ASSESSMENT REPORT

ON A COMBINED HELICOPTER-BORNE ELECTROMEGNETIC, MAGNETIC,
RADIAMETRIC AND VLF-EM SURVEY
OVER A PORTION OF THE EXPO PROPERTY,
PORT HARDY AREA, NANAIMO MINING DISTRICT
IN THE
PROVINCE OF BRITISH COLUMBIA

BY

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1. INTRODUCTION

During the period July 10 to 16, 1997, Aerodat Inc. completed a helicopter-borne combined magnetic, electromagnetic and radiometric airborne survey over 94 claims (101 units) that form a part of the larger, 545 claim Expo Property, located in the Port Hardy region of northern Vancouver Island. This report summarizes the results of that survey. Attached in appendix form is the Aerodat report, which provides all technical details as to flight specifications, equipment, data gathering, data plotting and manipulation, and results. This report summarizes the setting of the property, both geographically and in terms of the regional geology.

2. LOCATION, AREA, AND ACCESS

_The Expo Property is located on northern Vancouver Island, approximately 360 kilometres northwest of Vancouver. The claim group, currently comprising 545 claims, covers a 20 kilometre long area immediately north of and parallel to Holberg Inlet. Most portions of the property can be accessed by a well maintained series of logging roads, including the extreme western portion of the claim block, covered by this airborne survey.

Generally, the property is characterized by a series of northwest to westerly trending ridges, bounded by deeply incised valleys. Elevations on the property range from sea level to 600 metres ASL, and typically the ridge tops lie 200 tom 300 metres above valley floors.

Outcrop is generally restricted to ridge tops and faces, while scree, soil, and residual glacial gravels cover lower slope faces and valley floors.

Table 1 is a list of claims covered by the survey, and Figure 1 illustrates the location of the area flown in relation to the remainder of the Expo Property.

Map 1-1, in Appendix 1, illustrates actual claim boundaries in relation to flight lines, at a scale of 1:10,000.

3. EXPLORATION HISTORY

In 1962, the first claims, HEP 1 and 2, were staked b Gordon Milbourne, a prospector for Utah Construction and Mining (now BHP Minerals Canada). In 1963, a regional airborne aeromagnetic survey published by the British Columbia Department of Mines (BCDM) identified a northwesterly trend of magnetic highs immediately north of Holberg Inlet. Extensive staking along the trend by Utah initially totalled 661 units, and came to be known as the EXPO property on completion of staking in Canada's centennial year..

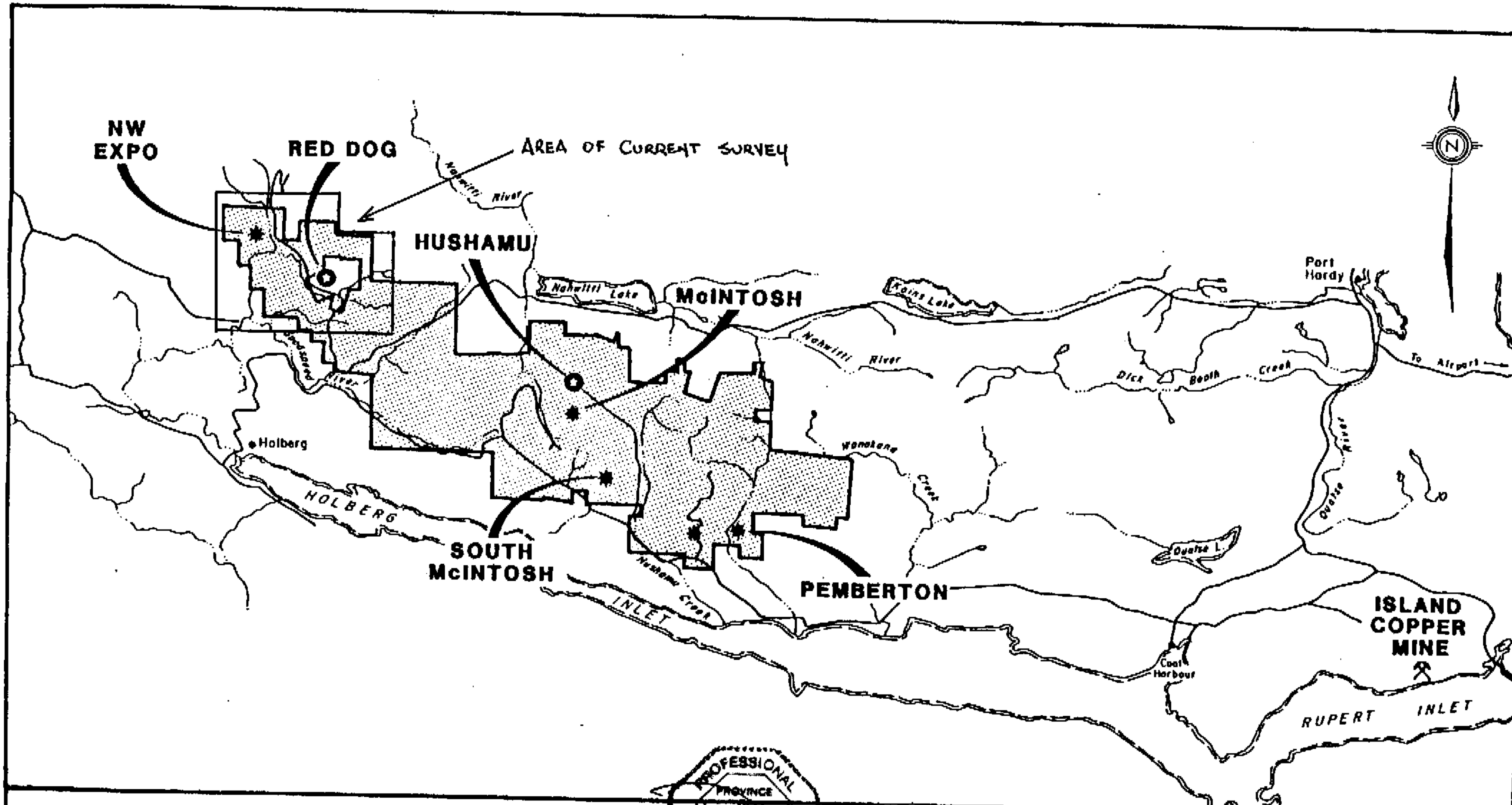
From 1967 to 1977, the area was investigated by silt and soil geochemical surveys, geologic mapping, ground magnetics, and limited IP surveys. Subsequent drill testing of soil and geophysical anomalies resulted in the discovery and delineation of the Hushamu Zone, which in 1977 stood at 52,900,000 tons grading 0.32% Cu, 0.008% Mo, and 413 ppb Au, with a stripping ratio of 2.21:1.

From 1980 to 1985, exploration work on the Expo property switched emphasis, from porphyry copper-gold targets to epithermal gold targets, after recognition of higher level silicified and argillically altered zones on the property. Additional work consisted of extensive soil sampling, rock sampling, and VLF-EM and seismic surveying over selected portions of the property, followed by drilling of 12 diamond drill holes.

TABLE 1

LIST OF CLAIMS COVERED BY AIRBORNE GEOPHYSICAL SURVEY
EXPO PROPERTY, NORTHWEST PORTION

CLAIM NUMBER	TENURE NO.	CLAIM NUMBER	TENURE NO.
EXPO 1	231711	EXPO 60	231759
EXPO 2	231712	EXPO 61	231760
EXPO 3	231713	EXPO 63	231762
EXPO 4	231714	EXPO 71	231763
EXPO 5	231715	EXPO 73	231765
EXPO 6	230787	EXPO 75	231767
EXPO 7	231716	EXPO 76	231768
EXPO 8	231717	EXPO 77	231769
EXPO 9	231718	EXPO 78	231770
EXPO 10 FR	231719	EXPO 81	231771
EXPO 11	231720	EXPO 82	231772
EXPO 12	231721	EXPO 83	231773
EXPO 13	231722	EXPO 84	231774
EXPO 14	231723	EXPO 85	231775
EXPO 15	231724	EXPO 86	231776
EXPO 16	231725	EXPO 87	231777
EXPO 18	231726	EXPO 88	231778
EXPO 21	231727	EXPO 93	231779
EXPO 22	231728	EXPO 94	231780
EXPO 23	231729	EXPO 95	231781
EXPO 24	231730	EXPO 96	231782
EXPO 25	231731	EXPO 97	231783
EXPO 26	231732	EXPO 98	231784
EXPO 27	231733	EXPO 862	232190
EXPO 28	231734	EXPO 863	232191
EXPO 31	231737	EXPO 864	232192
EXPO 32	231738	EXPO 865	232193
EXPO 33	231739	EXPO 900	229714
EXPO 34	231740	H-3	300430
EXPO 35	231741	H-4	300431
EXPO 36	231742	HEP 88	231853
EXPO 37	231743	HEP 89	231854
EXPO 38	231744	HEP 90	231855
EXPO 41	231745	HEP 91	231856
EXPO 42	231746	HEP 92	231857
EXPO 44	231747	HEP 93	231858
EXPO 45	231748	HEP 96	231861
EXPO 46	231749	HEP 97	231862
EXPO 47	231750	HEP 98	231863
EXPO 48	231751	HEP 99	231864
EXPO 49	231752	HEP 100	231865
EXPO 50	231753	HEP 101	231866
EXPO 51	231754	M-1 FR	232472
EXPO 52	231755	M-2 FR	232472
EXPO 53	231756	T-1 FR	232383
EXPO 54	231757	T-2 FR	232384
EXPO 55	231758	T-4 FR	232386



LEGEND

- EPITHERMAL CENTRES
- PORPHYRY COPPER - GOLD DEPOSITS
- ROAD
- PROPERTY OUTLINE

KILOMETRES 0 5

PROFESSIONAL
PROVINCE OF
D. F. McIVOR
BRITISH COLUMBIA
GEOSCIENTIST

MORAGA RESOURCES LTD.

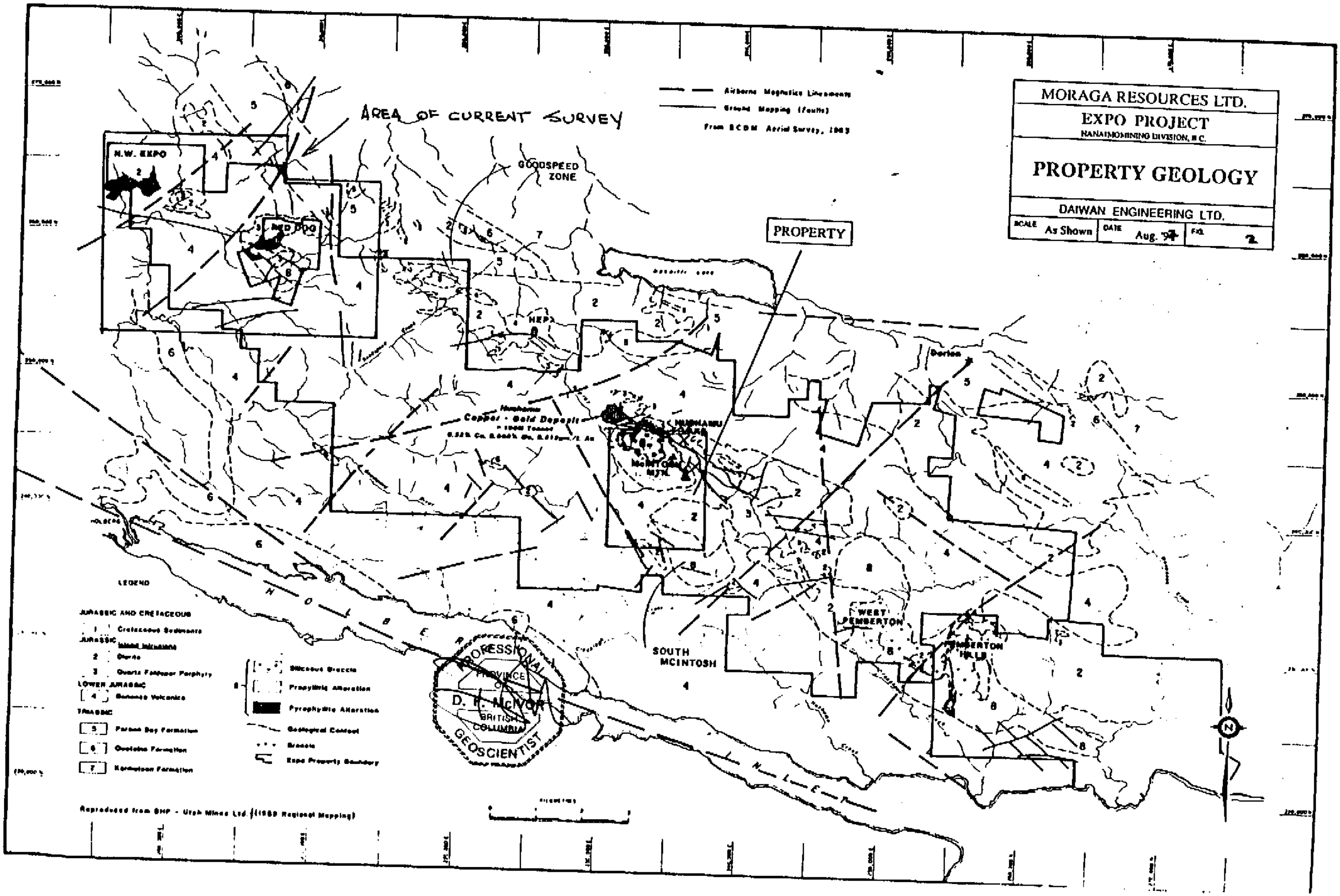
EXPO PROJECT

NANAIMO MINING DIVISION, B.C.

PROPERTY MAP

DAIWAN ENGINEERING LTD.

SCALE:	DATE:	FIGURE No.
As Shown	Sept. '97	1



MORAGA RESOURCES LTD.
EXPO PROJECT
NANAIMO MINING DIVISION, B.C.
PROPERTY GEOLOGY
DAIWAN ENGINEERING LTD.
SCALE As Shown
DATE Aug. '94
FIG. 2
AREA OF CURRENT SURVEY
PROPERTY
Airborne Magnetics Lineaments
Ground Mapping (Faults)
From BCDM Aerial Survey, 1963
N.W. EXPO
RED DOG
GOODSPEED ZONE
HEP
Hushamu Copper - Gold Deposit
HUSHAMU
McINTOSH MTN.
SOUTH McINTOSH
WEST PEMBERTON
PEMBERTON HILLS
Dorlon
HOLBERG
H O L B E R G   I N L E T
LEGEND
JURASSIC AND CRETACEOUS
1 Cretaceous Sediments
JURASSIC
2 Diorite
3 Quartz Feldspar Porphyry
LOWER JURASSIC
4 Bonanza Volcanics
TRIASSIC
5 Parson Bay Formation
6 Quatsino Formation
7 Karmutsen Formation
Siliceous Breccia
Propylitic Alteration
Pyrophyllite Alteration
Geological Contact
Breccia
Expo Property Boundary
Reproduced from BHP - Utah Mines Ltd. (1989 Regional Mapping)
PROFESSIONAL
PROVINCE OF BRITISH COLUMBIA
D. R. McIVOR
GEOSCIENTIST
N

During 1982 to 1983, Utah held an option on the Red Dog Property, an block of claims located internal to the Expo Property boundaries. During that period, Utah drilled an additional 12 holes, totalling 2,056 metres, and subsequently dropped the option.

In 1987, Moraga Resources optioned the Expo property from BHP-Utah, and completed various phases of exploration through to 1994, when Moraga subsequently completed an earn-in for 100% interest in Expo, subject to a 10% NPI retained by then BHP Minerals Canada. Most of the work concentrated on expanding and confirming the reserves at Hushamu, which now stand at 191,000,000 tons grading 0.272% Cu, 0.01 opt Au, and 0.009% Mo, with a stripping ratio of 2.2:1. At the same time, Jordex Resources Inc. acquired 100% of Moraga Resources.

