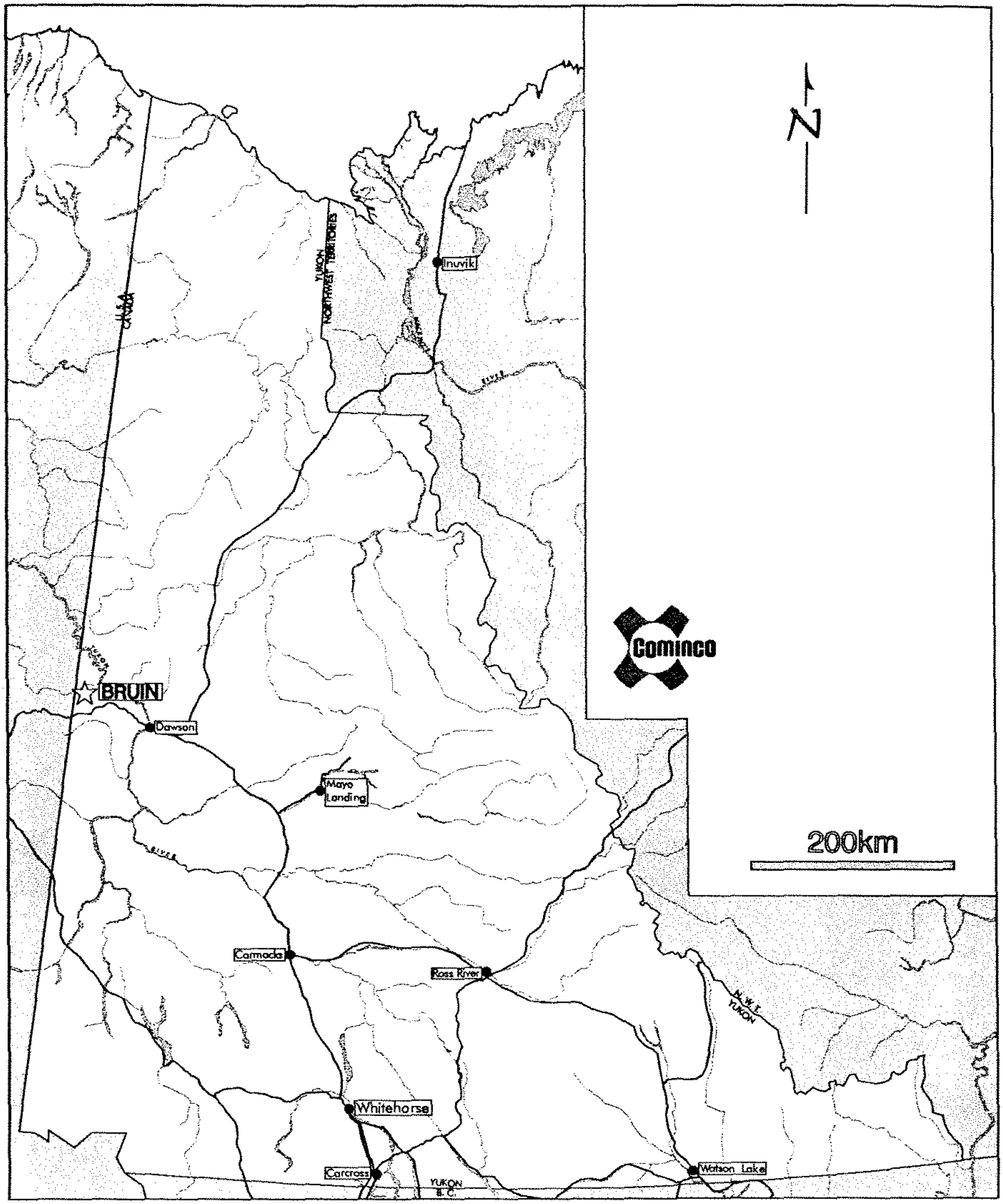
The survey area is shown on the following map, including local topography and latitude - longitude coordinates. This index map also appears on all black line map products. The flight line direction is north-south.

3. SURVEY PROCEDURES

The survey of the Bruin Property was completed on June 11, 1995. A total of 2 survey flights were required to complete the project as detailed in the previous table. Principal personnel are listed in Appendix I. Aircraft ground speed is maintained at approximately 60 knots (30 metres per second). The nominal EM sensor height is 30 metres (100 feet), consistent with the safety of the aircraft and crew.

A global positioning system (GPS) consisting of Magnavox MX 9212 operated in differential mode guides aircraft navigation and flight line control. Field processing of the differential GPS data in the field utilizes a PC using software supplied by the manufacturer. One system is installed in the survey helicopter. This involved mounting the receiver antenna on the tail boom. A second system acts as the base station.

The published NTS maps provide the UTM coordinates of the survey area corners. These coordinates program the navigation system. A test flight confirms if area coverage is correct. Thereafter the navigation system guides



Drawn by:		Traced by: a. m. a.	
Revised by:	Date:	Revised by:	Date:

BRUIN PROPERTY
Location Map

Scale: As Shown | Date: Dec. 13.1995 | Plate:

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

BRUIN PROPERTY LOCATION MAP

Scale: 1:250,000 | Date: DEC. 13, 1995 | Plate:

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the pilot along the survey traverse lines marked on the topographic map. The operator also enters manual fiducials over prominent topographic features. Survey lines showing excessive deviation are re-flown.

Aircraft position is registered by the navigation system. The operator calibrates the geophysical systems at the start, middle (if required) and end of every survey flight. During calibration the aircraft is flown away from ground effects to record electromagnetic zero levels.

4. DELIVERABLES

The maps and report on the results of the survey is presented in two copies. The report includes folded white print copies of all black line maps.

The black line maps show topography, UTM grid coordinates and the survey boundary. A full list of all map types is at the beginning of this report. A summary follows:

MAP NO.	DESCRIPTION
BLACK LINE	
1-1	Base Map
1-2	Total Field Magnetic Contours
1-3	HEM Offset Profiles - 935 Hz
1-4	HEM Offset Profiles - 4,600 Hz

The processed digital data, in profile form, is on nine track archive tape. A full description of the archive tape(s) is included with the package. All gridded data are on diskettes suitable for displaying on IBM compatible microcomputers using the Aerodat AXIS (Aerodat Extended Imaging System) or RTI (Real Time Imaging) software package. The complete data package includes all analog records, base station magnetometer records, flight path video tape and original map cronaflexes.

5. AIRCRAFT AND EQUIPMENT

5.1 Aircraft

The survey aircraft was an Eurocopter AS350BA helicopter, piloted by K. Hyllestao, owned and operated by Peace Helicopters Ltd. of Peace River, Alberta. M. Barry of Aerodat acted as navigator and equipment operator. Aerodat performed the installation of the geophysical and ancillary equipment. The survey aircraft flies at a mean terrain clearance of 60 metres (200 feet).

5.2 Electromagnetic System

The electromagnetic system is an Aerodat five frequency configuration. Two vertical coaxial coil pairs operate at frequency ranges of 935 Hz and 4,600 Hz and three horizontal coplanar coil pairs at frequency ranges of 865 Hz, 4,175 Hz and 33 kHz. Actual frequencies used depend on the particular bird configuration. Presently, Aerodat have eight bird systems. This survey utilized the Hornet bird which has frequencies of 917 Hz and 4,507 Hz for the coaxial coil pairs and 867 Hz, 4,127 Hz and 32,330 Hz for the coplanar coil pairs. Transmitter-receiver separation is seven metres. Inphase and quadrature signals are measured simultaneously for the five frequencies with a time constant of 0.1 seconds. The HEM bird is towed 30 metres (100 feet) below the helicopter.

5.3 Magnetometer

A Scintrex H8 cesium, optically pumped magnetometer sensor, measures the earth's magnetic field. The sensitivity of this instrument is 0.001 nanoTesla at a sampling rate of 0.2 second. The sensor is towed in a bird 15 metres (50 feet) below the helicopter 45 metres (150 feet) above the ground).

5.4 Ancillary Systems

Base Station Magnetometer

An IFG-2 proton precession magnetometer is set up at the base of operations to record diurnal variations of the earth's magnetic field. Synchronization of the clock of the base station with that of the airborne system is checked each day to insure diurnal corrections will be accurate. Recording resolution is 1 nT with an update rate of four seconds. Magnetic field variation data are plotted on a 3" wide gridded paper chart analog recorder. Each division of the grid (0.25") is equivalent to one minute (chart speed) or five nT (vertical sensitivity). The date, time and current total field magnetic value are automatically recorded every 10 minutes. The data is also saved to digital tape.

Radar Altimeter

A King KRA-10 radar altimeter records terrain clearance. The output from the instrument is a linear function of altitude. The radar altimeter is pre-calibrated by the manufacturer and is checked after installation using an internal calibration procedure.

Tracking Camera

A Panasonic colour video camera records the flight path on VHS video tape. The camera operates in continuous mode. The video tape also shows the flight number, 24 hour clock time (to .01 second), and manual fiducial number.

Global Positioning System (GPS)

The Global Positioning System is a U.S. Department of Defense program that provides world-wide, 24 hour, all weather position determinations. GPS consists of three segments:

- a constellation of satellites
- ground stations that control the satellites
- a receiver

The receiver takes in coded data from satellites in view and there after calculates the range to each satellite. The coded data must therefore include the instantaneous position of the satellite relative to some agreed earth-fixed coordinate system. The satellite constellation consists of 24 satellites with a proportion of the satellites acting as standby spares.

Analog Recorder

An RMS dot matrix recorder displays the data during the survey. Record contents are as follows:

Label	Contents	Scale
MAGF	Total Field Magnetics, Fine	2.5 nT/mm
MAGC	Total Field Magnetics, Course	25 nT/mm
CXI1	935 Hz, Coaxial, Inphase	2.5 ppm/mm
CXQ1	935 Hz, Coaxial, Quadrature	2.5 ppm/mm
CXI2	4,600 Hz, Coaxial, Inphase	2.5 ppm/mm
CXQ2	4,600 Hz, Coaxial, Quadrature	2.5 ppm/mm
CPI1	865 Hz, Coplanar, Inphase	10 ppm/mm
CPQ1	865 Hz, Coplanar, Quadrature	10 ppm/mm
CPI2	4,175 Hz, Coplanar, Inphase	10 ppm/mm
CPQ2	4,175 Hz, Coplanar, Quadrature	10 ppm/mm
CPI3	33,000 Hz, Coplanar, Inphase	20 ppm/mm
CPQ3	33,000 Hz, Coplanar, Quadrature	20 ppm/mm
RALT	Radar Altimeter	10 ft/mm

Data is recorded with positive - up, negative - down. The analog zero of the radar altimeter is 5 cm from the top of the analog record. A helicopter terrain clearance of 60 m (200 feet) should therefore be seen some 3 cm from the top of the analog record.

Chart speed is 2 mm/second. The 24 hour clock time is printed every 20 seconds. The total magnetic field value is printed every 30 seconds. The ranges from the radar navigation system are printed every minute.

Vertical lines crossing the record are manual fiducial markers activated by the operator. The start of any survey line is identified by two closely spaced manual fiducials. The end of any survey line is identified by three closely spaced manual fiducials. Manual fiducials are numbered in order. Every tenth manual fiducial is indicated by its number, printed at the bottom of the record. Calibration sequences are present at the start and end of each flight and at intermediate times where needed.