Since 1994, there has been no additional exploration work completed on the property.

4. GENERAL GEOLOGIC SETTING

The geology of northern Vancouver Island is characterized by fault bounded blocks or slices of Triassic (Vancouver Group) to lower Jurassic (Bonanza Group) volcanic and metasedimentary units, which are locally intruded by a series of early to middle Jurassic felsic plutons. Theses units are in turn underlain by by a thick basal sequence of submarine to subareal mafic flows and tuffs, known as the Karmutsen Group. Also present in places is the Triassic sequences of limestones and mixed limestone and clastic sediments known as the Quatsino Formation, and Parsons Bay Formation, respectively.

The Jurassic felsic intrusive rocks may be co-magmatic equivalents to Bonanza Group, and consist of a series of small granitic stocks and batholiths that align along a northwest-southeast trend from Rupert Inlet to the north coast of the Island. The southern edge of this "belt" is characterized by widespread quartz-feldspar porphyry occurring as dykes and irregularly shaped plugs. These felsic bodies are often extensively altered and pyritized, and are closely associated with Cu-Au mineralization on the Expo Property.

Figure 2 illustrates the general geology of the Expo Property.

5. SURVEY RESULTS

Appendix 1 contains a detailed report discussing the results of the completed survey, and includes both interpretive and data maps for all components of the survey.

6. STATEMENT OF COSTS

Direct Expenditures for Airborne Survey:

156.1 Flight-line kilometres at $90 per kilometre:	$14,049.00
Mobilization/Demobilization:	$3,239.00
Sub-Total:	$17,288.00
GST (7%):	$1,210.16
Sub-Total:	$18,498.16

Administrative Cost (Planning Survey, Overseeing Performance, Filing Results):

D. McIvor, 1.0511 days at $400 per day:	$420.44
Total:	$18,918.60

7. STATEMENT OF QUALIFICATIONS

I, Duncan Forbes McIvor, certify that;

1) I reside at 5429 River Road in Delta, B.C.

2) I am a graduate of the University of Waterloo in Earth Sciences.

3) I have practiced my profession more or less continuously since 1982.

4) I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia.

5) I am an employee of Jordex Resources Inc., owners of the mineral claims in question through their ownership of Moraga Resources Ltd..

6) The expenditures listed above were incurred by Jordex in completing the airborne survey on the claims in question.

The signature below endorses the Statement of Costs, and the submitted report here-in.

PROFESSIONAL
PROVINCE OF
D. F. McIVOR
BRITISH COLUMBIA
SCIENTIST

Duncan McIvor, P. Geo.
September 17, 1997

REPORT

ON A
COMBINED HELICOPTER-BORNE
ELECTROMAGNETIC, MAGNETIC
RADIOMETRIC AND VLF-EM SURVEY
EXPO PROPERTY
PORT HARDY AREA
BRITISH COLUMBIA
LONGITUDE 128° 0', LATITUDE 53° 43'
NTS 92 L/12 L/13, 102 I/9 I/16

FOR

JORDEX RESOURCES INC.
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August 18, 1997

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**REPORT ON A
COMBINED HELICOPTER-BORNE
ELECTROMAGNETIC, MAGNETIC
RADIOMETRIC AND VLF-EM SURVEY
EXPO PROPERTY
PORT HARDY AREA
BRITISH COLUMBIA**

1. INTRODUCTION

This is a report on an airborne geophysical survey carried out for Jordex Resources Inc. by Aerodat Inc. under a contract dated June 18, 1997. Principal geophysical sensors included a five frequency electromagnetic system, a high sensitivity cesium vapour magnetometer, a radiometric system and a two frequency VLF-EM system. Ancillary equipment included a colour video tracking camera, Global Positioning System (GPS) navigation instrumentation, a radar altimeter, a power line monitor and a base station magnetometer.

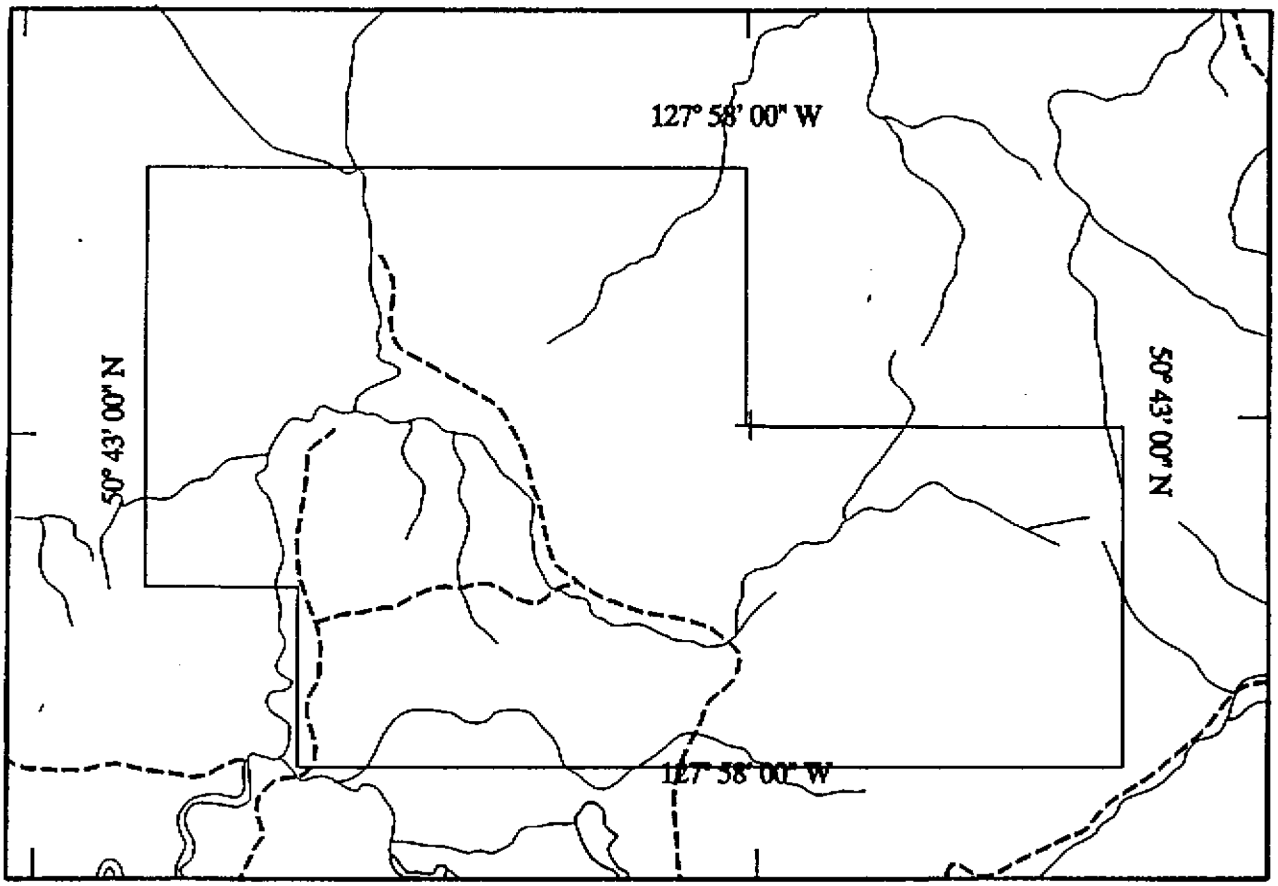
The survey covered an area of about 20 square kilometres located 30 km east of Port Hardy on the northern tip of Vancouver Island. Total survey coverage is approximately 153 line kilometres including 10 kilometres of tie lines. The Aerodat Job Number is J9772.

This report describes the survey, the data processing, data presentation and interpretation of the geophysical results. Identified electromagnetic anomalies appear on selected map products as anomaly symbols with interpreted source characteristics. The interpretation map indicates conductive and anomalous radiometric areas of possible interest. It also shows prominent structural features interpreted from the magnetic results. Significant anomalous radiometric, structural, conductive and/or magnetic associations are the basis for the selection of specific geophysical anomalies for further investigation.

2. SURVEY AREA

The area is about 6 km. north of Holberg which is on Holberg Inlet. Topography is shown on the 1:50,000 scale NTS map sheets 92 L/12 L/13, 102 I/9 I/16. Local relief is very rugged. Elevations range from 500 m to over 1,700 m above mean sea level. The survey area is shown in the attached index map that includes local topography and latitude - longitude coordinates. This index map also appears on all map products. The flight line direction is north-south. Line spacing is 150 metres.

INDEX MAP



3. AIRCRAFT AND SURVEY EQUIPMENT

3.1 Aircraft

The survey aircraft was an Aerospatialle AS 315B helicopter (C-FJJW), piloted by B. Johnstone and D. Rokosh, owned and operated by Turbowest Helicopters Ltd. G. Bernetic of Aerodat acted as navigator and equipment operator. Aerodat performed the installation of the geophysical and ancillary equipment. The survey aircraft is flown at a mean terrain clearance of 60 metres and speed of 60 knots.

3.2 Electromagnetic System

The Helicopter-borne ElectroMagnetic (HEM) system is an Aerodat multi-frequency configuration. Two vertical coaxial coil pairs operate at frequency ranges of 900 Hz and 4,500 Hz and two or three horizontal coplanar coil pairs at frequency ranges of 900, 4,500 Hz and 33 kHz. The actual frequencies used depend on the particular bird configuration. At the present time Aerodat has ten bird systems. This survey utilized the Harrier bird with frequencies of 913 Hz and 4,427 Hz for the coaxial coil pairs and 858 Hz, 4,830 Hz and 32,550 Hz for the coplanar coil pairs. The transmitter-receiver separation is 6.4 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 below the helicopter.

3.3 VLF-EM System

The VLF-EM System is a Herz Totem 2A. This instrument measures the total field and vertical quadrature components of two selected frequencies. The sensor is towed in a bird 10 metres below the helicopter.

VLF transmitters are designated "Line" and "Ortho". The line station is in a direction from the survey area, ideally, normal to the flight line direction. This is the VLF station most often used because of optimal coupling with near vertical conductors running perpendicular to the flight line direction. The ortho station is ideally 90 degrees in azimuth away from the line station.

The transmitters used for this survey are:

NAA, Cutler, Maine broadcasting at 24.0 kHz. (line)

NDT, Yosami, Japan broadcasting at 17.4 kHz. (line)

NPM, Laulaualei, Hawaii broadcasting at 23.4 kHz. (ortho)

NSS, Annapolis, Maryland broadcasting at 21.4 kHz. (line)

3.4 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 below the helicopter 45 metres above the ground.

3.5 Gamma-Ray Spectrometer

An Exploranium GR-820 spectrometer coupled to 1,024 cubic inches of crystal sensor records four channels of radiometric data. Spectrum stabilization is based on the 662 KeV peak from Cesium sources planted on the crystals. A 256 cubic inch upward looking atmospheric detector is used to monitor background radiation.

The channels recorded and their energy windows are as follows:

AIRBORNE SPECTROMETER	SPECIFICATION
Channels	U, Th, K, Total Count, Cosmic, Upward Uranium
Windows	Potassium 1370 to 1570 keV Uranium 1660 to 1860 keV Thorium 2410 to 2810 keV Total Count 410 to 2810 keV Cosmic 3000 to ∞ keV Upward Uranium 1660 to 1860 keV
Energy per channel	12 keV linear
Detector - Terrestrial	NaI - 16.8 l downward
Detector - Atmospheric	NaI - 4.2 l upward
Resolution	< 10% FWHM @ 0.663 MeV (Cs-137)
Dead Time	measured electronically
Stabilization	Cs stabilization Self stabilization on a chosen isotope, usually K40 or Tl208 to within 1 channel
Sampling Time	1 second

The six channels of radiometric data record at a one second update rate (counts per second - cps). Digital recording resolution is one cps.

3.6 Ancillary Systems

Base Station Magnetometer

A Gem Systems, Inc. GSM19 magnetometer, or similar system, 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)

Global Positioning Systems utilize at present 25 active satellites orbiting the earth. The orbital period for each satellite is approximately 12 hours with an altitude of approximately 12,600 miles (~ 20,000 km). Each satellite contains a very accurate cesium clock which is synchronized to a common clock by the ground control stations (operated by the U.S. Air Force).

The satellites radiate individually coded radio signals which are received by the user's GPS receiver. Along with timing information, each satellite transmits ephemeris (astronomical almanac or table) information which enables the receiver to compute the satellite's precise spatial position. The receiver decodes the timing signals from the satellites in view (4 or more for a three dimensional fix) and, knowing their respective locations from the ephemeris information, computes a latitude, longitude, and altitude for the user. This position fix process is continuous and can be updated once per second.

Differential GPS is employed to eliminate the problem of selective availability where the US Defence Department corrupts the satellite's timing signal. Differential GPS utilizes a GPS reference receiver which must be established within a few hundred miles from the survey aircraft. The GPS System computes differential corrections as a post-processing operation to achieve accuracies in the 2 to 5 metre range.

A Magnavox 9212 (12 channel) GPS receiver is used in the aircraft. Nortech differential GPS processing software is used to compute the differentially corrected GPS positions on a daily flight basis. The navigational unit in the aircraft supplies continuous information to the pilot and allows multiple way point entry.

The Picodas PNAV 2001 survey navigation system is utilized on the aircraft to provide a left/right indicator for the pilot. The single point GPS positions are logged onto the PICODAS or RMS digital acquisition systems along with the magnetometer data. The single point GPS accuracy is much better than 25 metres. The GPS positions are converted to NAD27 format for inclusion in the technical report and in the digital archive data.

Analog Recorder

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

LABEL	PARAMETER	CHART SCALE
MAGF	Total Field Magnetics, Fine	2.5 nT/mm
MAGC	Total Field Magnetics, Coarse	25 nT/mm
VLT	VLF-EM, Total Field, Line Station	2.5% / mm
VLQ	VLF-EM, Vert. Quadrature, Line Station	2.5% / mm
VOT	VLF-EM, Total Field, Ortho Station	2.5% / mm
VOQ	VLF-EM, Vert. Quadrature, Ortho Station	2.5% / mm
L9XI	900 Hz, Coaxial, Inphase	2.5 ppm/mm
L9XQ	900 Hz,Coaxial,Quadrature	2.5 ppm/mm
M4XI	4,500 Hz, Coaxial, Inphase	2.5 ppm/mm
M4XQ	4,500 Hz, Coaxial, Quadrature	2.5 ppm/mm
L8PI	900 Hz, Coplanar, Inphase	10 ppm/mm
L8PQ	900 Hz, Coplanar, Quadrature	10 ppm/mm

LABEL	PARAMETER	CHART SCALE
M4PI	4,500 Hz, Coplanar, Inphase	10 ppm/mm
M4PQ	4,500 Hz, Coplanar, Quadrature	10 ppm/mm
H3PI	33,000 Hz, Coplanar, Inphase	20 ppm/mm
H3PQ	33,000 Hz, Coplanar, Quadrature	20 ppm/mm
TC	Radiometric - Total Count	50 counts/mm
K	Radiometric - Potassium	5 counts/mm
U	Radiometric - Uranium	2.5 counts/mm
TH	Radiometric - Thorium	2.5 counts/mm
BALT	Barometer	50 ft/mm
RALT	Radar Altimeter	10 ft/mm
PWRL	50/60 Hz Power Line Monitor	-

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 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 located 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	0.1 second	0.001 nT
VLF-EM (4 Channels)	0.2 second	0.03%
HEM, (8 or 10 Channels)	0.1 second	
HEM, coaxial- 900 Hz/4,500 Hz		0.03 ppm
HEM, coplanar- 900 Hz/4,500 Hz		0.06 ppm
HEM, coplanar- 33,000 Hz		0.125 ppm
Radiometer	1 second	1 cps
Position (2 Channels)	0.2 second	0.1 m
Altimeter	0.2 second	0.05 m
Power Line Monitor	0.2 second	
Manual Fiducial		
Clock Time		

4. SURVEY LOGISTICS AND CALIBRATION

4.1 Survey

The survey was completed in the period July 10 to 16, 1997. Principal personnel are listed in Appendix I. A total of seven survey flights was required to complete the project. Aircraft ground speed is maintained at approximately 60 knots (30 metres per second) and mean terrain clearance of 60 metres consistent with the safety of the aircraft and crew.

4.2 Navigation

A global positioning system (GPS) consisting of a 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 involves mounting the receiver antenna on the casing ("bird") containing the magnetometer sensor. A second system acts as the base station.

The published NTS maps provide the Universal Transverse Mercator (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 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.

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.

4.3 Calibration and Data Verification

The operator calibrates the geophysical systems including the barometric altimeter at the start, middle (if required) and end of every survey flight. Immediately after takeoff and before landing the altimeter values are compared with the 30 m separation between the helicopter and EM sensor. The geophysical systems are calibrated and monitored as follows:

Electromagnetics

The system is nulled and phased according to Aerodat's standard procedures. Any discrepancies from previous surveys require an external Q coil calibration. The External Calibration Procedure is done at the start of every survey and every week thereafter until the survey has been completed. There are four parts to the External Calibration Procedure. After system has warmed up, they are:

1.) Null each frequency
2.) Phase each frequency
3.) Set the gain for each frequency
4.) Note the response of the internal Cal-coil

The phasing is done with a ferrite bar. The gain calibration is done using a calibration coil which is mounted at a pre-set location off the end of the bird.

The phasing and calibration is checked with the internal Q coil. The internal Q coil is activated prior to and at the end of each flight with the system flying out of ground effect (250 m or higher) to assure correct EM calibration. Analog trace locations are corrected for all channels when the system is out of ground effect. If excessive drift is present on the EM system the preceding procedures are repeated as required.

Magnetics

The airborne magnetic data is monitored in the aircraft by means of a 4th difference of the data which is calculated and presented on the airborne analog recorder. Should the 4th difference exceed the allowable specification, the portion of the flight line thereby affected is reflown.

The fourth difference is defined as:

$$FD_i = X_{i+2} - 4x_{i+1} + 6x_i - 4x_{i-1} + X_{i-2}$$

where X_i is the i^{th} total field sample. The fourth difference in this form has units of nT. High frequency noise should be such that the fourth differences divided by 16 are generally less than ± 0.1 nT The fourth difference is displayed on analog at scales of 0.20 nT/cm.

VLF-EM

The most suitable VLF-EM stations for the specified flight direction are used. The VLF-EM system records two transmitter stations simultaneously. If a station shut-down occurs, the survey proceeds on an alternate station if available.

Selected VLF-EM stations are checked for operations and for correct reception gain. Occasional deficiencies or discontinuities of VLF-EM information due to VLF-EM transmission conditions are not grounds for rejection of acquired data.

Radiometrics

The spectrometer calibrations and tests to be performed during the survey conform to those detailed in the International Atomic Energy Agency's Technical Series Report number 323. The details of certain of these calibrations are given below:

Daily checks before and after each survey flight are performed as described below

i) Background radiation check where at least 60 seconds of spectrometer readings are taken with no radioactive sources in the vicinity of the detectors (at least 30 metres away). This is done before and after the detector gain checks described in ii) below.

ii) Detector gain checks using uranium and thorium sources where records are taken for a sufficiently long time so as to obtain over 1,000 counts in each channel.

iii) Spectral stability checks using the Cs - 137 source spectrum.

The results are analyzed throughout the survey and checked for consistency and are available for inspection during the survey. Mandatory logs are completed and the results are in digital format as part of the deliverable products.

Flight checks utilizing radioactive samples are carried out at the beginning and end of each flight to monitor the proper functioning of the spectrometer. A selected line about 5 km in length on the way to the survey area is repeated at the start of each day to monitor changes in natural signal level that may be caused by rainfall. Background readings are taken outside of ground effect at the beginning and end of each flight.

Calibration flights to establish the factors for atmospheric and cosmic background correction are conducted at the start of the field work and are repeated monthly during survey operations. These tests are conducted over the ocean at heights ranging from 1,500 to 3,000 metres above sea level in intervals of 250 metres. In addition, the aircraft background is verified weekly by a flight at a height of 2,000 metres above ground level. If the variation of any of these measurements from the value predicted from all previous values exceeds 5% then the measurements over the ocean at 250 metres between 1,500 and 3,000 metres are repeated.

The amount of rain which falls within the survey area is monitored and flying is discontinued for a period of twenty four hours after a rainfall in excess of 250 mm.

Altimeters

The radar altimeter test is carried out before and after the survey and if any of the altitude equipment is changed. The radar altimeter reading is determined when flying at barometric altitudes of 60, 120, 180 and 240 meters above the base airstrip. Also, the barometric altimeter is calibrated pre-flight and post-flight using the radar altimeter to determine the drift and this drift is applied to the data in the subsequent data processing.

Video Flight Path Verification

The record from the video camera is monitored continuously in flight. The video tape is reviewed immediately after each flight to ensure that the quality is acceptable. Selective flight path verification is performed as necessary.

Lag Tests

Before survey production commences and when any major survey equipment modification or replacement occurs, a lag test is performed to determine the time difference between the magnetometer reading, the electronic navigation reading and the operation of the positioning equipment. These tests are flown at the survey flight altitude in two (2) directions across a distinct magnetic anomaly and a recognizable feature whose exact location is known.

5. DATA PROCESSING AND PRESENTATION

5.1 Base Map

The base map is taken from a photographic enlargement of the NTS topographic maps. A UTM reference grid (grid lines usually every kilometre) and the survey area boundaries 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, shadow and ternary maps.

5.2 Flight Path Map

Global Positioning System

The GPS 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.

A further calculation using ranges to several 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 four satellites for a full positional determination (three space coordinates and time). If the elevation is known in advance, only three satellites are needed. These are termed 3D and 2D solutions.

The position of the receiver is updated every tenth of a second. The accuracy of any one 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 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 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 five 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 3.0 mm at a scale of 1:10,000). Occasional dropouts 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 two 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 aircraft position is expressed in geographic latitude and longitude coordinates, using the North American Datum NAD27 based on the Clarke 1866 ellipsoid. Any particular survey area located on the globe has a specific reference ellipsoid or projection zone. A further refinement for a better fit to the earth's surface at the survey location is applied by adding or subtracting slight x, y and/or z datum shifts (a few metres to hundreds of metres) to the origin of the ellipsoid. The geographic coordinates are converted to fit this ellipsoid before calculating the UTM coordinates. The UTM coordinates are expressed as UTM eastings (x) and UTM northings (y).

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.

5.3 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. This is referred to as a "surgical mute" in signal processing terms. The signal to noise ratio is further enhanced by the application of a low pass digital filter. This filter has zero phase shift that 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 electromagnetic 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 are the basis for the determination of apparent resistivity (see following section). The inphase and quadrature responses along the flight line are presented in profile form offset along the flight lines. Differentiation of the various profiles is achieved using two colours (coaxial and coplanar) and two line weights (inphase and quadrature). For interpretation purposes the coaxial and coplanar data sets for a similar frequency range are presented together on one map (900 Hz or 4,500 Hz)

5.4 Total Field Magnetics

The aeromagnetic data are corrected for diurnal variations by adjustment with the recorded base station magnetic values. If required, depending on the size of the survey area and magnetic amplitudes, the International Geomagnetic Reference Field (IGRF) is subtracted from the diurnally corrected data. The corrected profile data are interpolated on to a regular square grid using an Akima spline technique. The grid provides the basis for threading the presented contours. The minimum contour interval is 5 nT with a grid cell size of 25 m. On the colour maps magnetic high areas are assigned warm colours (orange/red) while magnetic low areas show as cool colours (blue).

5.5 Calculated Vertical Magnetic Gradient

The vertical magnetic gradient is calculated from the gridded total field magnetic data. The calculation is based on a 17 x 17 point convolution in the space domain or FFT processing which involves using a two dimensional Fourier Transform, applying a vertical derivative operator and transforming the filtered data back into the space domain. The results are contoured using a minimum contour interval of 0.025 nT/m. Grid cell sizes are the same as those used in processing the total field data. The high and low amplitude responses are give the same colour representation as the total field contours.

5.6 Colour Relief or Shadow Map of Total Field Magnetics

A useful manipulation of the magnetic data is the production of a colour shadow map. It is an aid in the interpretation and presentation of the magnetic information. The shadow map displays two independent variables simultaneously on the same map. The two variables are the amplitude and the gradient of the quantity measured over the mapping region. At every point or grid cell on the map the hue represents the amplitude of the magnetic value and the lightness/darkness of the hue is varied according to the slope or gradient of the data at the cell location. The gradient is translated into a reflectance parameter with respect to a chosen illumination direction. Subtle magnetic structures having a specific trend are enhanced or attenuated depending on the position and angle to the horizon of the light source relative to the trend. If the light source is orthogonal to the trend there will be maximum shadow effect. Regional discontinuities representing fault structures are easily recognized with shadow enhancement.

5.7 Apparent Resistivity

The apparent resistivity is calculated by assuming a 200 metre thick conductive layer over resistive bedrock. The computer determines the resistivity that would be consistent with the sensor elevation and recorded inphase and quadrature response amplitudes at the selected frequency. The apparent resistivity profile data is re-interpolated onto a regular grid at a 25 metres true scale interval using an Akima spline technique and contoured using logarithmically arranged contour intervals. The minimum contour interval depends on the selected frequency and is in units of log(ohm.m) in logarithmic intervals of 0.1, 0.5, 2.5, 10.0 etc. The colour presentation assigns warmer colours (reds) to low resistivity or very conductive responses and cooler colours (blues) to high resistivity or poor conductivity responses.

The highest measurable resistivity is approximately equal to the transmitter frequency. The lower limit on apparent resistivity is rarely reached.

5.8 VLF-EM

The VLF Total Field data from the Line Station is levelled such that a response of less than 0% is seen in non-anomalous regions. The corrected profile data are interpolated onto a regular grid using an Akima spline technique. The grid provided the basis for threading the presented contours. The minimum contour interval is 2%. Grid cell size is 25 m.

5.9 Radiometric Data

The four channels of radiometric data are subject to a number of corrections and filters:

The stages are:

- livetime correction
- background removal (cosmic and radon)
- terrain clearance correction
- compton scattering correction
- low pass profile filter (seven point Hanning)
- low pass grid filter (5X5 point Hanning)

The Compton stripping factors are:

ALPHA	0.2613	Th into U
BETA	0.4097	Th into K
GAMMA	0.7432	U into K
A	0.0524	U into Th
B	0.0014	K into Th
G	0.0075	K into U

where alpha, beta and gamma are the forward stripping coefficients and a, b, g are the backward stripping coefficients. These coefficients are taken in part from the sample checks done at the start of each flight.

The altitude attenuation coefficients are TC: 0.0058; K: 0.0081; U: 0.0056; and Th: 0.0100. The units are metres $^{-1}$. These coefficients are taken from GSC publications for similar radiometric systems. Radiometric data are corrected to a mean terrain clearance of 60 m.

The corrected data are interpolated on a square grid (cell size 25 m) using an Akima spline technique. The grids provided the basis for threading the presented contours. The minimum contour intervals are TC = 10 cps, K = Th = U = 1 cps.

5.10 Ternary Map of Radiometric Channels

The relative amplitude of the three radioelement concentrations measured is often an important parameter. High potassium with relatively no thorium or high thorium with relatively no potassium often indicates a specific alteration environment or rock type. The presence or absence of an uranium response is also often diagnostic. In order to readily recognize and display these signatures a ternary map is generated. It is obtained by assigning each radioelement a primary colour and intensity relative to amplitude. The three primary colour intensities are mixed to give unique colour hues for various radioelement signatures. The Aerodat assignments are potassium = magenta, thorium = yellow and uranium = cyan.

6. DELIVERABLES

The report on the results of the survey is presented in two copies. The report includes folded white print copies of all black line maps. Two copies of the colour, shadow and ternary maps are in accompanying map tube(s).

The black line maps show topography, UTM grid coordinates and the survey boundary. The survey data are presented in a set of numbered maps in the following format:

I BLACK LINE MAPS: (Scale 1:10,000)

Map No. Description

1. BASE MAP; screened topographic base map plus survey area boundary, and UTM grid.

2. COMPILATION / INTERPRETATION MAP; with base map, flight path map and HEM anomaly symbols with interpretation .

3. TOTAL FIELD MAGNETIC CONTOURS; with base map HEM anomaly symbols and flight lines.

4. VERTICAL MAGNETIC GRADIENT CONTOURS; with base map HEM anomaly symbols and flight lines.

5A. APPARENT RESISTIVITY CONTOURS; apparent resistivity calculated for the coplanar 800 Hz data, with base map HEM anomalies and flight lines.

5B. APPARENT RESISTIVITY CONTOURS; apparent resistivity calculated for the coplanar 4,175 Hz data, with base map HEM anomalies and flight lines.

6. VLF-EM TOTAL FIELD CONTOURS; with base map HEM anomalies and flight lines.

II COLOUR MAPS: (Scale 1:10,000)

1. TOTAL FIELD MAGNETICS; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

2. VERTICAL MAGNETIC GRADIENT; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

3A. HEM OFFSET PROFILES; coplanar 865 Hz and coaxial 935 Hz data with flight lines, topographic features and HEM anomaly symbols.

3B. HEM OFFSET PROFILES; coplanar 4,175 Hz and coaxial 4,600 Hz data with flight lines, topographic features and HEM anomaly symbols.

3C. HEM OFFSET PROFILES; coplanar 33,000 Hz data with flight lines, topographic features and HEM anomaly symbols.

4A. APPARENT RESISTIVITY; calculated for the coplanar 800 Hz data with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

4B. APPARENT RESISTIVITY; calculated for the coplanar 4,175 Hz data with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

5A. URANIUM COUNT RADIOMETRIC; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

5B. THORIUM COUNT RADIOMETRIC; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

5C. POTASSIUM COUNT RADIOMETRIC; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

5D. TOTAL COUNT RADIOMETRIC; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

6. VLF-EM TOTAL FIELD; with superimposed contours, flight lines, topographic features and HEM anomaly symbols.

7. TOTAL FIELD MAGNETICS SHADOW MAP; with suitable sun angle

8. TERNARY MAP; of Uranium, Thorium and Potassium

The processed digital data, including both the profile and the gridded data, is on CD ROM'S (ISO 9660). Profile data is written as columnar ASCII records and the gridded data as standard Geosoft PC grids. A full description of the format is included with the package. All gridded data can be displayed 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.

7. INTERPRETATION

7.1 Area Geology

The rocks of Vancouver Island, north of Rupert and Holberg Inlets, are primarily volcanic and sedimentary units ranging in age from Upper Triassic to Lower Cretaceous. Intrusive rocks of early to middle Jurassic age intrude the central and upper portions of the North Island sequence and locally are associated with copper molybdenum mineralization.

The Island Copper Mine located a few kilometres south of Port Hardy, was delineated by Utah Mines Ltd. in 1969. It is a large low grade copper-molybdenum deposit hosted by metamorphosed andesitic, pyroclastic rocks in the hanging wall and footwall of a quartz-feldspar porphyry dyke. Disseminated pyrite and magnetite is associated with the ore minerals and surrounding alteration halo. (in Geophysics and Geochemistry in the Search for Metallic Ores, Geological Survey of Canada, Economic Geology Report 31, p. 685-696, 1979)

7.2 Magnetic Interpretation

The total field magnetic responses reflect major changes in the magnetite content of the underlying rock units. The amplitude of the magnetic responses relative to the regional background help to assist in identifying specific magnetic and nonmagnetic units related to, for example, mafic flows or tuffs, mafic to ultramafic intrusives, felsic intrusives, felsic volcanics and/or sediments etc. Obviously, several geological sources can produce the same magnetic response. These ambiguities can be reduced considerably if basic geological information on the area is available to the geophysical interpreter.