Digital Recorder

A DGR-33 data system records the digital survey data on magnetic media. Contents and update rates are as follows:

DATA TYPE	RECORDING INTERVAL	RECORDING RESOLUTION
Magnetometer	0.2 s	0.001 nT
HEM (8 Channels)	0.1 s	
coaxial		0.03 ppm
coplanar-865 Hz/4,175 Hz		0.06 ppm
coplanar -33 kHz		0.125 ppm
Position (2 Channels)	0.2 s	0.1 m
Altimeter	0.2 s	0.05 m
Power Line Monitor	0.2 s	-
Manual Fiducial		
Clock Time		

6. DATA PROCESSING AND PRESENTATION

6.1 Base Map

The base map is taken from a photographic enlargement of the NTS topographic maps. A UTM reference grid (lines usually every kilometre) and the survey area boundary are added. After registration of the flight path to the topographic base map, some topographic detail and the survey boundary are added digitally. This digital image forms the base for the colour maps.

6.2 Flight Path Map

Global Positioning System

The GPS receiver takes in coded data from satellites in view and there after works out the range to each satellite. The coded data must therefore include the instantaneous position of the satellite relative to some agreed earth-fixed coordinate system.

A further calculation using ranges to a number of satellites gives the position of the receiver in that coordinate system (eg. UTM, lat/long.). The elevation of the receiver is given with respect to a model ellipsoidal earth.

Normally the receiver must see 4 satellites for a full positional determination (3 space coordinates and time). If the elevation is know in advance, only 3 satellites are needed. These are termed 3D and 2D solutions.

The position of the receiver is updated every second. The accuracy of any 1 second position determination is described by the Circular Error Probability (CEP). Ninety-five percent of all position determinations will fall within a circle of a certain radius. If the horizontal position accuracy is 25 m CEP for example, 95% of all trials will fall within a circle of 25 m radius centred on the mean. The system may be degraded for civilian use and the autonomous accuracy is then 100 m CEP. This situation is called selective availability (SA). Much of this error (due to principally to satellite position/time errors and atmospheric delays) can be removed using two GPS receivers operating simultaneously. One receiver acting as the base station, is located at a known position. The second remote receiver is in the unknown position. Differential corrections determined for the base station may then be applied to the remote station. Differential positions are accurate to 5 m CEP (for a one second sample). Averaging will reduce this error further.

Flight Path

The flight path is drawn using linear interpolation between x,y positions from the navigation system. These positions are updated every second (or about 1.5 mm at a scale of 1:20,000). These positions are expressed as UTM eastings (x) and UTM northings (y).

Occasional dropouts may occur when the optimum number of satellites are not available for the GPS to make accurate positional determinations. Interpolation is used to cover short flight path gaps. The navigator's flight path and/or the flight path recovered from the video tape may be stitched in to cover larger gaps. Such gaps may be recognized by the distinct straight line character of the flight path.

The manual fiducials are shown as a small circle and labelled by fiducial number. The 24 hour clock time is shown as a small square, plotted every 30 seconds. Small tick marks are plotted every 2 seconds. Larger tick marks are plotted every 10 seconds. The line and flight numbers are given at the start and end of each survey line.

The flight path map is merged with the base map by matching UTM coordinates from the base maps and the flight path record. The match is confirmed by checking the position of prominent topographic features as recorded by manual fiducial marks or as seen on the flight path video record.

6.3 Electromagnetic Survey Data

The electromagnetic data are recorded digitally at a sample rate of 10 per second with a time constant of 0.1 seconds. A two stage digital filtering process rejects major sferic events and reduces system noise.

Local sferic activity can produce sharp, large amplitude events that cannot be removed by conventional filtering procedures. Smoothing or stacking will reduce their amplitude but leave a broader residual response that can be confused with geological phenomena. To avoid this possibility, a computer algorithm searches out and rejects the major sferic events. The signal to noise ratio is further enhanced by the application of a low pass digital filter. This filter has zero phase shift which prevents any lag or peak displacement from occurring, and it suppresses only variations with a wavelength less than about 0.25 seconds. This low effective time constant gives minimal profile distortion.

Following the filtering process, a base level correction is made using EM zero levels determined during high altitude calibration sequences. The correction applied is a linear function of time that ensures the corrected amplitude of the various inphase and quadrature components is zero when no conductive or permeable source is present. The filtered and levelled data is the basis for determination of apparent resistivity (see section 6.6).

6.4 Total Field Magnetics

The aeromagnetic data are corrected for diurnal variations by adjustment with the recorded base station magnetic values. No corrections for regional variations are applied. The corrected profile data are interpolated on to a regular grid using an Akima spline technique. The grid provided the basis for threading the presented contours. The minimum contour interval is 2 nT with a grid cell size of 25 m.

7. ELECTROMAGNETIC ANOMALY SELECTION

Usually two sets of stacked colour coded profile maps of one coaxial and one coplanar inphase and quadrature responses are used to select conductive anomalies of interest. Selection of anomalies is based on conductivity as indicated by the inphase to quadrature ratios of the 935 Hz and/or 4,600 Hz coaxial data, anomaly shape, and anomaly profile characteristics relative to coaxial and corresponding coplanar responses (see discussion and figure in Appendix I). It is difficult to differentiate between responses associated with the edge effects of flat lying conductors and actual poor conductivity bedrock conductors on the edge of or overlain by flat lying conductors. Poor conductivity bedrock conductors having low dips will also exhibit responses that may be interpreted as surficial overburden conductors. In such cases, where the source of the conductive response appears to be ambiguous, the anomaly is still selected for plotting. In some situations the conductive response has line to line continuity and some magnetic association thus providing possible evidence that the response is related to an actual bedrock source.

The calculation of the depth to the conductive source and its conductivity is based on the 4,600 Hz data assuming a thin vertical sheet model. The amplitude of the inphase and quadrature responses are used for the calculations which are automatically determined by computer. These data are listed in appendix II and the depth and conductivity values are shown with each plotted anomaly. Further detailed discussion and illustration of the determination of these values is contained in Appendix I.

The selected anomalies are automatically categorized according to their conductivity and amplitude. The calculation of the conductivity of low amplitude anomalies can be very inaccurate. Therefore, anomalies having amplitudes below a certain level and/or low conductivity value are given a zero rating with the category increasing for increasing conductivity values that are statistically reliable.

7.1 INTERPRETATION

One conductive zone was detected on this small grid, marked as feature "A". It is open to the SE and is located on a portion of the lower south slopes of Bruin Ck. The strongest responses encircle the strongest lobe of a broad magnetic high but there appears no direct magnetic associations with the strongest EM peaks.

Single, possibly two-line EM peak feature B (Line 10090, time fid. 89 and possibly Line 10100) is mainly seen in the higher frequencies. It has a magnetic correlation and is situated near a break in slope along Bruin Ck. This break may reflect a fault (NE-SW). These features warrant follow-up

This report compiled by
R.W. Woolham, P.Eng.
Consulting Geophysicist

for

AERODAT INC.

July 21, 1995

8. STATEMENT OF EXPENDITURES

Aerodat Inc. Airborne EM & Mag. Survey:	
70 line km x $73/line km	$ 5,110.00
Report Preparation	220.00
TOTAL:	**$5,330.00**

Report Endorsed by:

K.R. Pride, P.Geo
Senior Geologist
Western Canada

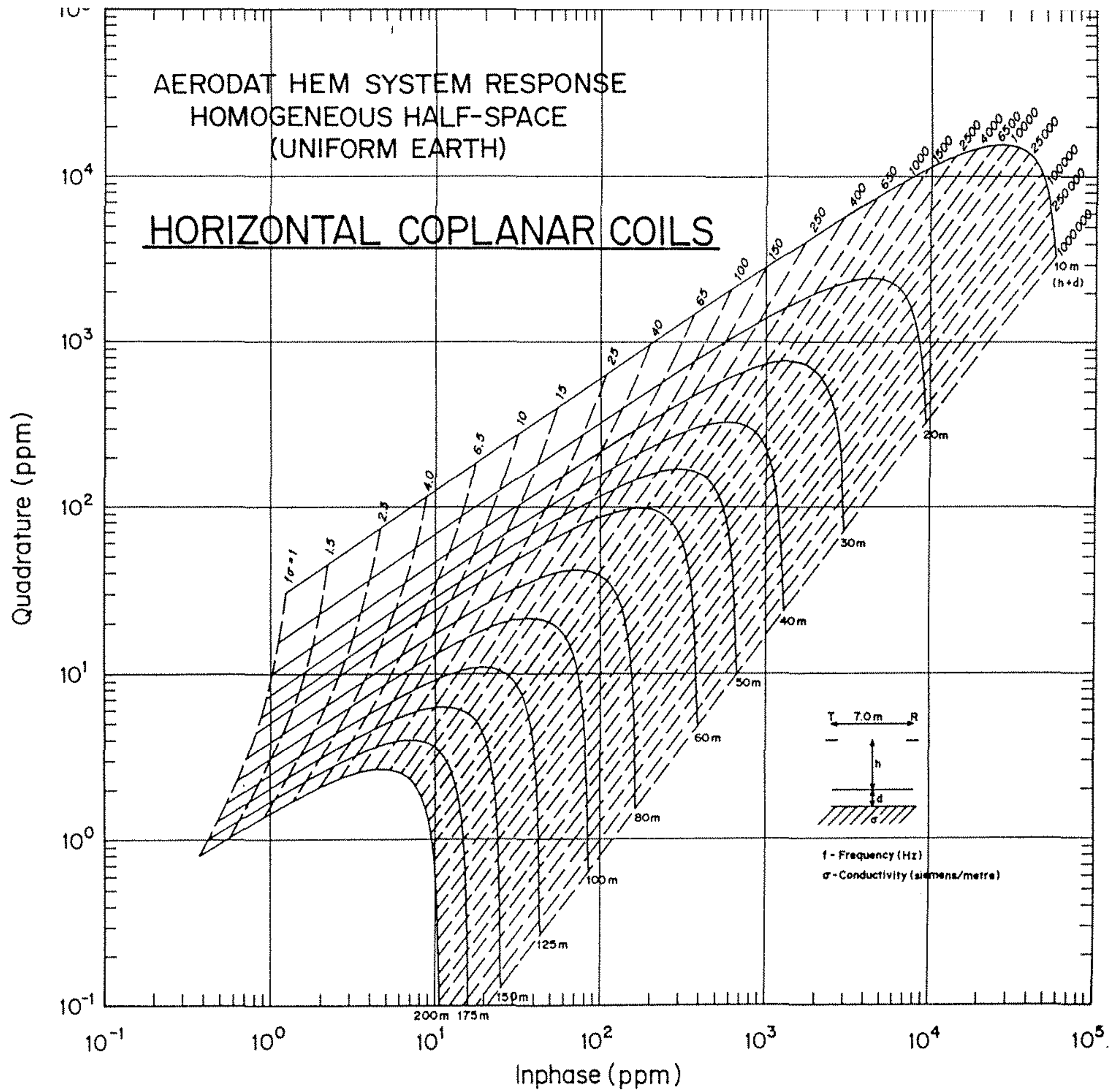
Approved for
Release by:

D.W. Moore
Manager Exploration,
Western Canada

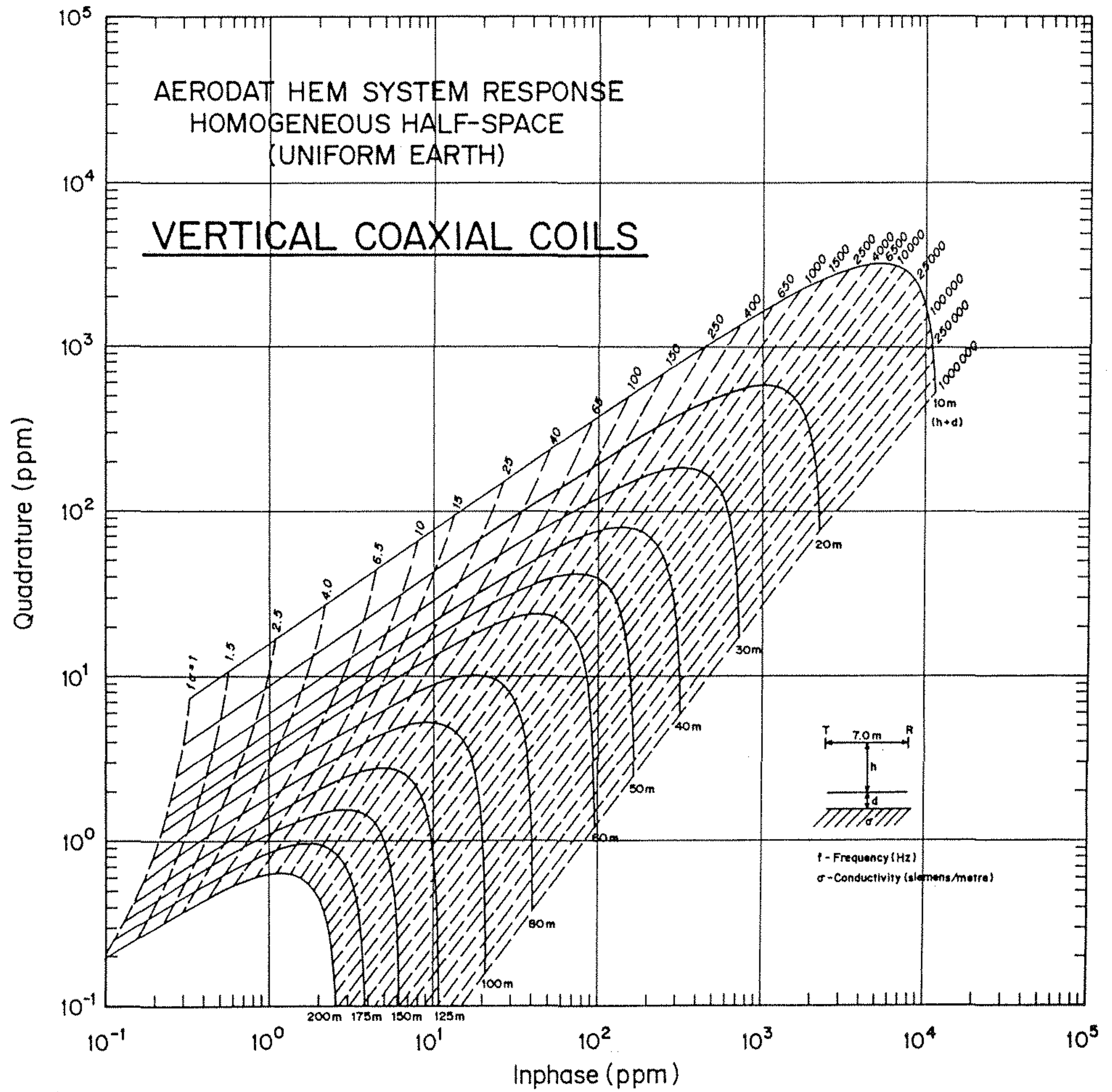
Distribution:
Mining Recorder (2)
Western Canada (1)

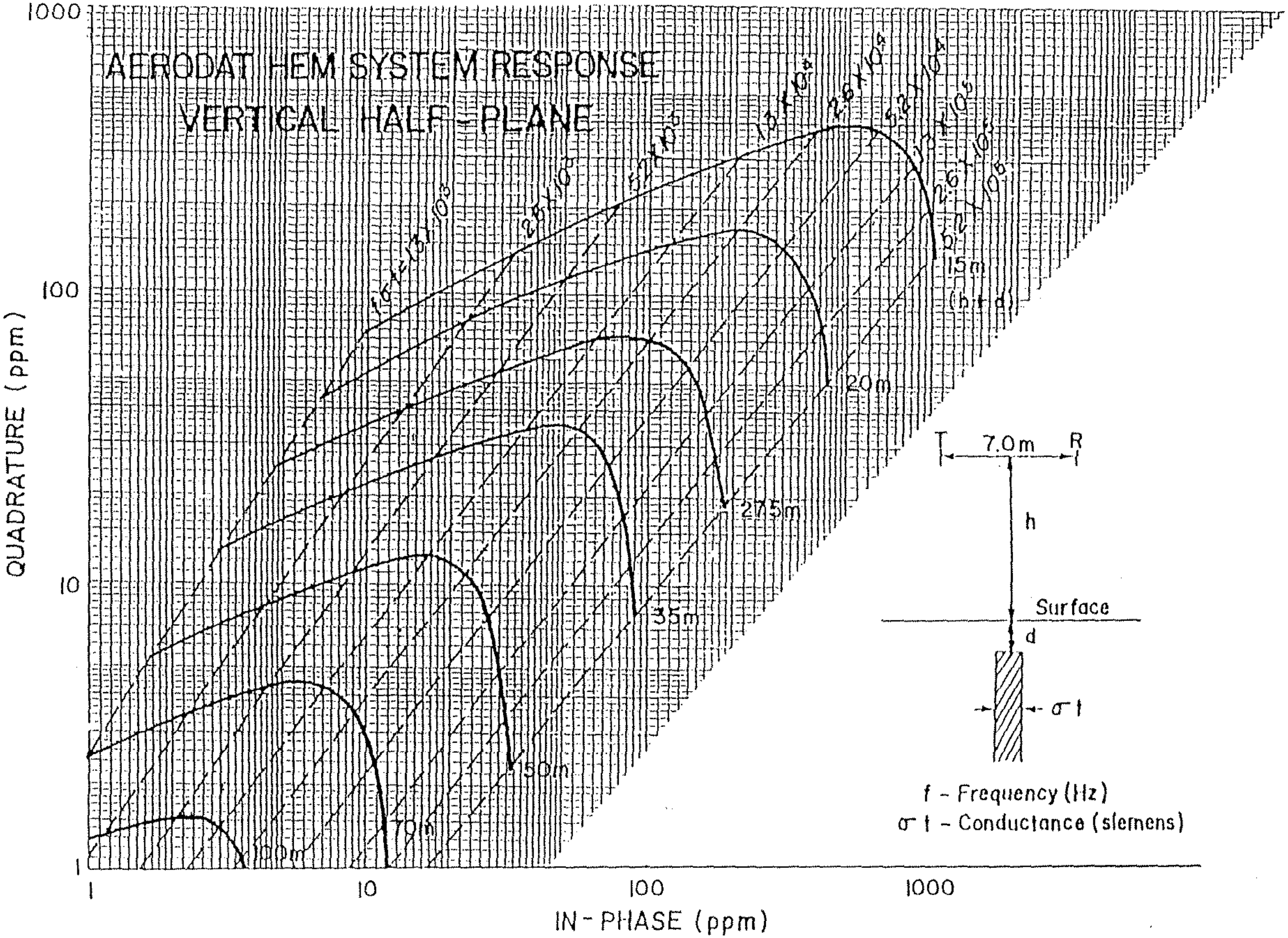
APPENDIX I

GENERAL INTERPRETIVE CONSIDERATIONS



AERODAT HEM SYSTEM RESPONSE
HOMOGENEOUS HALF-SPACE
(UNIFORM EARTH)
HORIZONTAL COPLANAR COILS
Quadrature (ppm)
Inphase (ppm)
10 m (h+d)
20m
30m
40m
50m
60m
80m
100m
125m
150m
200m 175m
T 7.0m R
h
d
σ
f - Frequency (Hz)
σ - Conductivity (siemens/metre)


AERODAT HEM SYSTEM RESPONSE
HOMOGENEOUS HALF-SPACE
(UNIFORM EARTH)
VERTICAL COAXIAL COILS
Quadrature (ppm)
Inphase (ppm)
10m (h+d)
20m
30m
40m
50m
60m
80m
100m
200m 175m 150m 125m
T 7.0m R
h
d
σ
f - Frequency (Hz)
σ - Conductivity (siemens/metre)



AERODAT HEM SYSTEM RESPONSE
VERTICAL HALF-PLANE
15m
(h+d)
20m
27.5m
35m
50m
70m
100m
1000
100
10
1
QUADRATURE (ppm)
1
10
100
1000
IN-PHASE (ppm)
T
7.0m
R
h
Surface
d
σ t
f - Frequency (Hz)
σ t - Conductance (siemens)

The conductance and depth vales as presented are correct only as far as the model approximates the real geological situation. The actual geological source may be of limited length, have significant dip, may be strongly magnetic. Its conductivity and thickness may vary with depth and/or strike and adjacent bodies and overburden may have modified the response. In general the conductance estimate is less affected by these limitations than is the depth estimate, but both should be considered as relative rather than absolute guides to the anomaly's properties.

Conductance in mhos is the reciprocal of resistance in ohms and in the case of narrow slab-like bodies is the product of electrical conductivity and thickness.

The higher ranges of conductance, greater than 2-4 mhos, indicate that a significant fraction of the electrical conduction is electronic rather than electrolytic in nature. Materials that conduct electronically are limited to certain metallic sulphides and to graphite. High conductance anomalies, roughly 10 mhos or greater, are generally limited to massive sulphides or graphites.

Sulphide minerals, with the exception of such ore minerals as sphalerite, cinnabar and stibnite, are good conductors. Sulphides may occur in a disseminated manner that inhibits electrical conduction through the rock mass. In this case the apparent conductance can seriously underrate the quality of the conductor in geological terms. In a similar sense the relatively non-conducting sulphide minerals noted above may be present in significant concentrations in association with minor conductive sulphides, and the electromagnetic response will only relate to the minor associated mineralization. Indicated conductance is also of little direct significance for the identification of gold mineralization. Although gold is highly conductive, it would not be expected to exist in sufficient quantity to create a recognizable anomaly. Minor accessory sulphide mineralization may however provide a useful indirect indication.