In addition to amplitude variations, magnetic patterns related to the geometry of the particular rock unit also help in determining the probable source of the magnetic response. For instance, long narrow magnetic linears usually reflect mafic tuff/flow horizons or mafic intrusive dyke structures while semi-circular features with complex magnetic amplitudes may be produced by local plug-like intrusive sources such as pegmatites, carbonatites or kimberlites.

The calculated vertical magnetic gradient assists considerably in mapping weaker magnetic linears that are partially masked by nearby higher amplitude magnetic features. The broad zones of higher magnetic amplitude, however, are severely attenuated in the vertical magnetic gradient results. These higher amplitude zones reflect rock units having magnetic susceptibility signatures. For this reason both the total and gradient magnetic data sets must be evaluated.

Theoretically the magnetic gradient zero contour line marks the contacts or limits of large magnetic sources. This applies to wide sources, greater than 50 metres, having simple slab geometries and shallow depth.(See discussion in Appendix II) Thus the gradient map also aids in the more accurate delineation of contacts between differing magnetic rock units.

The cross cutting structures, shown on the interpretation map as faults, are based on interruptions and discontinuities in the magnetic trends. Generally, sharp folding of magnetic units will produce a magnetic pattern indistinguishable from a fault break. Thus, if anomaly displacements are small such fault structures, where they mark an anomaly interruption, may actually represent a deformation node rather than faulting.

7.3 Magnetic Survey Results and Conclusions

To facilitate the following discussion of the magnetic results it is suggested the interpretation map be compared with the total field and vertical gradient magnetic colour contour maps either as overlays or side by side.

On the interpretation map relatively high amplitude and apparent discrete magnetic centres are outlined with thick solid lines. These anomalies are thought to be possible mafic intrusive source bodies as opposed to the lower amplitude more linear features typical of mafic volcanic units, sills or dyke structures. The trend directions of these lower amplitude horizons are indicated with thin lines. Below background non-magnetic zones are the third type of magnetic signature indicated on the interpretation maps. These zones usually map felsic or sedimentary rocks. Local small negative zones can also indicate possible alteration effects or felsic stocks. The more significant below background zones are shown with thick dashed lines and triangular depression symbols.

The magnetic background is interpreted to be approximately 55,550 nanoTesla (nT). Amplitudes range from about 225 nT below background to 1,650 nT above background. The major feature is the semi-circular anomaly in the centre of the area noted on the interpretation map as location A. It has the highest amplitude response of the block, is bounded on the east by an interpreted fault structure and is just south of a large radiometric anomaly complex to be discussed in a following section. Part of its high amplitude is probably related to the fact it occupies a localized topographic peak and the magnetic sensor altitude was probably lower than normal when traversing this peak. The two magnetic centres to the east are of lesser interest for their lack of any other significant geophysical associations. They are also associated with topographic highs.

The rest of the survey area comprises lower amplitude sinuous and sometimes contorted anomaly trends with a regional west-northwest strike grain. Mafic volcanic units are probably the source of many of these anomalies. The much lower amplitude zone trending through the south part of the property is probably reflecting intercalated intermediate volcanic and sedimentary rocks.

7.4 VLF Electromagnetic Survey

This high frequency type of survey, utilizing fixed government communication transmitter stations, tends to detect long strike length and/or surficial poor conductivity sources such as swamps, creeks and rivers. Conductors that are optimum coupled with the primary field will usually predominate over those with other strike directions. In some instances anomalies will be produced by variations in topographic relief.

For this survey the quality of the VLF data, as indicated by the contoured map product, suggests low signal levels resulting in a lack of conductive trends. There are a few "hot spots" or spikes scattered about the area but these are not considered significant because of the low signal levels. In any case, this method does not have the diagnostic capabilities or resolution of the HEM five frequency self contained electromagnetic system.

7.5 HEM Anomaly Selection/Interpretation

Vertical to Near Vertical Tabular Conductive Sources

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. These HEM intercepts are automatically plotted on the various map products listed previously. Selection of HEM anomaly intercepts is based on conductivity as indicated by the inphase to quadrature ratios of the 900 Hz and/or 4,500 Hz coaxial data, anomaly shape, and anomaly profile characteristics relative to coaxial and corresponding coplanar responses. The peak of the coaxial responses is picked for digitizing as that defines the position of any near vertical to dipping tabular source.

These response shapes are illustrated in Appendix II, in the figure entitled "HEM Response Profile Shapes .....". Profile A illustrates the coaxial and coplanar signature of a vertical source while profiles B and C show the effect of dip on the coplanar and coaxial profiles. For a gently dipping source the small up-dip tail of the coplanar profiles B and C is not present and there is just a shift of the coplanar peak down dip from the coaxial peak.

Flat Lying Conductive Sources

Flat lying responses are characterized by identically shaped coaxial and coplanar response profiles. Profile I, Appendix II, illustrates a flat source response. Variations in the conductivity and thickness of flat lying sources produces peaks and valleys in the profile data. Ordinarily the anomaly peaks from flat lying sources are not selected for plotting as HEM intercepts. Their locations have little meaning if the source is flat lying. Nevertheless, if the sources are gently dipping the peaks sometimes have line to line continuity and may show the "grain" of the underlying geology. A much better presentation of conductive flat lying sources is achieved by the resistivity calculations and map plots. Comparison of the resistivity data with geological information can then ascertain if the source of the responses are of possible geological interest.

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. Extensive flat lying to gently dipping conductors often have an "edge effect" anomaly which is a coaxial peak on the flank of the coplanar responses similar to one side of profile E, G or H, Appendix II. Often only one edge can be seen if the source is dipping. Such edge effect anomalies are often seen marking the perimeter of lakes or swamps containing conductive material.

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 coaxial peak of 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.

Negative Inphase Responses

In some areas the inphase profile component exhibits a negative anomaly response usually over obvious magnetic areas. This is produced by local concentrations of magnetite and usually occurs when the sensor is flying close to the ground surface. If only magnetite is present there will be no quadrature response associated with the negative inphase response. If conductive material is present, however, such as graphite or sulphides, a positive quadrature response will be evident with the negative inphase response. In this case the anomaly is selected for plotting and evaluation and designated as a magnetic/conductive response.

Depth and Conductivity Calculation

The calculation of the depth to the conductive source and its conductivity is based on the 4,500 Hz coaxial 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 III 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 II. Note the depth calculation for those conductors having a gently dipping to flat lying profile signature will not be accurate although the conductivity value will have some relative meaning.

The selected HEM intercepts 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.

7.6 Electromagnetic Survey Results and Conclusions

Conductive flat lying to gently dipping material is contributing to the electromagnetic responses in various degrees throughout the survey block. There is a definite correlation between low resistivity and topographically low or swampy areas, along drainage gulleys and on the flanks of hills. This suggests conductive overburden or talus debris are the main source of these particular conductive effects. Resistivities in these areas are in the order of 150 to 500 ohm metres typical of surficial overburden sources.

Some of the conductors may be produced by man-made sources such as mine infrastructures, buildings, bridges, culverts, highway guard rails, irrigation pipes, disused power lines, grounded metal fences etc. The location of the anomalies relative to these features or suspected features gives a clue to a possible cultural source for the anomaly. Other anomalies produced by operating power lines are sometimes difficult to recognize without reference to the power line monitor record. A check of the power line channel showed no activity.

There are a great many conductive intercepts, not attributable to obvious culture, scattered haphazardly throughout the survey block. Suggested line to line continuity of major trends are indicated where evident. Many of these have poor conductivity signatures with a dominate quadrature response and little inphase response. In some locations there is a definite inphase component especially where the amplitude of the quadrature response is quite high. This still indicates relatively poor conductivity.

In certain instances, however, the quadrature peak is superimposed on an elevated quadrature background. Without the high background effect the amplitude of the quadrature response is often similar or less than the inphase amplitude. This implies a much better conductivity than that calculated by the normal conductivity calculation which does not take into account high background levels. These types of anomalies as well as other definitive inphase/quadrature responses are designated on the interpretation map with a number for investigation. All five designated investigation locations are part of longer formational horizons. Number 4 has the best potential as it is on the west edge of magnetic anomaly A and is a conductive/magnetic response with a spatial association to a radiometric anomaly to the north. Number 3 is just south of magnetic anomaly A and may be also of primary interest.

7.7 Radiometric Interpretation

The ability to detect natural occurring radiation, whether on the ground or from an airborne platform, depends on a number of factors listed as follows:

Count Time

Measurements or count rate statistics are more reliable the longer the detector is in position over a particular location. Therefore in airborne surveying, traverse speed is an important factor in detecting radiation sources. For this reason STOL aircraft and helicopters are a favoured platform for radiometric surveys.

Detector size

The detector crystal volume and thickness determine the sensitivity of the radiometric system to radiation. For accurate measurement and differentiation of higher energy levels of radiation, a large crystal volume is a pre-requisite.

Distance from Source (Altitude)

The attenuation or absorption of radiation in air, although not a significant factor in ground surveys, is a factor in airborne surveys. Normalization of the radiation amplitude data for altitude variations of the aircraft during the survey is necessary. The attenuation is not significant for large areal sources of radiation but is quite severe for localized point sources.

Overburden Cover

Radiation can be completely masked by about 30 cm of rock or a metre of unconsolidated overburden.

Source Geometry

A large exposed outcrop of slightly radioactive material, such as granite which usually has a high potassium count, will be easily detectable from the air. A small outcrop of highly radioactive material, containing an appreciable amount of pitchblende for instance, may not be detectable unless the sensor passes directly over the outcrop and/or is quite close to it.

Source Characteristics

The type and percentage concentration of radioactive minerals present in the rock will determine radiation amplitudes and therefore the ability of the sensor to measure the radiation.

The above factors must be taken into consideration when evaluating and interpreting radiometric surveys. Variations in radiation amplitudes may only be a factor of overburden cover. As a result, an outcrop map of the survey area is very useful for initial evaluation of radioactive element concentrations.

Shales and felsic intrusives tend to have high potassium and thorium levels. Mafic intrusives, sandstone and especially limestone have concentrations of one half to one tenth of the highest levels. Specific intrusives types, such as pegmatites, can have levels of potassium, uranium and thorium, in the order of three to four times the amounts normally present. Uranium ore can contain concentrations of radioactive minerals one to four orders of magnitude greater than normally encountered.

Thus, interpretation of the source of radioactive anomalies, even when the uranium, thorium and potassium thresholds are separated, can be difficult and ambiguous. In some geological environments, specific rock units have higher or lower potassium/thorium, potassium/uranium or thorium/uranium ratios. Additional diagnostic information is sometimes available when such ratio maps are generated and compared to known geological parameters.

7.8 Radiometric Survey Results and Conclusions

The potassium channel results are of most interest as high potassium usually reflects the presence of felsic intrusives such as granite type rocks as well as the presence of potassium associated with alteration processes. The additional absence or presence of thorium or uranium is also an important signature correlation for specific ore-model targets.

Anomalous responses are considered to be those having levels equal or greater than twice background. More subtle lower amplitude anomalies may be also important but until more specific geological information is known only the higher amplitude responses can be assessed. On the interpretation maps anomalous potassium channel levels, greater than 34 cps, are shown with diagonal northeast/southwest lines. The thorium and uranium levels are quite low with backgrounds of 10 cps and 7 cps respectively. There are no areas where levels exceed twice background for the thorium and uranium levels. Threshold responses of about 15 cps for the thorium channel, associated with potassium channel anomalies, are present in a few locations and are indicated with the letters Th. Anomalies designated for investigation have a prefix letter R and a number to differentiate them from magnetic or conductive anomalies designated for investigation.

Some caution is required, however, when assessing the anomalous zones. There is a specific correlation of higher amplitude anomalous responses along the flanks of peaks or topographic ridges, within gulleys on the flanks of the topographic highs and along drainage valleys. This might be explained if the geological units were flat lying and contained a radiometrically active sequence at a specific stratigraphic level. Normally potassium and/or thorium are the dominant radiometric responses with minor accompanying uranium levels. If topography is a factor, however, generally all three channels will show anomalous responses if associated with topographic depressions. The regional thorium and uranium channel responses are quite low but topographic correlations are still apparent. This would suggest the effect is produced by over compensation for altitude often caused by altitude changes in the aircraft greater than the altitude attenuation coefficient corrections are designed for. In steep topographic gradients it is difficult to drape fly even with a helicopter.

Three anomalous potassium channel response zones are designated for investigation. All have some unfavourable topographic correlation. R1 partially covers a local non-magnetic zone and was selected for this reason. R2 and R3 are part of the same large potassium channel anomaly. The R2 location was selected for its amplitude and proximity to magnetic anomaly A and conductor 4. The R3 area is intersected by a fault structure a favourable association for mineralization.

8. RECOMMENDATIONS

Selection of geophysical anomalies for further investigation is based on the structural and magnetic associations of the designated conductors as well as their relative conductivity. Significant radiometric anomalies having specific signatures and/or magnetic associations are also selected for evaluation. It should be noted, exploration of the Island Copper Deposit by Utah Mines Ltd. found that magnetics was the most useful tool in providing a very approximate spatial association with the deposit area. There is no mention, however, of the use or suitability of the airborne electromagnetic or radiometric methods in the area.

Prior to any ground follow-up, the following priority categories should be reviewed with respect to the geological target model being sought and known geology and mineralization in the area. Note, letters designate magnetic anomalies, numbers denote conductive responses and R prefixed numbers are radiometric investigation targets. The anomalies are rated as first or second priority exploration targets as follows:

First Priority: A - 3, 4 - R2, R3

Second Priority: 1, 2, 5 - R1

The magnetic, conductive and radiometric anomalies recommended for investigation represent a first phase exploration program. Additional work will be contingent on the results of this program. More detailed geological information used in conjunction with geophysics may help to direct further exploration efforts.

REGISTERED PROFESSIONAL ENGINEER
R. W. WOOLHAM
PROVINCE OF ONTARIO

Respectfully submitted,

R. W. Woolham, P.Eng.
Consulting Geophysicist

for

AERODAT INC.

J9772

August 18, 1997

APPENDIX I

PERSONNEL

FIELD

Flown	July 10 to 16, 1997
Pilot(s)	B. Johnstone, D. Rokosh
Operator(s)	G. Bernetic

OFFICE

Processing	Will Icay George McDonald
Report	R. W. Woolham

APPENDIX II

GENERAL INTERPRETIVE CONSIDERATIONS

GENERAL INTERPRETIVE CONSIDERATIONS

Electromagnetic

The Aerodat electromagnetic system utilized two different transmitter-receiver coil geometries. The traditional coaxial coil configuration is operated at widely separated frequencies. The horizontal coplanar coil configuration is similarly operated at different frequencies where at least one pair is approximately aligned with one of the coaxial frequencies.

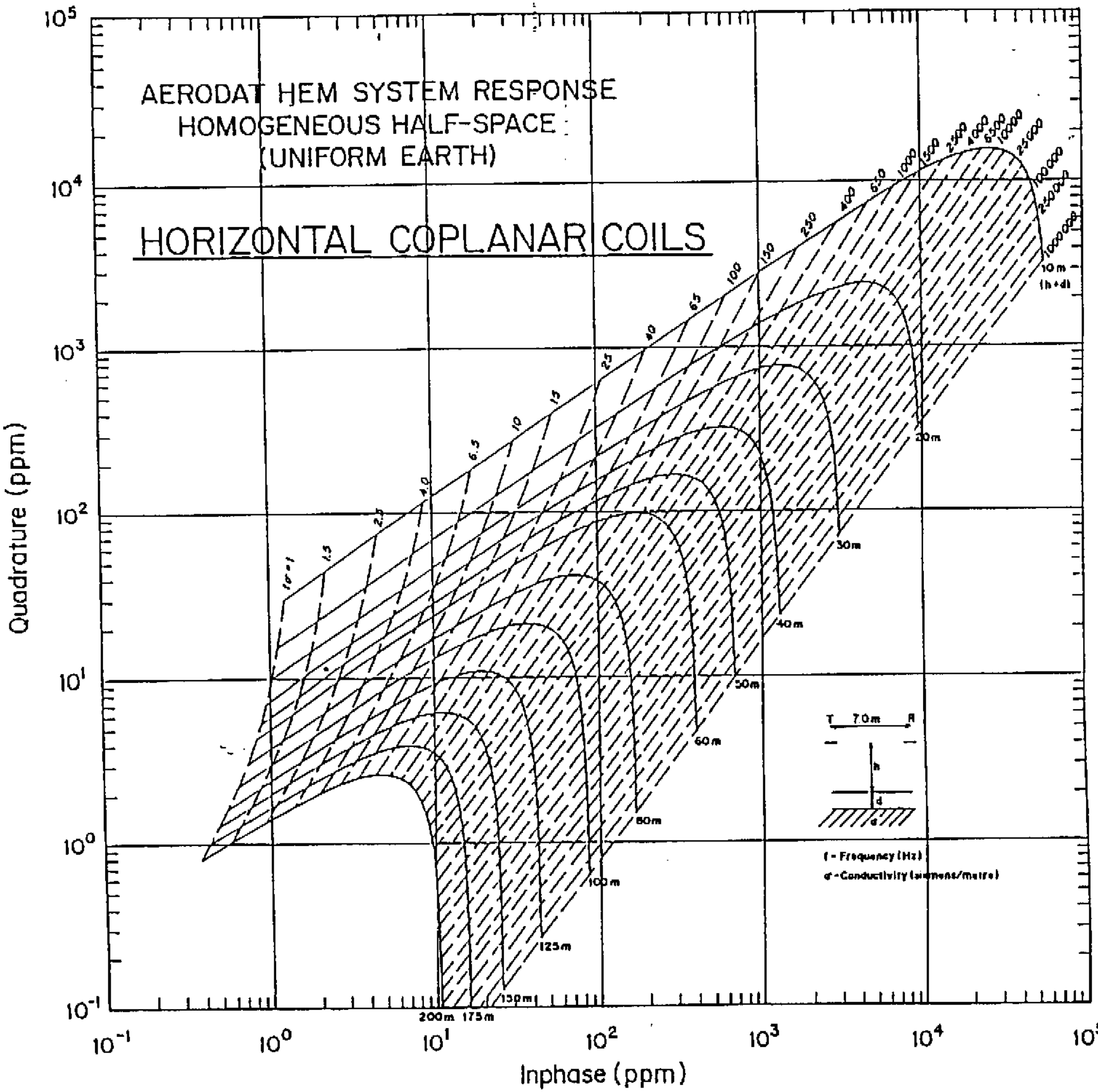
The electromagnetic response measured by the helicopter system is a function of the "electrical" and "geometrical" properties of the conductor. The "electrical" property of a conductor is determined largely by its electrical conductivity, magnetic susceptibility and its size and shape; the "geometrical" property of the response is largely a function of the conductor's shape and orientation with respect to the measuring transmitter and receiver.

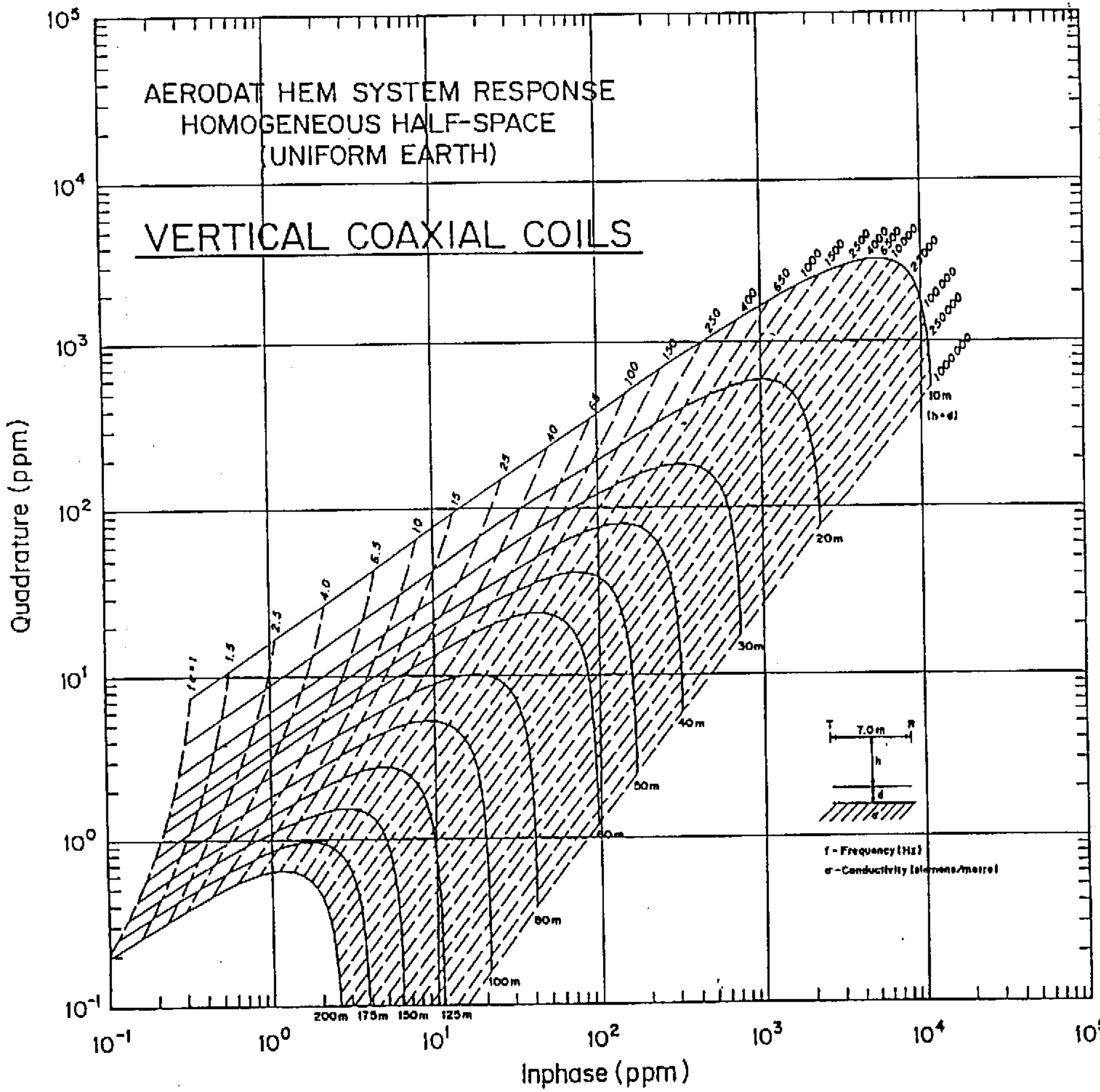
Electrical Considerations

For a given conductive body the measure of its conductivity or conductance is closely related to the measured phase shift between the received and transmitted electromagnetic field. A small phase shift indicates a relatively high conductance, a large phase shift lower conductance. A small phase shift results in a large inphase to quadrature ratio and a large phase shift a low ratio. This relationship is shown *quantitatively for a non-magnetic vertical half-plane and half space models on the* accompanying phasor diagrams. Other physical models will show the same trend but different quantitative relationships

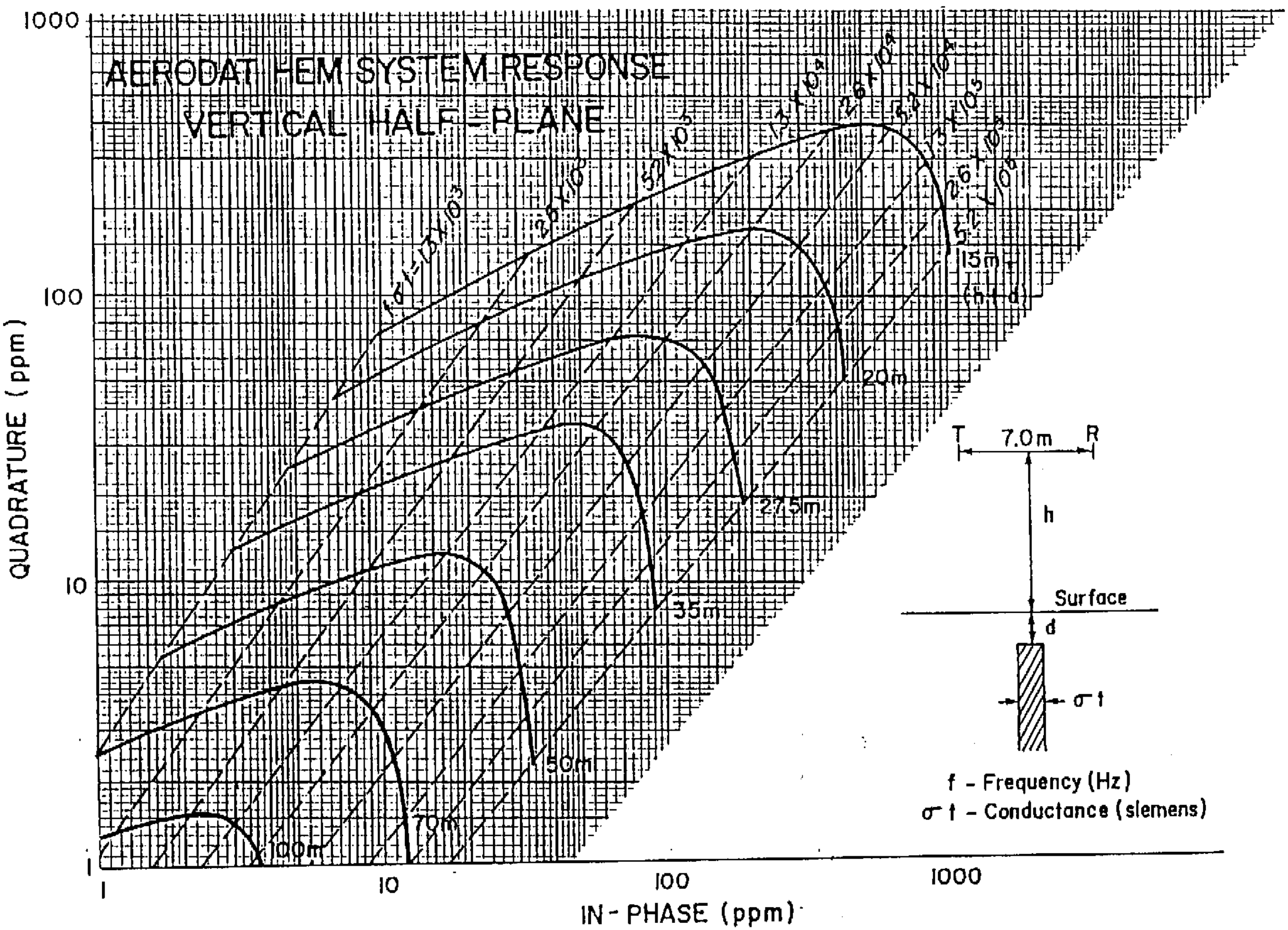
The phasor diagram for the vertical half-plane model, as presented, is for the coaxial coil configuration with the amplitudes in parts per million (ppm) of the primary field as measured at the response peak over the conductor. To assist the interpretation of the survey results the computer is used to identify the apparent conductance and depth at selected anomalies. The results of this calculation are presented in anomaly listings included in the survey report and the conductance and inphase amplitude are presented in symbolized form on the map presentation.

The conductance estimate is most reliable when anomaly amplitudes are large and background resistivities are high. Where the anomaly is of low amplitude and background resistivities are low, the conductance estimates are much less reliable. In such situations, the conductance estimate is often quite low regardless of the true nature of the conductor. This is due to the elevated background response levels in the quadrature channel. In an extreme case, the conductance estimate should be discounted and should not prejudice target selection.


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


AERODAT HEM SYSTEM RESPONSE
VERTICAL HALF-PLANE
QUADRATURE (ppm)
IN-PHASE (ppm)
1000
100
10
1
15m
(h+d)
20m
27.5m
35m
50m
70m
100m
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.

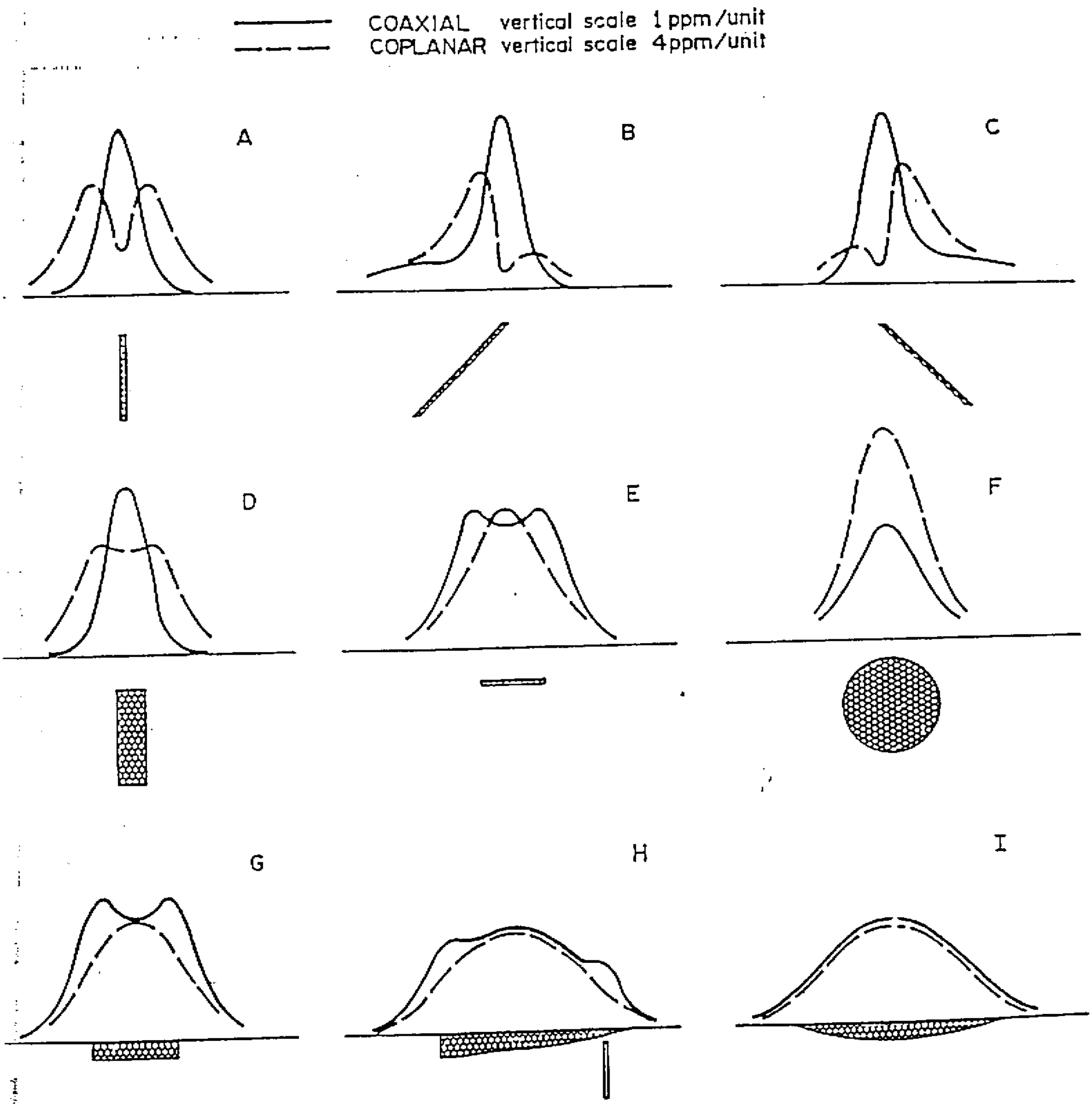
Sulphide minerals, with the exception of such ore minerals as sphalerite, cinnabar and stibnite, are good conductors. Sulphides may occur in a disseminated manner that inhibits electrical conduction through the rock mass. In this case the apparent conductance can seriously underrate the quality of the 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



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.