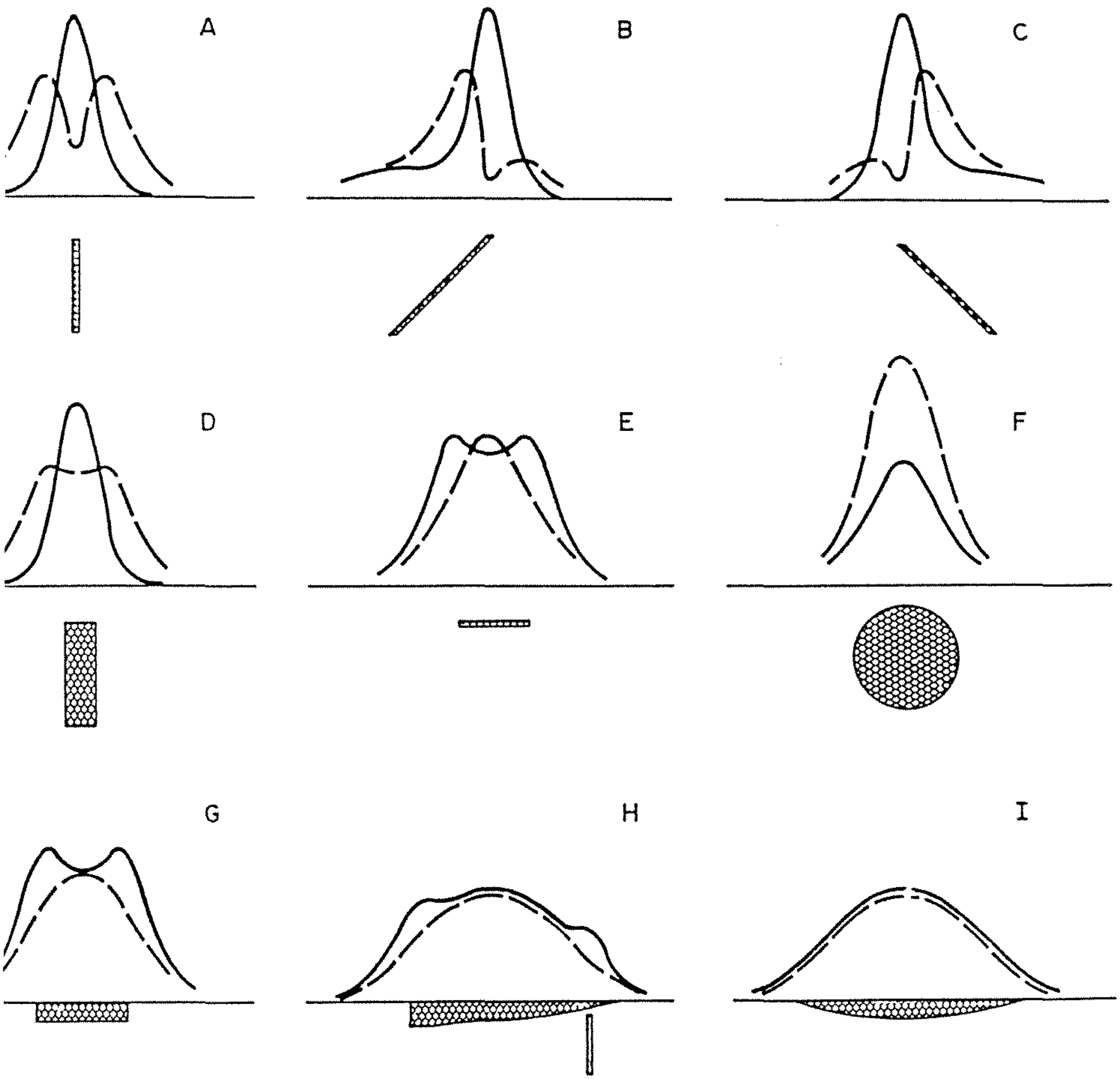
In summary, the estimated conductance of a conductor can provide a relatively positive identification of significant sulphide or graphite mineralization. A moderate to low conductance value does not rule out the possibility of significant economic mineralization.

Geometrical Considerations

Geometrical information about the geologic conductor can often be interpreted from the profile shape of the anomaly. The change in shape is primarily related to the change in inductive coupling among the transmitter, the target, and the receiver. The accompanying figure shows a selection of HEM response profile shapes from nine idealized targets. Response profiles are labelled A through I. These labels are used in the discussion which follows.

HEM RESPONSE PROFILE SHAPE AS AN INDICATOR OF CONDUCTOR GEOMETRY

——— COAXIAL vertical scale 1 ppm/unit
— — — COPLANAR vertical scale 4 ppm/unit



In the case of a thin, steeply dipping, sheet-like conductor, the coaxial coil pair will yield a near symmetric peak over the conductor. On the other hand, the coplanar coil pair will pass through a null couple relationship and yield a minimum over the conductor, flanked by positive side lobes (Profile A). As the dip of the conductor decrease from vertical, the coaxial anomaly shape changes only slightly, but in the case of the coplanar coil pair the side lobe on the down dip side strengthens relative to that on the up dip side (Profiles B and C).

As the thickness of the conductor increases, induced current flow across the thickness of the conductor becomes relatively significant and complete null coupling with the coplanar coils is no longer possible (Profile D). As a result, the apparent minimum of the coplanar response over the conductor diminishes with increasing thickness, and in the limiting case of a fully 3 dimensional body or a horizontal layer or half-space, the minimum disappears completely.

A horizontal conducting layer such as a horizontal thin sheet or overburden will produce a response in the coaxial and coplanar coils that is a function of altitude (and conductivity if not uniform). The profile shape will be similar in both coil configurations with an amplitude ratio (coplanar:coaxial) of about 4:1* (Profiles E and G).

In the case of a spherical conductor, the induced currents are confined to the volume of the sphere, but not relatively restricted to any arbitrary plane as in the case of a sheet-like form. The response of the coplanar coil pair directly over the sphere may be up to 8* times greater than that of the coaxial pair (Profile F).

In summary, a steeply dipping, sheet-like conductor will display a decrease in the coplanar response coincident with the peak of the coaxial response. The relative strength of this coplanar null is related inversely to the thickness of the conductor. A pronounced null indicates a relatively thin conductor. The dip of such a conductor can be inferred from the relative amplitudes of the side-lobes.

Massive conductors that could be approximated by a conducting sphere will display a simple single peak profile form on both coaxial and coplanar coils, with a ratio between the coplanar to coaxial response amplitudes as high as 8*.

Overburden anomalies often produce broad poorly defined anomaly profiles (Profile I). In most cases, the response of the coplanar coils closely follows that of the coaxial coils with a relative amplitude ration of 4*.

Occasionally, if the edge of an overburden zone is sharply defined with some significant depth extent, an edge effect will occur in the coaxial coils. In the case of a horizontal conductive ring or ribbon, the coaxial response will consist of two peaks, one over each edge; whereas the coplanar coil will yield a single peak (Profile H).

* It should be noted at this point that Aerodat's definition of the measured ppm unit is related to the primary field sensed in the receiving coil without normalization to the maximum coupled (coaxial configuration). If such normalization were applied to the Aerodat units, the amplitude of the coplanar coil pair would be halved.

Magnetics

The Total Field Magnetic Map shows contours of the total magnetic field, uncorrected for regional variation. Whether an EM anomaly with a magnetic correlation is more likely to be caused by a sulphide deposit than one without depends on the type of mineralization. An apparent coincidence between an EM and a magnetic anomaly may be caused by a conductor which is also magnetic, or by a conductor which lies in close proximity to a magnetic body. The majority of conductors which are also magnetic are sulphides containing pyrrhotite and/or magnetite. Conductive and magnetic bodies in close association can be, and often are, graphite and magnetite. It is often very difficult to distinguish between these cases. If the conductor is also magnetic, it will usually produce an EM anomaly whose general pattern resembles that of the magnetics. Depending on the magnetic permeability of the conducting body, the amplitude of the inphase EM anomaly will be weakened, and if the conductivity is also weak, the inphase EM anomaly may even be reversed in sign.

The interpretation of contoured aeromagnetic data is a subject on its own involving an array of methods and attitudes. The interpretation of source characteristics for example from total field results is often based on some numerical modelling scheme. The vertical gradient data is more legible in some aspects however and useful inferences about source characteristics can often be read off the contoured VG map.

The zero contour lines in contoured VG data are often sited as a good approximation to the outline of the top of the magnetic source. This only applies to wide (relative to depth of burial) near vertical sources at high magnetic latitudes. It will give an incorrect interpretation in most other cases.

Theoretical profiles of total field and vertical gradient anomalies from tabular sources at a variety of magnetic inclinations are shown in the attached figure. Sources are 10, 50 and 200 m wide. The source-sensor separation is 50 m. The thin line is the total field profile. The thick line is the vertical gradient profile.

The following comments about source geometry apply to contoured vertical gradient data for magnetic inclinations of 70 to 80°.

Outline

Where the VG anomaly has a single sharp peak, the source may be a thin near-vertical tabular source. It may be represented as a magnetic axis or as a tabular source of measurable width - the choice is one of geological preference.

Where the VG anomaly has a broad, flat or inclined top, the source may be a thick tabular source. It may be represented as a thick body where the width is taken from the zero contour lines if the body dips to magnetic north. If the source appears to be dipping to the south (i.e. the VG anomaly is asymmetric), the zero contours are less reliable indicators of outline. The southern most zero contour line should be ignored and the outline taken from the northern zero contour line and the extent of the anomaly peak width.

Dip

A symmetrical vertical gradient response is produced by a body dipping to magnetic north. An asymmetrical response is produced by a body which is vertical or dipping to the south. For southern dips, the southern most zero contour line may be several hundred meters south of the source.

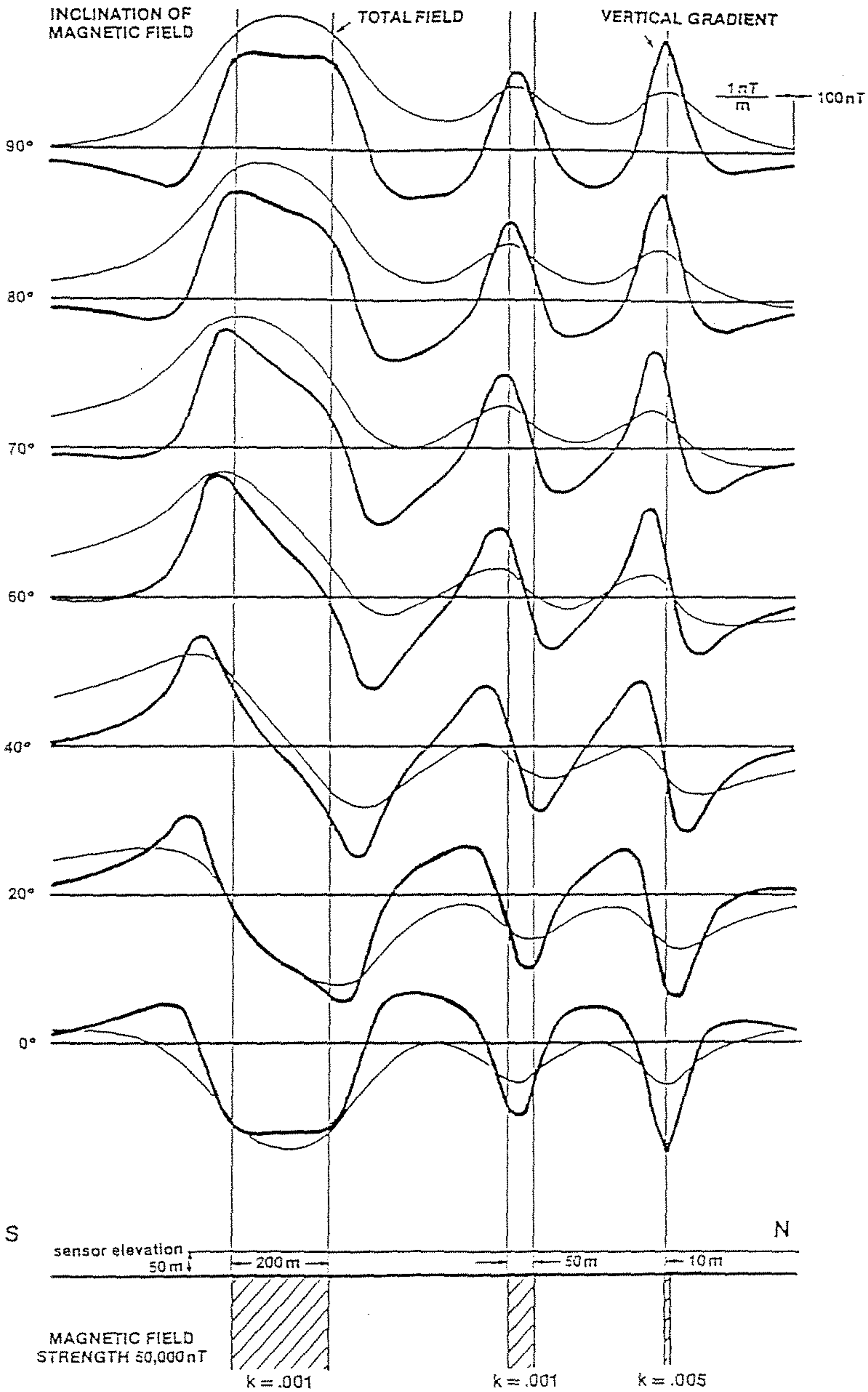
Depth of Burial

The source-sensor separation is about equal to half of the distance between the zero contour lines for thin near-vertical sources. The estimated depth of burial for such sources is this separation minus 50 m. If a variety of VG anomaly widths are seen in an area, use the narrowest width seen to estimate local depths.