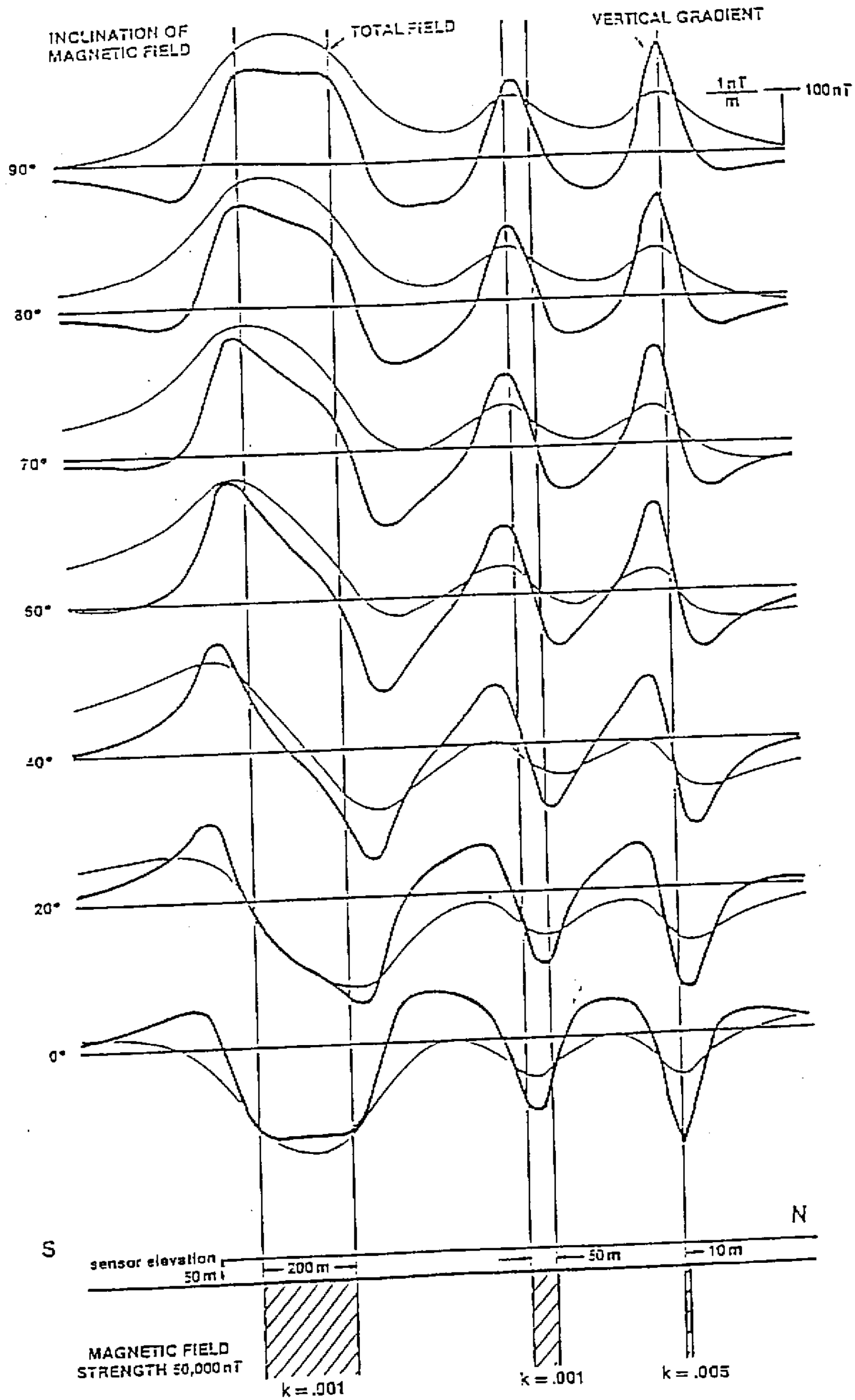
Depth of Burial

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
1nT/m
100nT
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 resistivity 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 III

ANOMALY LISTINGS

J9772 (EXPO PROPERTY) ANOMALY LISTING

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
3	10410	A	0	4.0	9.0	0.2	12	34	569033.0	5619250.0
3	10410	B	0	-1.3	19.7	0.0	0	31	568976.6	5619884.5
3	10420	R FEO	0	-4.4	24.1	0.0	0	28	569145.9	5620126.5
3	10420	S FEO	0	-2.5	28.8	0.0	0	24	569145.2	5620101.5
3	10420	T FEO	0	-22.3	29.0	0.0	0	13	569114.6	5619993.0
2	10430	M	0	2.1	10.8	0.0	0	40	569297.8	5619199.5
2	10430	N	0	3.0	22.5	0.0	0	25	569266.7	5617646.5
2	10440	A	0	15.4	22.5	0.7	0	39	569459.6	5618732.5
2	10440	B	0	0.2	7.1	0.0	0	39	569443.5	5619293.5
2	10450	J	0	-1.0	6.3	0.0	0	46	569587.3	5619323.0
2	10450	K	0	7.7	11.0	0.5	5	42	569602.4	5618831.5
2	10450	M	0	8.6	14.5	0.4	0	49	569604.6	5618685.5
2	10460	A	0	10.9	24.6	0.3	9	23	569727.9	5617613.5
2	10460	B	0	12.3	30.1	0.3	9	20	569743.3	5617850.5
2	10460	C	0	16.8	28.6	0.6	0	42	569763.9	5618860.0
2	10460	D	0	13.7	26.3	0.4	2	31	569759.4	5618972.0
2	10460	E	0	2.4	9.5	0.0	0	47	569754.9	5619164.5
2	10470	G	0	14.0	40.5	0.2	0	28	569878.7	5620184.0
2	10470	H	0	11.7	17.2	0.6	2	39	569896.8	5619959.5
2	10470	J	0	8.5	13.7	0.4	13	30	569885.5	5618980.5
2	10470	K	0	15.5	19.6	0.8	0	52	569885.1	5618741.5
2	10470	M	0	6.8	16.4	0.2	7	30	569894.9	5617274.5
2	10480	A	0	7.5	16.9	0.2	5	31	570061.7	5617376.5
2	10481	A	0	9.2	15.2	0.4	0	51	570036.1	5618963.0
2	10481	B	0	7.5	16.8	0.2	1	36	570034.9	5619073.0
2	10481	C	0	10.8	16.5	0.5	0	45	570046.9	5619605.0
2	10481	D	0	10.0	24.6	0.2	0	42	570025.4	5620245.0
2	10481	E	0	7.2	16.5	0.2	0	57	570030.9	5620412.0
2	10490	F	0	10.1	34.3	0.1	0	36	570180.7	5620152.0
2	10490	G	0	10.3	15.8	0.5	0	51	570184.1	5619467.0
2	10490	H	0	7.5	18.5	0.2	0	42	570205.6	5619024.5
2	10490	J	0	9.6	18.3	0.4	0	38	570218.1	5618277.0
2	10500	A	0	6.9	25.7	0.1	1	26	570330.8	5617132.0
2	10500	B	0	9.5	16.0	0.4	3	37	570344.9	5618272.0

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.

J9772 (EXPO PROPERTY) ANOMALY LISTING

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
2	10500	C	0	10.3	18.0	0.4	0	38	570358.1	5619154.5
2	10500	D	0	19.3	30.0	0.7	0	41	570341.6	5619403.5
2	10500	E	0	9.7	30.6	0.2	0	38	570322.9	5620119.5
2	10510	G	0	12.7	27.5	0.3	0	36	570497.1	5619160.5
2	10510	H	0	5.8	14.9	0.2	2	35	570491.1	5616640.5
2	10521	A	0	5.1	10.8	0.2	1	43	570669.9	5616630.0
2	10521	B	0	5.4	31.7	0.0	0	25	570642.3	5617239.0
2	10521	C	0	-16.7	34.5	0.0	0	18	570641.7	5617361.0
2	10532	F FEO	0	-7.5	23.1	0.0	0	11	570809.7	5620137.5
2	10532	G	0	8.6	24.1	0.2	0	38	570796.6	5619533.5
2	10532	H	0	14.1	34.3	0.3	7	21	570832.8	5619010.0
2	10532	J	0	8.8	29.7	0.1	2	24	570792.8	5617295.0
2	10532	K	0	10.2	17.6	0.4	4	34	570810.8	5616541.0
2	10540	A	0	4.2	15.5	0.1	0	44	570944.1	5616841.0
2	10540	B	0	6.1	24.1	0.1	0	29	570938.9	5617191.0
2	10540	C	0	9.5	37.0	0.1	0	26	570949.2	5617908.5
2	10540	D	0	14.1	39.8	0.2	4	21	570947.8	5618171.5
2	10540	E	0	15.1	38.5	0.3	8	18	570947.4	5618962.0
2	10540	F	0	12.0	32.8	0.2	8	20	570950.1	5619201.5
2	10550	F FEO	0	-10.1	19.6	0.0	0	20	571093.6	5620014.5
2	10550	G	0	4.6	18.7	0.0	0	34	571112.9	5619404.0
2	10550	H	0	12.6	26.8	0.3	3	29	571082.4	5618822.5
2	10550	J	0	9.5	28.9	0.2	6	22	571088.3	5618169.0
2	10550	K	0	4.5	22.5	0.0	0	33	571100.4	5617566.0
2	10550	M	0	4.8	20.1	0.0	4	25	571090.5	5617086.5
2	10561	A	0	6.8	22.3	0.1	0	39	571230.7	5616922.0
2	10561	B	0	4.9	22.4	0.0	6	21	571230.4	5617119.5
2	10561	C	0	4.2	29.7	0.0	0	30	571250.4	5617321.0
2	10561	D	0	4.3	45.0	0.0	0	21	571252.3	5617394.0
2	10561	E	0	3.1	39.3	0.0	2	14	571257.9	5617452.5
2	10561	F	0	17.1	35.0	0.4	0	29	571246.5	5617915.0
2	10561	G	0	5.1	16.4	0.1	0	37	571222.6	5618186.0
2	10561	H	0	21.0	38.0	0.6	4	25	571247.3	5619008.0
2	10561	J	0	13.1	29.2	0.3	0	30	571256.9	5619349.0
2	10561	K FEO	0	-8.8	23.2	0.0	0	19	571245.5	5619835.0
2	10570	C	0	-0.2	14.2	0.0	0	42	571392.5	5619925.0
2	10570	D	0	15.7	44.3	0.3	0	28	571411.2	5619157.5
2	10570	E	0	18.7	41.2	0.4	0	30	571399.8	5618806.5

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.

J9772 (EXPO PROPERTY) ANOMALY LISTING

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
2	10570	F	0	12.7	31.0	0.3	0	32	571397.3	5618402.5
2	10571	A	0	5.1	15.1	0.1	5	30	571396.8	5617058.5
2	10571	B	0	3.8	10.4	0.1	5	37	571400.7	5616943.0
2	10580	A	0	7.1	17.7	0.2	0	41	571537.3	5617325.5
2	10580	B	0	32.5	72.6	0.5	0	24	571522.4	5618195.5
2	10580	C	0	4.9	18.8	0.1	0	37	571557.1	5619688.5
2	10580	D FEO	0	-12.2	28.7	0.0	0	13	571552.0	5620095.0
2	10580	E	0	-5.6	8.9	0.0	0	14	571548.9	5620289.5
1	10590	A	0	5.4	7.6	0.4	0	68	571709.6	5616737.5
1	10590	B	0	11.9	27.7	0.3	0	41	571711.8	5617431.0
1	10590	C	0	16.1	35.0	0.4	0	31	571707.4	5617870.0
1	10590	D	0	19.9	57.3	0.3	0	24	571699.6	5618175.0
1	10590	E	0	16.0	37.6	0.3	0	27	571697.9	5618377.0
1	10590	F	0	8.5	21.8	0.2	0	40	571696.4	5618722.0
1	10590	G	0	-1.2	26.1	0.0	0	30	571692.3	5619806.0
1	10590	H	0	1.0	16.7	0.0	0	23	571699.7	5619973.5
1	10590	J	0	0.1	13.9	0.0	0	19	571693.4	5620100.5
1	10600	E	0	6.3	25.3	0.1	0	37	571849.3	5618977.5
1	10600	F	0	3.8	10.1	0.1	0	45	571862.6	5618123.5
1	10600	G	0	6.7	19.1	0.1	0	46	571840.8	5617776.0
1	10600	H	0	7.5	11.9	0.4	3	42	571838.5	5616613.5
1	10610	A	0	6.7	8.8	0.5	20	33	572004.8	5616828.0
1	10610	B	0	10.8	22.7	0.3	0	46	571990.8	5617280.0
1	10610	C	0	8.1	20.1	0.2	8	26	571975.1	5617604.5
1	10610	D	0	4.4	15.8	0.1	9	24	571987.0	5617712.5
1	10610	E	0	7.6	24.1	0.1	3	27	571996.3	5617809.0
1	10610	F	0	-0.9	18.4	0.0	0	28	572001.7	5618068.5
1	10610	G	0	1.6	15.7	0.0	0	34	571993.4	5620528.5
1	10620	D	0	5.3	39.8	0.0	0	25	572150.3	5618057.0
1	10620	E	0	9.7	58.1	0.0	0	26	572153.4	5617987.5
1	10620	F	0	15.8	34.3	0.4	1	28	572155.2	5617876.5
1	10620	G	0	6.5	12.8	0.3	9	33	572154.0	5617635.0
1	10620	H	0	8.8	26.8	0.2	0	32	572146.2	5617434.0
1	10620	J	0	15.0	21.8	0.7	13	24	572139.9	5617190.0
1	10620	K	0	5.5	14.3	0.2	4	33	572103.3	5616485.5
1	10631	A	0	-6.0	22.4	0.0	0	44	572301.8	5618141.5
1	10631	B	0	-2.1	8.9	0.0	0	27	572300.4	5618367.0
1	10631	C	0	11.7	18.3	0.5	0	45	572291.8	5619518.0

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.