VLF Electromagnetics

The VLF-EM method employs the radiation from powerful military radio transmitters as the primary signals. The magnetic field associated with the primary field is locally horizontal and normal to a line pointing at the transmitter.

The Herz Totem uses three coils in the X, Y, Z configuration to measure the total field and vertical quadrature component from two VLF stations. These stations are designated Line and Ortho. The line station is ideally in a direction from the survey area at right angles to the flight line direction. Conductors normal to the flight line direction point at the line station and are therefore optimally coupled to VLF magnetic fields and in the best situation to gather secondary VLF currents. The ortho station is ideally 90 degrees in azimuth from the line station.



INCLINATION OF MAGNETIC FIELD
TOTAL FIELD
VERTICAL GRADIENT
1 nT/m — 100 nT
90°
80°
70°
60°
40°
20°
0°
S
N
sensor elevation 50 m
200 m
50 m
10 m
MAGNETIC FIELD STRENGTH 50,000 nT
k = .001
k = .001
k = .005

The relatively high frequency of VLF (15-25) kHz provides high response factors for bodies of low conductance. Relatively "disconnected" sulphide ores have been found to produce measurable VLF signals. For the same reason, poor conductors such as sheared contacts, breccia zones, narrow faults, alteration zones and porous flow tops normally produce VLF anomalies. The method can therefore be used effectively for geological mapping. The only relative disadvantage of the method lies in its sensitivity to conductive overburden. In conductive ground to depth of exploration is severely limited.

The effect of strike direction is important in the sense of the relation of the conductor axis relative to the energizing electromagnetic field. A conductor aligned along a radius drawn from a transmitting station will be in a maximum coupled orientation and thereby produce a stronger response than a similar conductor at a different strike angle. Theoretically, it would be possible for a conductor, oriented tangentially to the transmitter to produce no signal. The most obvious effect of the strike angle consideration is that conductors favourably oriented with respect to the transmitter location and also near perpendicular to the flight direction are most clearly rendered and usually dominate the map presentation.

The total field anomaly is an indicator of the existence and position of a conductor. The response will be a maximum over the conductor, without any special filtering, and strongly favour the upper edge of the conductor even in the case of a relatively shallow dip.

Conversely a negative total field anomaly is often seen over local resistivity highs. This is because the VLF field produces electrical currents which flow towards (or away from) the transmitter. These currents are gathered into a conductor and are taken from resistive bodies. The VLF system sees the currents gathered into the conductor as a total field high. It sees the relative absence of secondary currents in the resistor as a total field low.

As noted, VLF anomaly trends show a strong bias towards the VLF transmitter. Structure which is normal to this direction may have no associated VLF anomaly but may be seen as a break or interruption in VLF anomalies. If these structures are of particular interest, maps of the ortho station data may be worthwhile.

Conductive overburden will obscure VLF responses from bedrock sources and may produce low amplitude, broad anomalies which reflect variations in the resistivity of thickness of the overburden.

Extreme topographic relief will produce VLF anomalies which may bear no relationship to variations in electrical conductivity. Deep gullies which are too narrow to have been surveyed at a uniform sensor height often show up as VLF total field lows. Sharp ridges show up as total field highs.

The vertical quadrature component over steeply dipping sheet-like conductor will be a cross-over type response with the cross-over closely associated with the upper edge of the conductor.

The response is a cross-over type due to the fact that it is the vertical rather than total field quadrature component that is measured. The response shape is due largely to geometrical rather than conductivity considerations and the distance between the maximum and minimum on either side of the cross-over is related to target depth. For a given target geometry, the larger this distance the greater the depth.

The vertical quadrature component is rarely presented. Experience has shown the total field to be more sensitive to bedrock conductors and less affected by variations in conductive overburden.

Apparent Resistivity/Conductivity Maps

Overburden and different types of bedrock may be modelled as a large area horizontal conductor of fixed thickness. A phasor diagram may be constructed, in the same fashion as for the vertical sheet, to convert the measured HEM in-phase and quadrature response to a depth and conductivity value for a horizontal layer. Traditionally if the thickness is large, an infinite half-space, the associated conductivity value is referred to as "apparent conductivity". We have generalized the use of the word "apparent" to include any model where the thickness of the layer is a fixed as opposed to a variable parameter. The units of apparent resisitivity are ohm-m and those of apparent conductivity are the inverse mhos/m or siemen/m. If the chosen model layer thickness is close to the true thickness of the conductor then the apparent conductivity will closely conform to the true value; however, if the thickness is inappropriate the apparent value may be considerably different from the true value.

The benefit of the apparent conductivity mapping is that it provides a simple robust method of converting the HEM in-phase and quadrature response to apparent change in ground conductivity.

A phasor diagram for several apparent resistivity models is presented. The general forms for the various thicknesses is very similar and also closely resembles the diagram for the vertical sheet. The diagrams also show the curves for apparent depth. As with the conductivity value the depth value is meaningful if the model thickness closely resembles the true conductive layer thickness. If the HEM response from a thin conducting layer is applied to a thick layer model the apparent conductivity and depth will be less than the true conductivity and depth.

APPENDIX II

ANOMALY LISTINGS AND INTERPRETATION

BRUIN PROPERTY

APPENDIX II

ANOMALY LISTINGS AND INTERPRETATION

BRUIN PROPERTY

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CTP MHOS	CONDUCTOR DEPTH MTRS	BIRD HEIGHT MTRS		
27	10110	A/	0	4.4	10.8	0.1	0	52	512755.8	7134099.0
27	10110	B/	0	5.6	10.0	0.3	0	48	512875.0	7133946.5
27	10110	C/	0	4.8	23.5	0.0	0	35	514039.7	7132595.5
27	10110	D/	0	3.2	9.2	0.1	3	39	515460.9	7131115.5
27	10110	E/	0	12.9	19.1	0.6	0	43	516575.0	7129731.5
27	10110	F/	0	10.3	19.4	0.4	0	40	516678.3	7129643.0
27	10100	A/	0	0.0	10.4	0.0	0	36	516148.8	7130697.5
27	10100	B/	0	4.4	23.8	0.0	0	41	515938.9	7130942.0
27	10100	C/	0	4.7	19.6	0.0	0	50	515881.3	7130999.0
27	10100	D/	0	6.2	14.2	0.2	0	65	515821.1	7131053.5
27	10100	E/	0	6.1	9.1	0.4	0	56	514092.9	7132973.5
27	10100	F/	0	14.5	43.5	0.2	0	35	513123.7	7134069.5
27	10100	G/	0	13.8	36.6	0.3	0	46	513067.2	7134133.0
27	10090	A/	0	3.7	14.7	0.0	8	25	513356.4	7134356.0
27	10090	B/	0	0.3	11.5	0.0	0	42	514032.2	7133579.0
27	10090	C/	1	14.3	15.7	1.0	0	53	514293.3	7133197.0
27	10090	D/	0	2.5	10.1	0.0	0	44	514447.9	7133067.5
27	10090	E/	0	3.9	17.3	0.0	0	38	515855.2	7131480.0
27	10090	F/	0	5.0	13.2	0.1	0	45	516198.0	7131148.0
27	10080	A/	1	36.6	46.8	1.1	0	36	517249.4	7130358.5
27	10080	B/	2	44.9	30.8	2.8	0	42	517180.3	7130439.0
27	10080	C/	2	42.8	31.0	2.6	0	39	517084.7	7130558.5
27	10080	D/	3	68.2	25.4	7.1	0	46	516960.3	7130719.5
27	10080	E/	0	9.8	19.4	0.3	6	30	516369.0	7131332.5
27	10080	F/	0	2.6	11.7	0.0	0	37	516105.3	7131662.5
27	10080	G/	0	6.1	12.6	0.2	0	43	515894.5	7131917.0
27	10080	H/	0	8.0	11.5	0.5	6	41	515733.2	7132092.0
27	10080	J/	0	4.3	17.6	0.0	0	33	514682.6	7133270.0
27	10080	K/	0	3.1	11.1	0.0	0	38	514618.0	7133393.0
27	10080	M/	0	10.2	16.1	0.5	0	41	513641.2	7134411.5
27	10070	A/	0	0.6	9.1	0.0	0	38	514775.2	7133671.0
27	10070	B/	0	7.7	10.4	0.6	0	50	516041.8	7132200.0
27	10070	C/	3	19.8	7.3	4.9	0	68	516982.0	7131089.0
27	10070	D/	2	18.8	9.9	3.0	4	47	517063.5	7131003.0
27	10070	E/	1	18.8	14.7	1.7	2	44	517481.4	7130506.0
27	10060	A/	2	16.6	7.1	3.8	0	57	517257.6	7131339.5
27	10060	B/	0	2.5	17.3	0.0	0	32	516540.8	7132157.5
27	10050	A/	0	-0.5	6.1	0.0	0	31	515247.2	7134067.0

Estimated 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 overburden effects.