J9772 (EXPO PROPERTY) ANOMALY LISTING

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
1	10631	D	0	5.4	33.8	0.0	0	25	572304.8	5620228.5
1	10631	E	0	5.3	25.1	0.0	3	23	572304.4	5620331.5
1	10640	A	0	0.9	7.4	0.0	0	47	572449.4	5618185.0
1	10640	B	0	-3.9	16.9	0.0	0	40	572455.6	5618046.5
1	10640	C	0	-9.0	17.1	0.0	0	24	572438.9	5617916.5
1	10640	D	0	0.7	17.3	0.0	0	27	572442.3	5617839.0
1	10640	E	0	8.1	19.9	0.2	0	37	572423.3	5617686.0
1	10640	F	0	7.5	17.5	0.2	0	42	572425.9	5617629.5
1	10640	G	0	5.4	12.1	0.2	0	47	572424.4	5617579.0
1	10640	H	0	13.7	21.3	0.6	3	34	572438.1	5616946.5
1	10640	J	0	13.9	33.4	0.3	0	43	572471.9	5616641.5
1	10640	K	0	10.5	32.6	0.2	0	35	572474.9	5616516.0
1	10650	A	0	5.3	13.4	0.2	0	53	572649.8	5616497.0
1	10650	B	0	7.5	24.2	0.1	0	41	572641.7	5616754.0
1	10650	C	0	6.6	23.8	0.1	0	36	572613.1	5616862.5
1	10650	D	0	8.3	18.5	0.3	11	24	572610.3	5616939.0
1	10650	E	0	15.6	32.2	0.4	0	35	572588.6	5617317.0
1	10650	F	0	5.3	44.8	0.0	0	22	572597.6	5617565.0
1	10650	G	0	17.3	74.5	0.1	0	17	572594.9	5617795.5
1	10650	H FEO	0	-54.2	21.6	0.0	0	21	572608.3	5618304.5
1	10650	J	0	0.1	6.1	0.0	0	50	572575.5	5618647.5
1	10650	K	0	-0.8	8.7	0.0	0	31	572580.7	5618802.5
1	10650	M	0	-3.1	10.5	0.0	0	24	572591.8	5619046.0
1	10650	N	0	5.4	18.8	0.1	0	36	572617.1	5619979.5
1	10660	A	0	-3.0	18.8	0.0	0	32	572720.9	5620445.0
1	10660	B	0	0.8	27.8	0.0	0	23	572732.6	5620148.5
1	10660	C	0	-0.2	26.0	0.0	0	29	572759.4	5619696.5
1	10660	D	0	12.4	49.1	0.1	0	28	572748.7	5617770.5
1	10660	E	0	7.9	25.9	0.1	3	25	572750.1	5617715.0
1	10660	F	0	3.6	14.5	0.0	4	29	572748.1	5617552.0
1	10660	G	0	4.9	11.2	0.2	0	45	572749.9	5617422.0
1	10660	H	0	7.2	15.3	0.3	7	32	572744.1	5616996.0
1	10660	J	0	6.2	28.0	0.0	0	29	572728.1	5616613.5
1	10670	A	0	24.4	67.6	0.3	0	26	572899.9	5616357.0
1	10670	B	0	18.9	69.5	0.2	0	28	572897.9	5616463.0
1	10670	C	0	12.0	56.1	0.1	0	23	572898.1	5616573.5
1	10670	D	0	7.6	17.6	0.2	0	43	572885.3	5616830.0
1	10670	E	0	11.2	26.7	0.3	0	37	572879.9	5616972.5
1	10670	F	0	11.8	18.6	0.5	5	34	572889.7	5617241.5
1	10670	G	0	5.9	14.0	0.2	3	36	572881.0	5617401.5
1	10670	H	0	8.2	23.6	0.2	0	42	572883.3	5617672.5

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J9772 (EXPO PROPERTY) ANOMALY LISTING

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
1	10670	J	0	5.9	35.6	0.0	0	29	572881.3	5617740.0
1	10670	K	0	3.1	41.2	0.0	0	24	572876.5	5617861.0
1	10670	M	0	0.0	5.3	0.0	0	43	572884.1	5618690.5
1	10670	N	0	-3.2	19.6	0.0	0	26	572903.8	5620093.5
1	10670	O	0	-3.0	4.3	0.0	0	53	572920.4	5620413.0
1	10680	A	0	-7.1	15.6	0.0	0	15	573018.3	5618499.0
1	10680	B	0	-1.7	12.7	0.0	0	30	573047.1	5618359.5
1	10680	C	0	3.5	29.8	0.0	0	31	573053.0	5618205.0
1	10680	D	0	0.8	45.1	0.0	0	17	573046.6	5618116.0
1	10680	E	0	4.2	19.7	0.0	0	37	573057.4	5617858.5
1	10680	F	0	7.6	12.0	0.4	0	50	573050.1	5617687.5
1	10680	G	0	9.1	19.3	0.3	0	48	573054.9	5616987.0
1	10680	H	0	8.3	22.4	0.2	0	44	573059.8	5616883.5
1	10680	J	0	16.3	37.6	0.4	0	31	573069.1	5616476.5
1	10680	K	0	24.8	40.9	0.7	0	32	573077.6	5616369.0
1	10690	A	0	22.5	30.0	0.9	0	41	573242.4	5616374.5
1	10690	B	0	15.0	30.2	0.4	0	44	573233.3	5616604.0
1	10690	C	0	0.4	17.6	0.0	0	41	573227.9	5616765.5
1	10690	D	0	3.1	17.0	0.0	0	37	573217.6	5616883.5
1	10690	E	0	7.2	16.8	0.2	0	42	573214.9	5616998.0
1	10690	F	0	17.4	56.7	0.2	0	29	573206.3	5617263.0
1	10690	G	0	16.5	41.9	0.3	0	27	573190.6	5617405.0
1	10690	H	0	10.8	15.0	0.6	2	41	573164.9	5617672.0
1	10690	J	0	0.9	16.1	0.0	0	29	573161.4	5618004.5
1	10690	K	0	-1.2	21.8	0.0	0	22	573149.8	5618174.5
1	10690	M	0	-0.3	15.7	0.0	0	26	573175.9	5618317.0
1	10700	A	0	-28.3	16.9	0.0	0	20	573339.7	5618261.0
1	10700	B	0	-1.3	16.0	0.0	0	32	573339.9	5616782.0
1	10700	C	0	6.5	27.0	0.1	1	25	573344.2	5616617.5
1	10700	D	0	9.5	26.7	0.2	0	30	573348.8	5616507.5
1	10710	A	0	22.0	50.4	0.4	0	32	573541.7	5616381.5
1	10710	B	0	18.1	44.4	0.3	0	29	573534.8	5616417.0
1	10710	C	0	5.1	17.2	0.1	0	46	573515.4	5616626.0
1	10710	D	0	14.5	29.7	0.4	0	40	573483.8	5617345.0
1	10710	E	0	7.0	13.1	0.3	0	52	573483.2	5617815.0
1	10720	A	0	6.9	19.2	0.2	0	34	573634.4	5617694.5
1	10720	B	0	11.6	26.0	0.3	0	32	573629.4	5617560.0
1	10720	C	0	9.3	21.2	0.3	0	34	573639.6	5617222.0
1	10720	D	0	3.6	14.2	0.0	0	35	573649.3	5616808.5
1	10720	E	0	9.7	38.0	0.1	6	18	573643.3	5616578.5

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.

J9772 (EXPO PROPERTY) ANOMALY LISTING

FLIGHT	LINE	ANOMALY	CATEGORY	AMPLITUDE (PPM) INPHASE	QUAD.	CONDUCTOR CTP MHOS	DEPTH MTRS	BIRD HEIGHT MTRS		
1	10720	F	0	13.5	51.0	0.1	3	18	573640.0	5616415.5
1	10730	A	0	11.1	32.2	0.2	0	33	573794.9	5616373.0
1	10730	B	0	4.9	22.1	0.0	0	29	573787.6	5616514.0
1	10730	C	0	2.9	18.6	0.0	0	31	573793.7	5616553.5
1	10740	A	0	4.5	7.7	0.3	23	30	573953.6	5617763.5
1	10740	B	0	6.6	13.5	0.3	0	45	573963.6	5617327.0
1	10740	C	0	5.3	15.3	0.1	1	34	573924.5	5616585.0
1	10740	D	0	17.5	43.8	0.3	0	29	573929.8	5616361.5
1	10750	A	0	2.4	13.8	0.0	0	37	574085.9	5616472.5
1	10750	B	0	7.4	14.1	0.3	5	36	574104.9	5617596.0
1	10760	A	0	16.5	31.6	0.5	1	30	574245.5	5617298.5
1	10760	B	0	15.1	39.1	0.3	0	29	574243.9	5617243.0
1	10770	A	0	-0.3	7.8	0.0	0	48	574364.1	5616402.0
1	10770	B	0	4.2	10.2	0.1	0	61	574410.6	5617218.0
1	10780	A	0	4.2	10.4	0.1	0	47	574551.3	5617243.5
1	10810	A	0	1.0	4.1	0.0	0	93	574960.2	5617666.5
1	10820	A	0	1.7	6.4	0.0	0	68	575131.9	5617680.0

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APPENDIX IV

CERTIFICATE OF QUALIFICATION

I, Roderick W. Woolham of the town of Pickering, Province of Ontario, do hereby certify that:-

1. I am a geophysicist and reside at 1463 Fieldlight Blvd., Pickering, Ontario, L1V 2S3

2. I graduated from the University of Toronto in 1961 with a degree of Bachelor of Applied Science, Engineering Physics, Geophysics Option. I have been practising my profession since graduation.

3. I am a member in good standing of the following organizations: Professional Engineers Ontario (Mining Branch); Society of Exploration Geophysicists; South African Geophysical Association; Prospectors and Developers Association of Canada.

4. I have not received, nor do I expect to receive, any interest, directly or indirectly, in the properties or securities of Jordex Resources Inc. or any affiliate.

5. The statements contained in this report and the conclusions reached are based upon evaluation and review of maps and information supplied by Aerodat.

6. I consent to the use of this report in submissions for assessment credits or similar regulatory requirements.

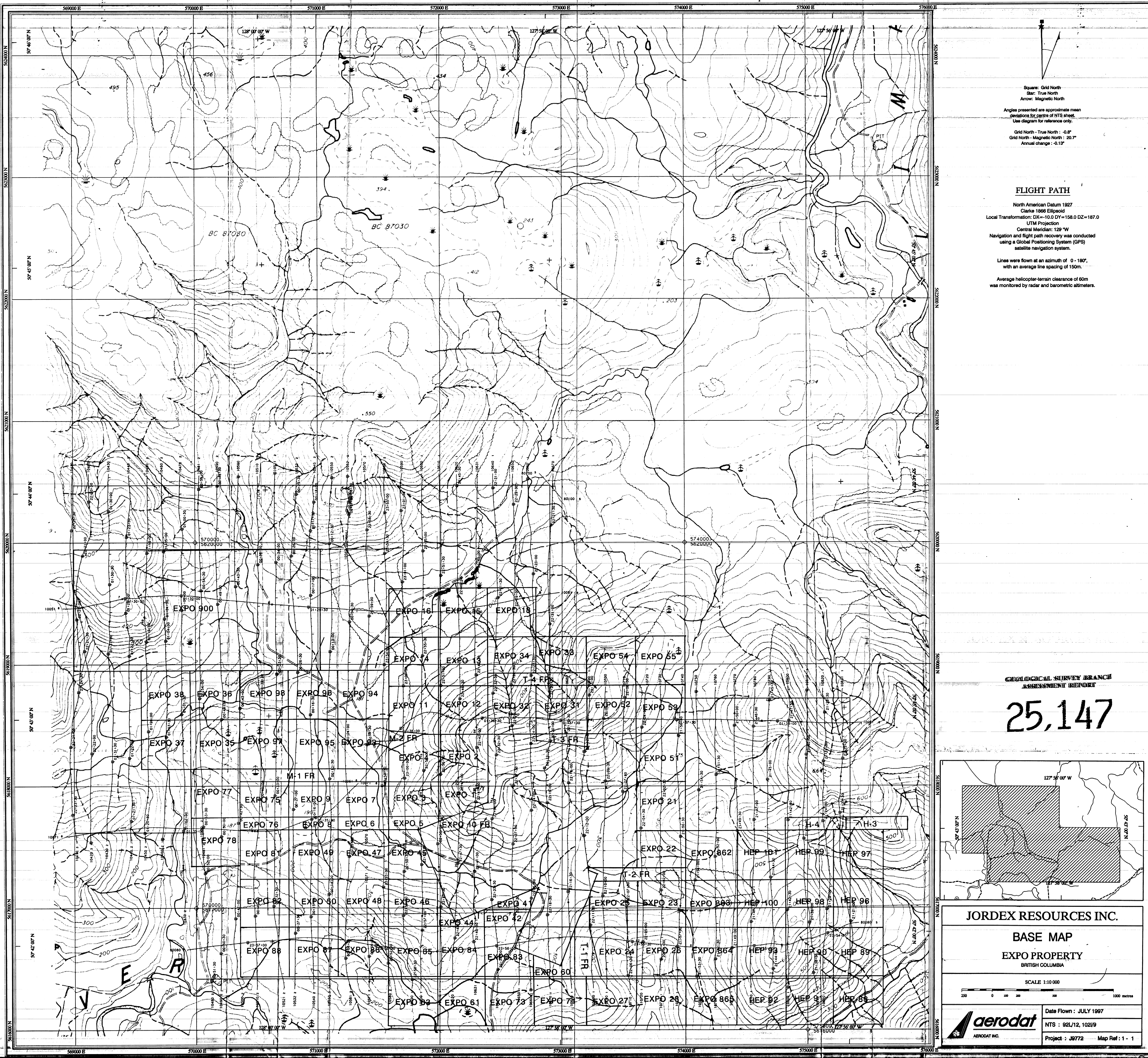
REGISTERED PROFESSIONAL ENGINEER
R. W. WOOLHAM
PROVINCE OF ONTARIO

R.W. Woolham, P.Eng.

Pickering, Ontario

J9772

August 18, 1997


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 : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°
FLIGHT PATH
North American Datum 1927
Clarke 1866 Ellipsoid
Local Transformation: DX=-10.0 DY=158.0 DZ=187.0
UTM Projection
Central Meridian: 129 °W
Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.
Lines were flown at an azimuth of 0 - 180°, with an average line spacing of 150m.
Average helicopter-terrain clearance of 60m was monitored by radar and barometric altimeters.
GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT
25,147
JORDEX RESOURCES INC.
BASE MAP
EXPO PROPERTY
BRITISH COLUMBIA
SCALE 1:10 000
250 0 100 200 500 1000 metres
aerodat
AERODAT INC.
Date Flown : JULY 1997
NTS : 92L/12, 102I/9
Project : J9772 Map Ref : 1 - 1
BC 87030
EXPO 900
EXPO 16
EXPO 15
EXPO 18
EXPO 14
EXPO 13
EXPO 34
EXPO 33
EXPO 54
EXPO 55
EXPO 38
EXPO 36
EXPO 98
EXPO 96
EXPO 94
EXPO 11
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EXPO 32
EXPO 31
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EXPO 95
EXPO 93
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EXPO 2
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EXPO 3
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EXPO 25
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HEP 100
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HEP 96
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HEP 89
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EXPO 27
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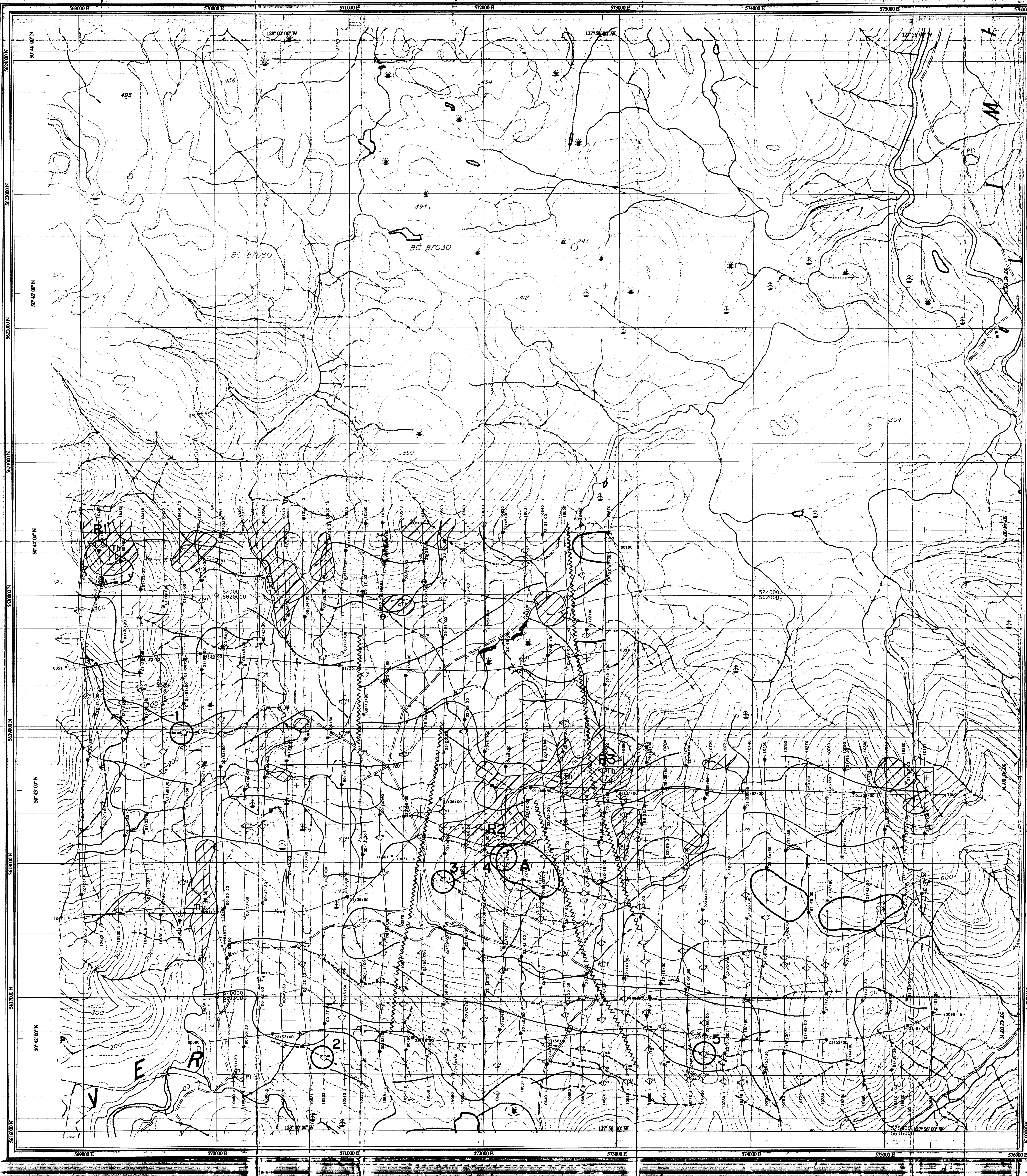
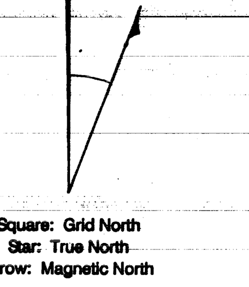
572000 E
573000 E
574000 E
575000 E
576000 E
5624000 N
5623000 N
5622000 N
5621000 N
5620000 N
5619000 N
5618000 N
5617000 N
5616000 N
50° 46' 00" N
50° 45' 00" N
50° 44' 00" N
50° 43' 00" N
50° 42' 00" N
128° 00' 00" W
127° 58' 00" W
127° 56' 00" W