BRUIN PROPERTY

						CONDUCTOR		BIRD		
				AMPLITUDE (PPM)		CTP	DEPTH	HEIGHT		
FLIGHT	LINE	ANOMALY	CATEGORY	INPHASE	QUAD.	MHOS	MTRS	MTRS		
------	----	-------	--------	-------	-----	----	----	----		
27	10050	B/	2	9.8	4.6	2.8	7	59	517919.2	7131020.0
27	10040	A/	0	1.3	7.1	0.0	9	29	518259.4	7130927.5
27	10040	B/	2	12.1	7.0	2.2	3	56	518087.5	7131138.5
27	10040	C/	0	-0.1	9.7	0.0	0	35	515447.8	7134178.5
27	10040	D/	0	0.5	10.8	0.0	0	47	514894.2	7134847.5
27	10040	E/	0	1.4	23.6	0.0	0	29	514739.4	7134991.0
27	10040	F/	0	3.5	16.0	0.0	0	38	514558.2	7135165.5
27	10040	G/	0	2.2	9.4	0.0	0	43	514471.4	7135256.0
27	10030	A/	0	7.9	17.4	0.3	5	31	514911.0	7135249.0
27	10030	B/	0	5.4	12.7	0.2	9	32	515302.2	7134820.0
27	10030	C/	0	4.4	14.5	0.1	0	35	515357.0	7134747.5
27	10030	D/	0	2.2	10.9	0.0	0	36	517206.6	7132640.5
27	10020	A/	0	2.3	12.8	0.0	0	34	517495.1	7132768.5
27	10020	B/	0	7.2	18.6	0.2	0	38	517332.2	7132955.5
27	10020	C/	0	-1.1	9.0	0.0	0	30	516330.7	7134104.5
27	10020	D/	0	5.9	16.8	0.1	2	33	515584.4	7134923.0
27	10020	E/	0	6.7	23.4	0.1	0	32	515474.9	7135047.0
27	10020	F/	0	10.2	20.2	0.4	0	43	515184.6	7135420.0
27	10010	A/	0	8.8	12.1	0.6	0	47	515424.6	7135472.5
27	10010	B/	1	9.8	7.2	1.5	7	52	515773.8	7135153.0
27	10010	C/	0	4.3	11.3	0.1	3	38	517469.7	7133386.5
27	10010	D/	0	3.1	12.6	0.0	0	38	517613.5	7133222.0

INTERPRETATION: Bruin Property

One conductive zone was detected on this small grid, marked as feature "A". It is open to the SE and is located on a portion of the lower south slopes of Bruin Ck. The strongest responses encircle the strongest lobe of a broad magnetic high but there appears no direct magnetic associations with the strongest EM peaks.

Single, possibly two-line EM peak feature B (Line 10090, time fid. 89 and possibly Line 10100) is mainly seen in the higher frequencies. It has a magnetic correlation and is situated near a break in slope along Bruin Ck. This break may reflect a fault (NE-SW). These features warrant follow-up

MAP NO: 116C/7	**ASSESSMENT REPORT:** X	**DOCUMENT NO:** 093481
	PROSPECTUS:	**MINING DISTRICT:** Dawson
	CONFIDENTIAL: X	**TYPE OF WORK:** GP
	OPEN FILE:	

REPORT FILED UNDER: Cominco Ltd.

DATE PERFORMED: June 11, 1995	**DATE FILED:** June 17, 1996
LATITUDE: 64 19	**AREA:** Bruin Creek
LONGITUDE: 140 41	**VALUE:** $4800

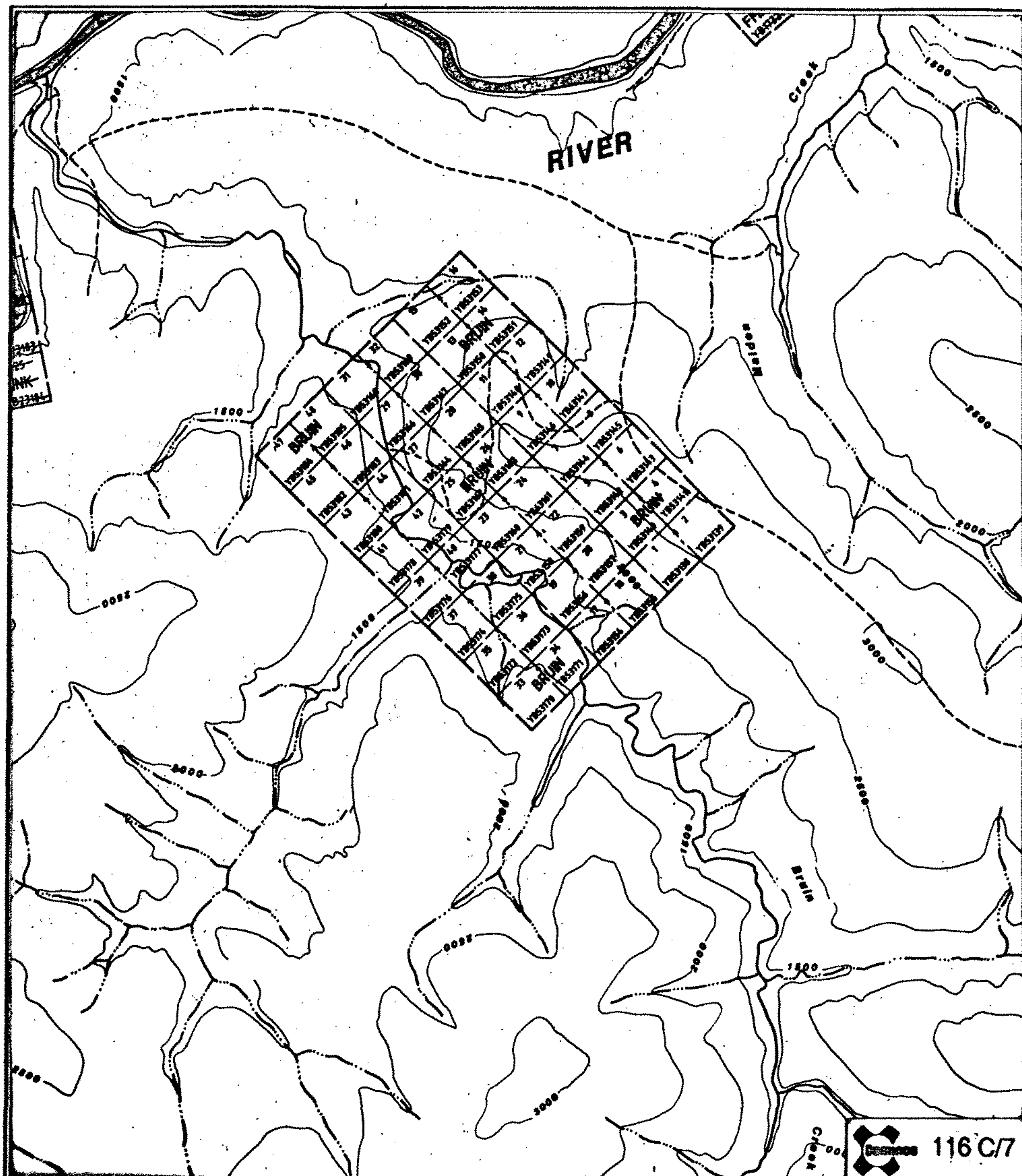
CLAIM NAME AND #: Bruin 1-48

WORK DONE BY: R.W. Woolham

WORK DONE FOR: Cominco Ltd.

Remarks: Helicopter magnetic and electromagnetic survey and soil geochemistry.

Claims in Good Standing	



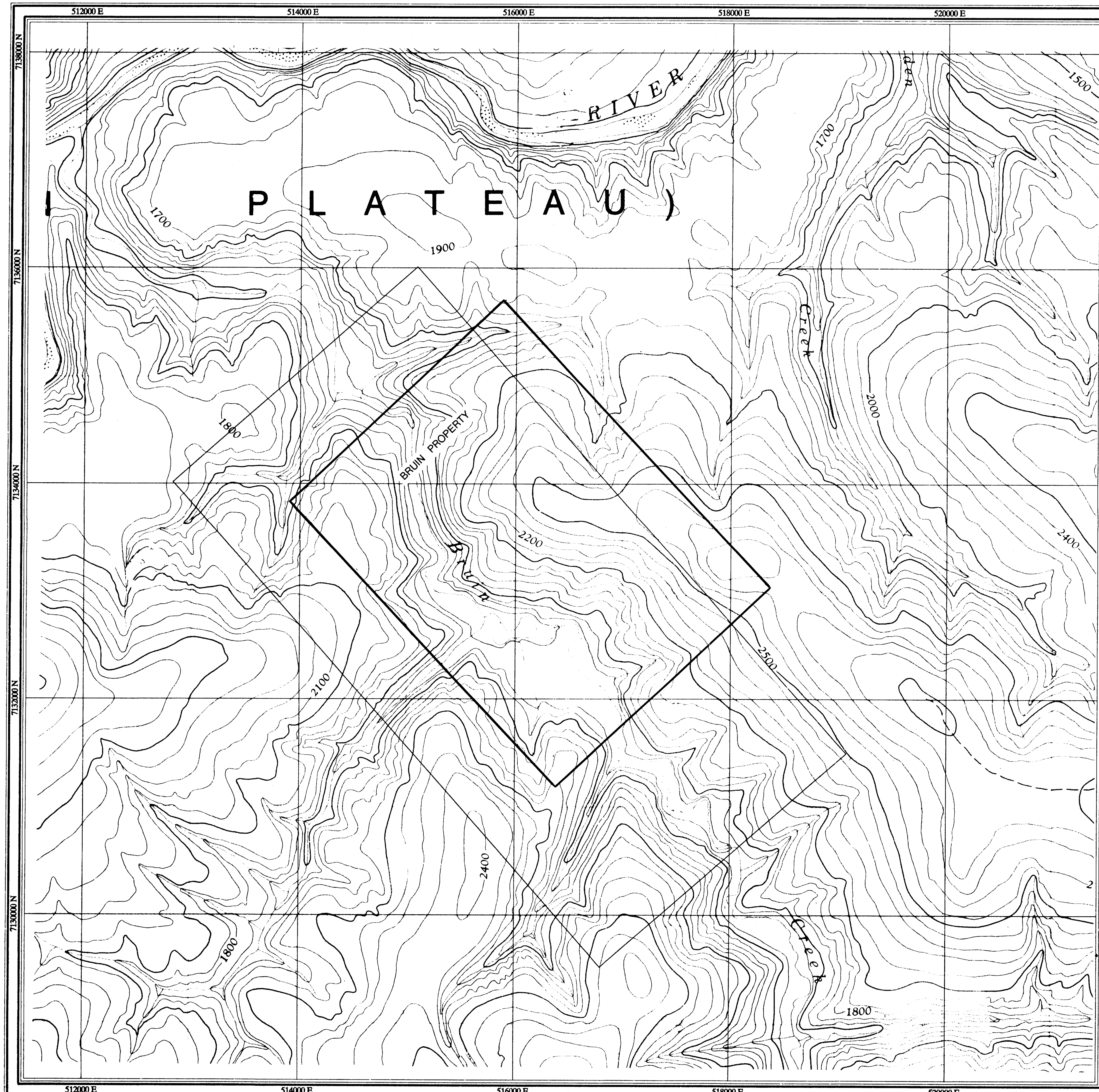
Drawn by:		Traced by:	
Revised by	Date	Revised by	Date

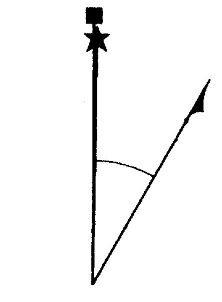
BRUIN PROPERTY
CLAIM MAP

093481

Scale: 1:50,000	Date: DEC. 13, 1995	Plate: 1–5

NCI 112A CL

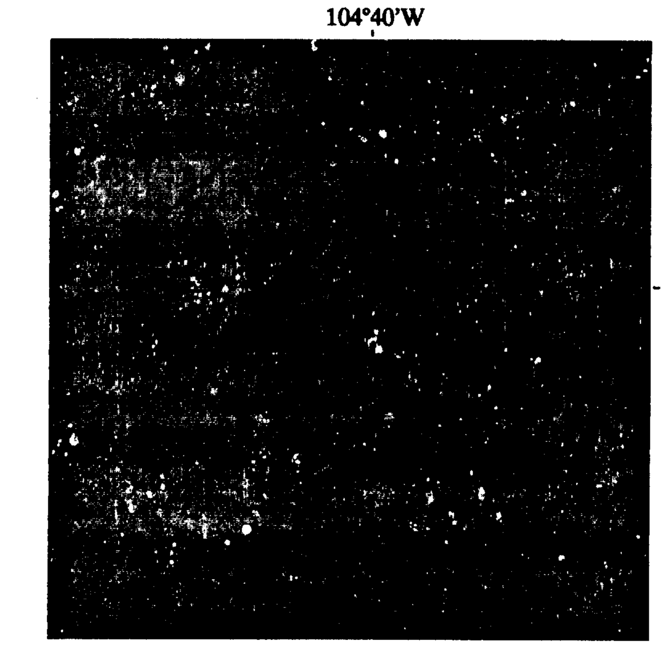




Square: Grid North
Star: True North
Arrow: Magnetic North

Angles presented are approximate mean deviations for centre of NTS sheet. Use diagram for reference only.

Grid North - True North : 0.7°
Grid North - Magnetic North : 29.4°
Annual change : 0.17°



COMINCO EXPLORATION

BASE MAP

BRUIN PROPERTY

YUKON

093481 #1

SCALE 1:20 000

500 0 200 400 1000 2000 metres

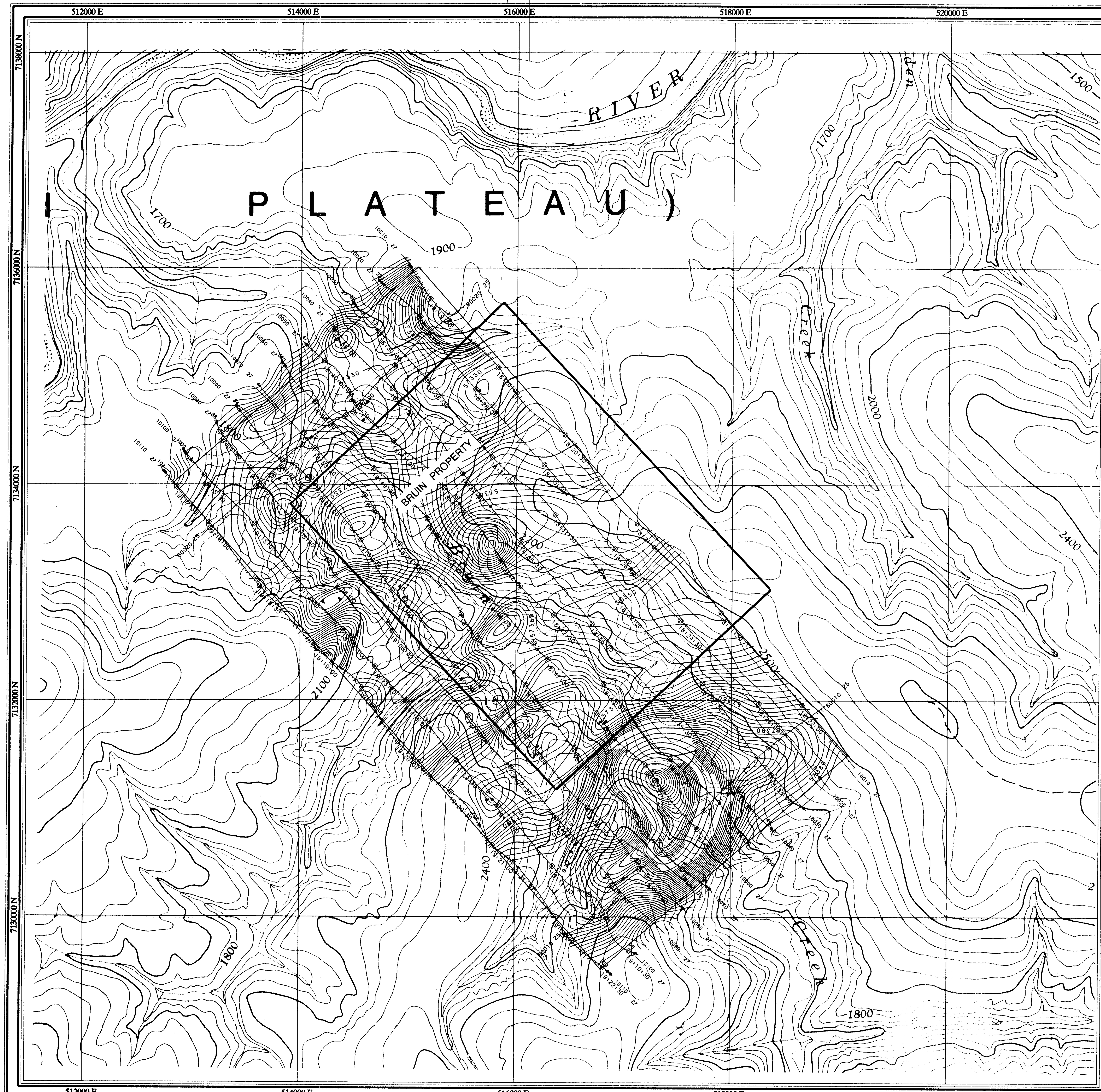
aerodat

AERODAT INC.

Date Flown : JUNE 1995

NTS : 116 C/7

Project : J9518 Map Ref : 1 - 1

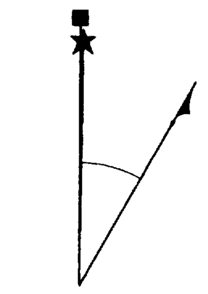


TOTAL FIELD MAGNETICS

Total field magnetic intensity contour data, measured by a cesium high sensitivity magnetometer at an average sensor elevation of 45m, and corrected for diurnal variation.

Map contours are in nanoTeslas, and are multiples of those listed below:

2 nT
10 nT
50 nT
250 nT
1000 nT



Angles presented are approximate mean deviations for centre of NTS sheet. Use diagram for reference only.

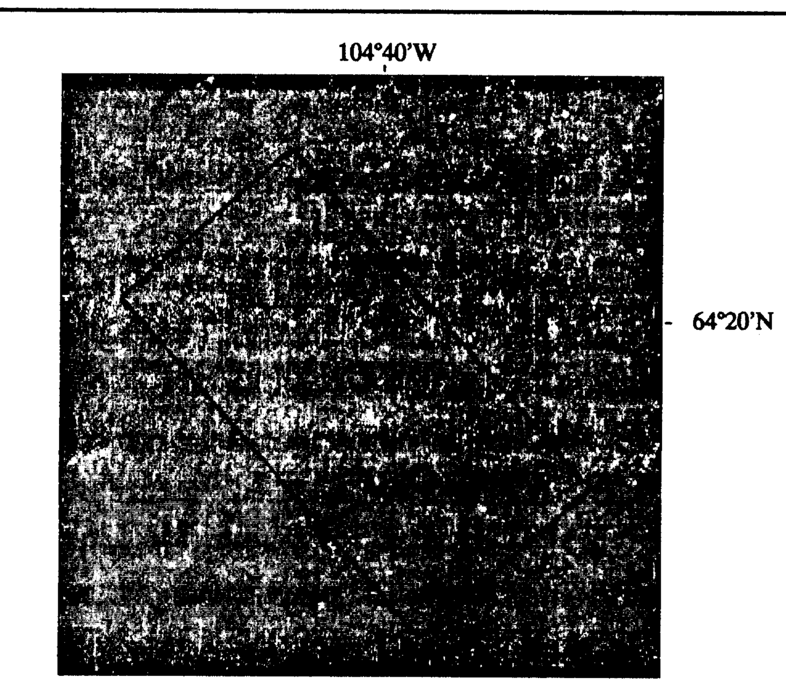
Grid North - True North : 0.7°
Grid North - Magnetic North : 29.4°
Annual change : 0.17°

FLIGHT PATH

Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 135 - 315°, with an average line spacing of 300m.

Average helicopter-terrain clearance of 60m was monitored by radar and barometric altimeters.



COMINCO EXPLORATION

TOTAL FIELD MAGNETICS

BRUIN PROPERTY 093481 #2

YUKON

SCALE 1:20 000

500 0 200 400 1000 2000 metres

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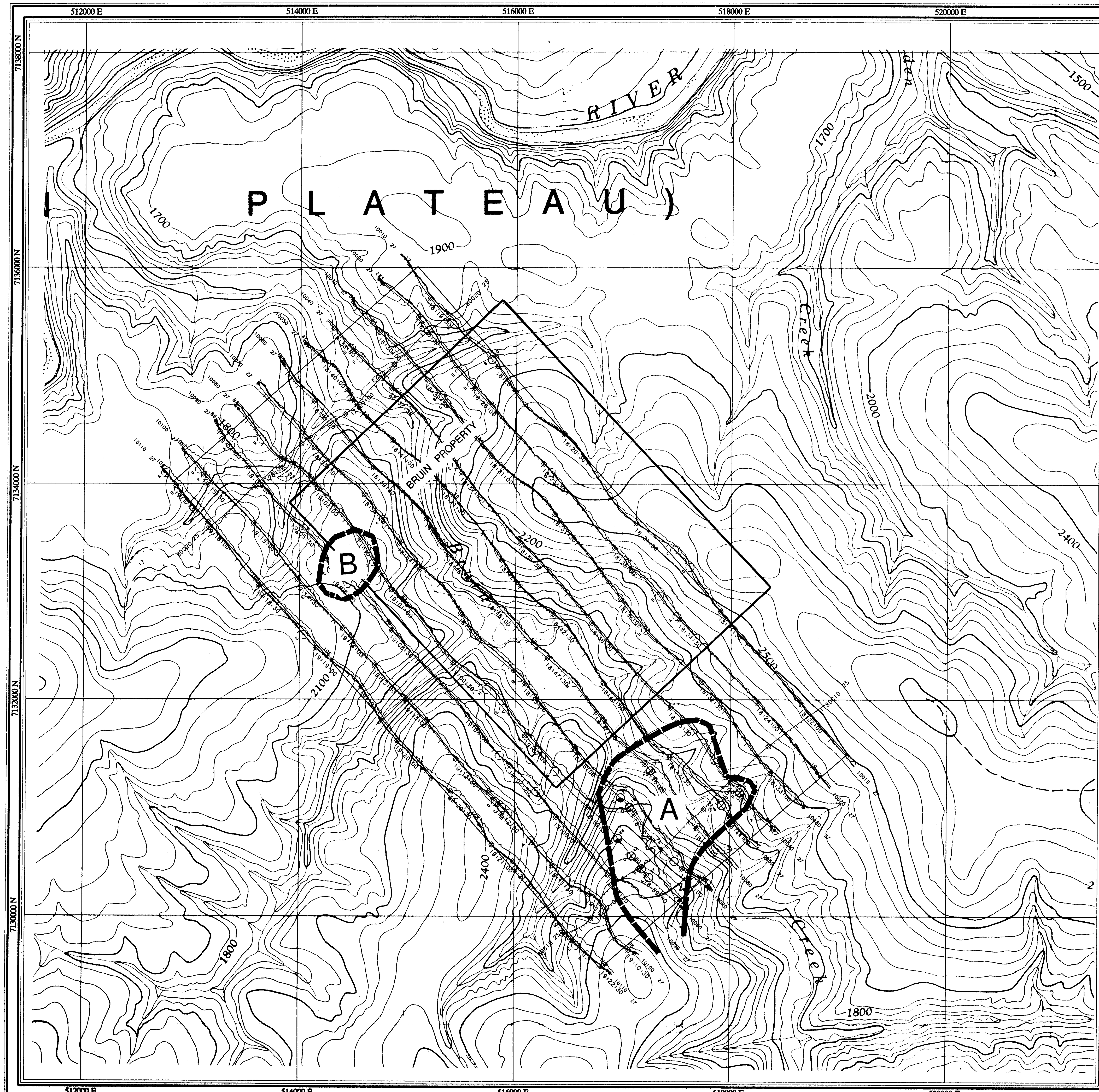
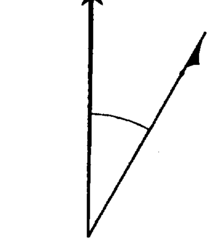
Date Flown : JUNE 1995

NTS : 116 C/7

Project : J9518 Map Ref : 1 - 2





EM PROFILES

Inphase and quadrature components (thick/thin) of measured EM responses. Coaxial and coplanar coil pairs operating at fixed frequencies are mounted in a towed bird, with an average coil separation of 6.5m, and an average sensor elevation of 30m.

Profiles are presented as offsets from flight lines, using the vertical scales listed below:

COAXIAL
935 Hz - 2 ppm/mm

Square: Grid North
Star: True North
Arrow: Magnetic North

Angles presented are approximate mean deviations for centre of NTS sheet. Use diagram for reference only.

Grid North - True North : 0.7°
Grid North - Magnetic North : 29.4°
Annual change : 0.17°

FLIGHT PATH

Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 135 - 315°, with an average line spacing of 300m.

Average helicopter-terrain clearance of 60m was monitored by radar and barometric altimeters.

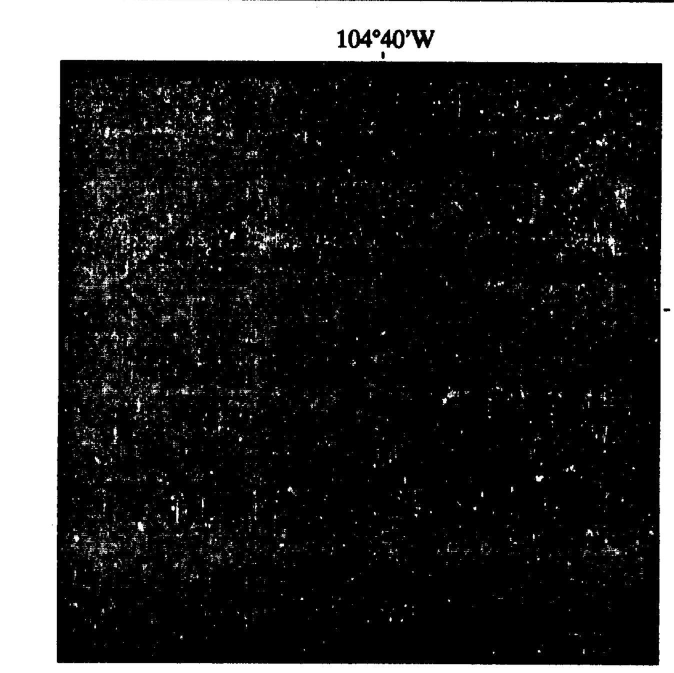
EM ANOMALIES

EM anomalies selected by computer algorithm and manually confirmed. Selection is based on the response correlation to theoretical sources such as a steeply dipping conductor.

Calculation of conductance is based on the response of the 4600 Hz coaxial data, and forms the basis for anomaly classification.

Letter codes are used to identify individual anomalies on a line, and the inphase amplitude of the 4600 Hz response is annotated opposite.

0 - 1 mhos
1 - 2 mhos
2 - 4 mhos
4 - 8 mhos
8 - 16 mhos
16 - 32 mhos
> 32 mhos



COMINCO EXPLORATION

EM PROFILES

935 Hz COAXIAL

BRUIN PROPERTY 093481 #3

YUKON

SCALE 1:20 000

500 0 200 400 1000 2000 metres

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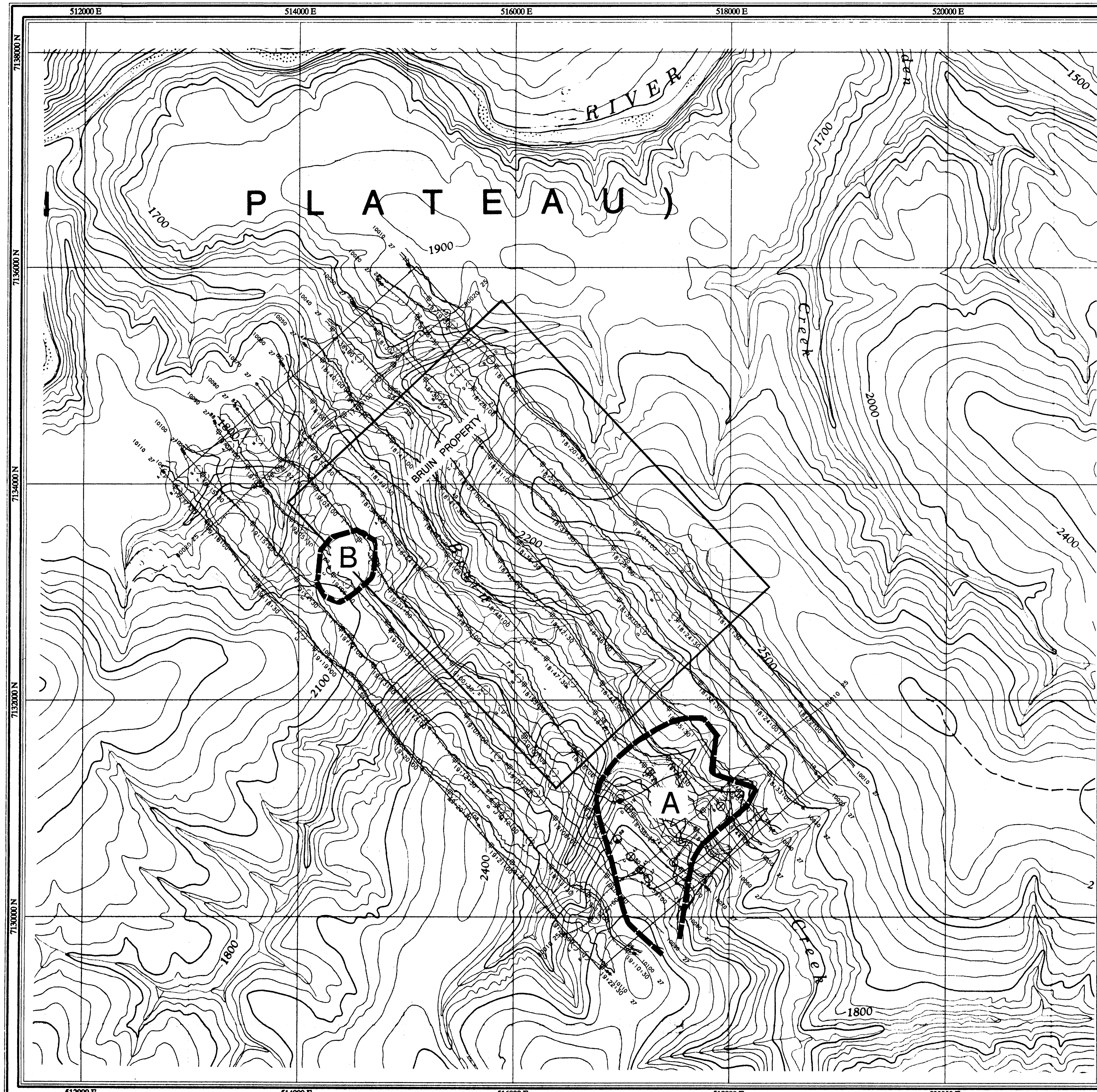
AERODAT INC.

Date Flown : JUNE 1995

NTS : 116 C/7

Project : J9518 Map Ref : 1 - 3

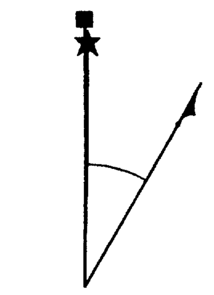


EM PROFILES

Inphase and quadrature components (thick/thin) of measured EM responses. Coaxial and coplanar coil pairs operating at fixed frequencies are mounted in a towed bird, with an average coil separation of 6.5m, and an average sensor elevation of 30m.

Profiles are presented as offsets from flight lines, using the vertical scales listed below:

COAXIAL
4600 Hz - 2 ppm/mm



Square: Grid North
Star: True North
Arrow: Magnetic North

Angles presented are approximate mean deviations for centre of NTS sheet. Use diagram for reference only.

Grid North - True North : 0.7°
Grid North - Magnetic North : 29.4°
Annual change : 0.17°

FLIGHT PATH

Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 135 - 315°, with an average line spacing of 300m.

Average helicopter-terrain clearance of 60m was monitored by radar and barometric altimeters.

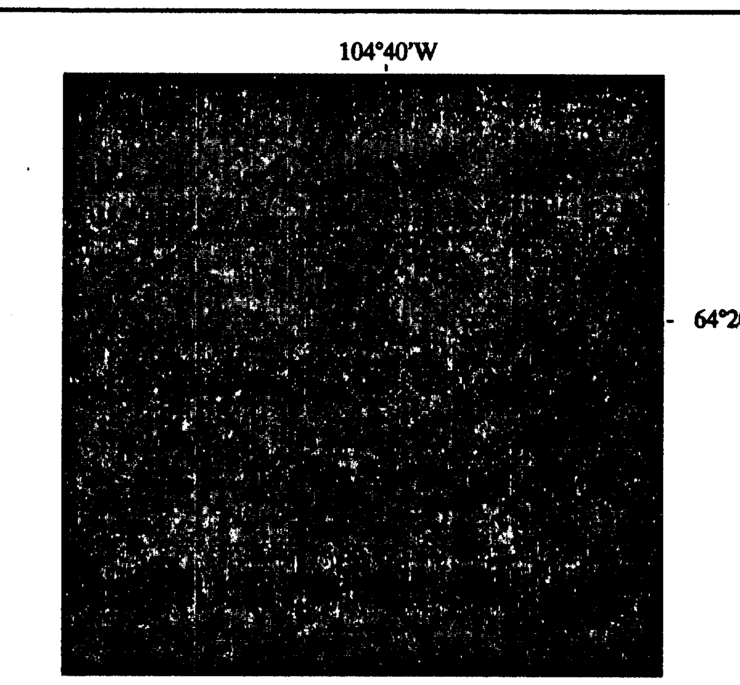
EM ANOMALIES

EM anomalies selected by computer algorithm and manually confirmed. Selection is based on the response correlation to theoretical sources such as a steeply dipping conductor.

Calculation of conductance is based on the response of the 4600 Hz coaxial data, and forms the basis for anomaly classification.

Letter codes are used to identify individual anomalies on a line, and the inphase amplitude of the 4600 Hz response is annotated opposite.

A○2	0 - 1 mhos
○	1 - 2 mhos
⊖	2 - 4 mhos
⊙	4 - 8 mhos
◒	8 - 16 mhos
●	16 - 32 mhos
●	> 32 mhos



COMINCO EXPLORATION

EM PROFILES

4600 Hz COAXIAL

BRUIN PROPERTY

YUKON

093481
#4

SCALE 1:20 000

500 0 200 400 1000 2000 metres

aerodat
AERODAT INC.

Date Flown : JUNE 1995

NTS : 116 C/7

Project : J9518 Map Ref : 1 - 4