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FLIGHT PATH

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Clarke 1866 Ellipsoid
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UTM Projection
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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.

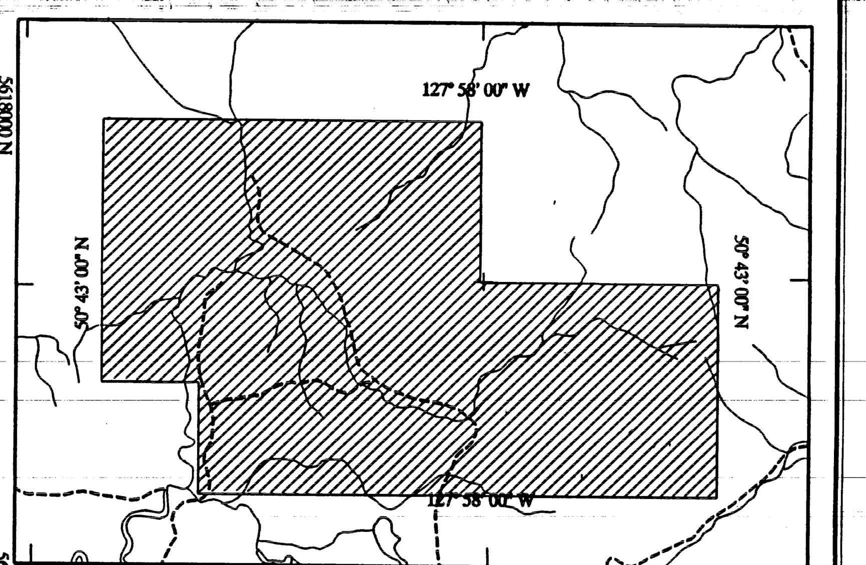
0 - 1 mhos
1 - 2 mhos
2 - 4 mhos
4 - 8 mhos
8 - 16 mhos
16 - 32 mhos
> 32 mhos
Magnetite

INTERPRETATION

Relatively high amplitude magnetic zone
Other magnetic trend
Non-magnetic below background zone
Conductive trend
Anomalous potassium channel response
Th Anomalous threshold thorium channel response
Fault/contact structure interpreted from magnetics
B Anomalous magnetic response designated for investigation
3 Anomalous conductive response designated for investigation
R2 Anomalous radiometric response designated for investigation

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,147



JORDEX RESOURCES INC.

INTERPRETATION

EXPO PROPERTY

BRITISH COLUMBIA

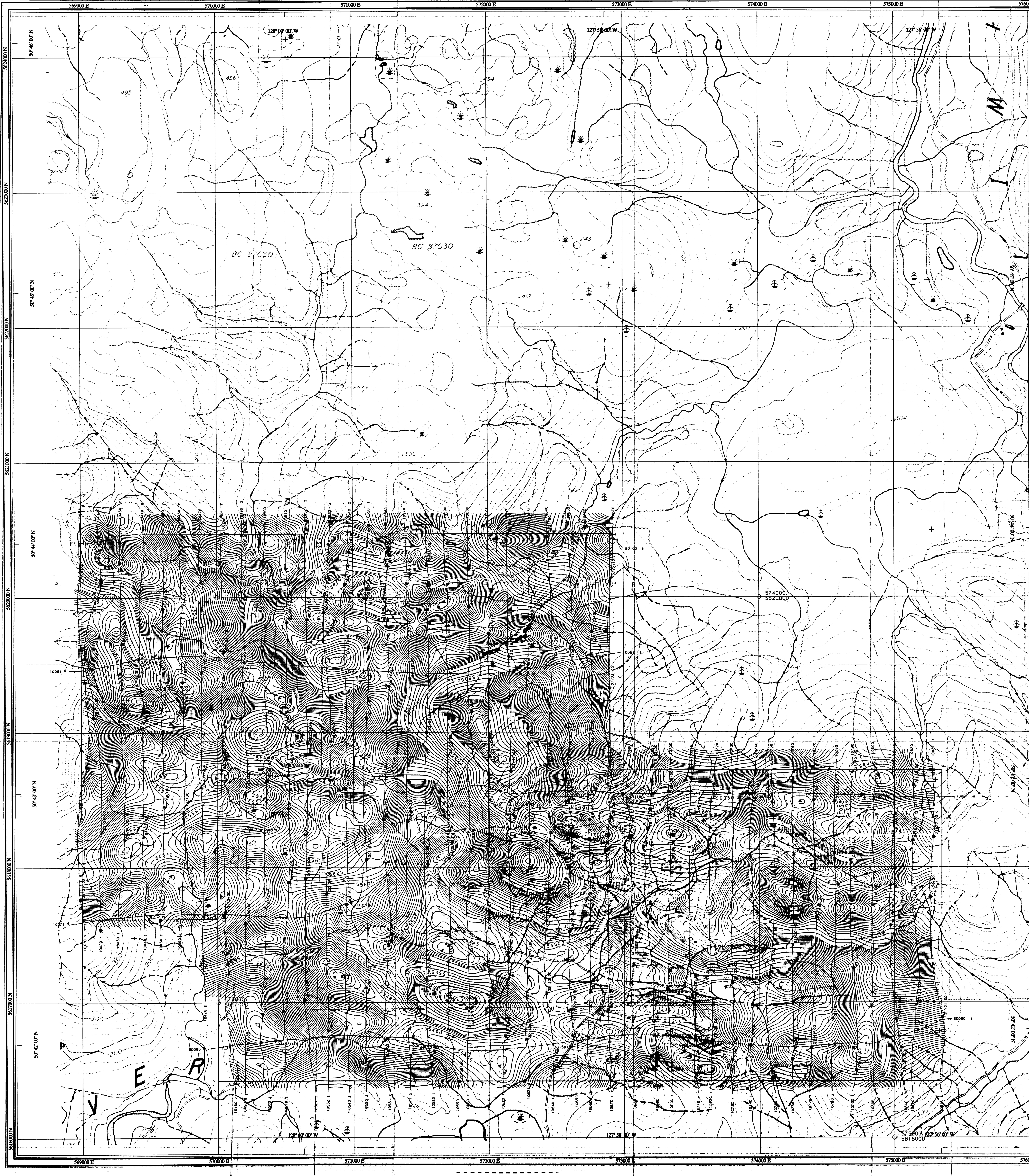
SCALE 1:10 000

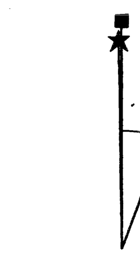
250 0 100 200 500 1000 metres

aerodat
AERODAT INC.

Date Flown : JULY 1997
NTS : 92L/12, 102I/9
Project : J9772 Map Ref : 1 - 2

2





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Grid North - True North : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°

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:

5 nT
25 nT
100 nT
500 nT
2000 nT

FLIGHT PATH

North American Datum 1927
Clarke 1866 Ellipsoid
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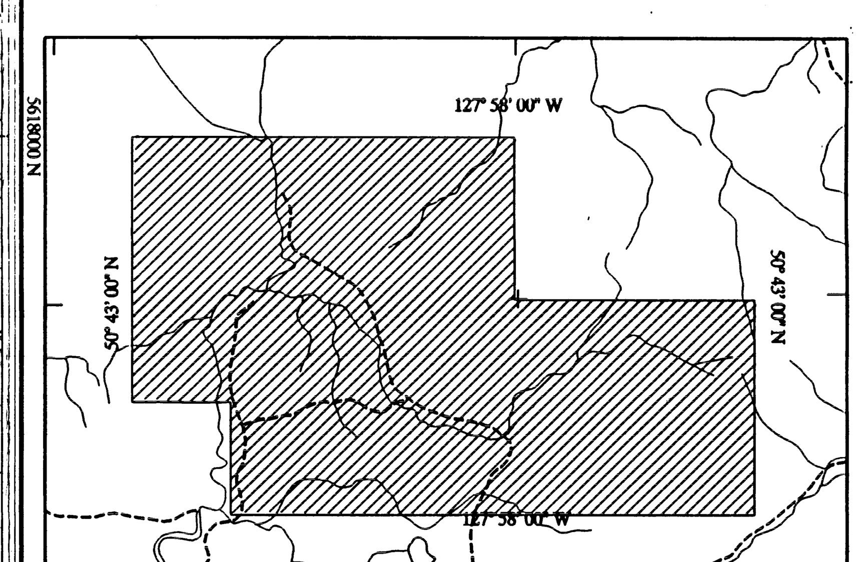
1 - 2 mhos
2 - 4 mhos
4 - 8 mhos
8 - 16 mhos
16 - 32 mhos
> 32 mhos
Magnetite

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,147



JORDEX RESOURCES INC.

TOTAL FIELD MAGNETICS

EXPO PROPERTY

BRITISH COLUMBIA

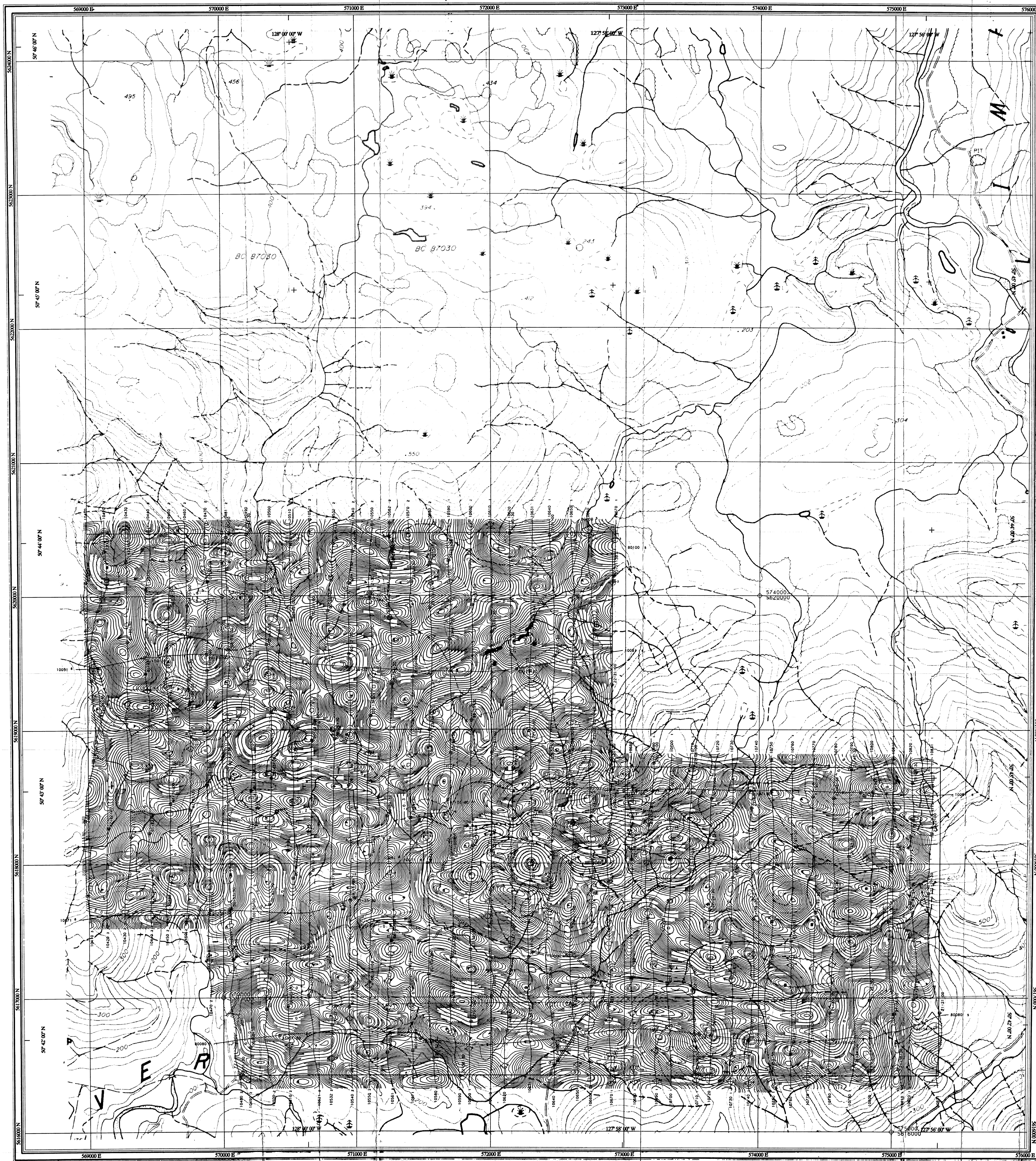
SCALE 1:10 000

250 0 100 200 500 1000 metres

aerodat
AERODAT INC.

Date Flown : JULY 1997
NTS : 92L/12, 102I/9
Project : J9772 Map Ref : 1 - 3

3



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 : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°

VERTICAL GRADIENT

Vertical magnetic gradient contour data, calculated from the gridded total field magnetics data by a 17x17 convolution filter.

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

0.025 nT/m
0.100 nT/m
0.500 nT/m
2.000 nT/m
10.00 nT/m

FLIGHT PATH

North American Datum 1927
Clarke 1866 Ellipsoid
Local Transformation: DX=-10.0 DY=158.0 DZ=187.0
UTM Projection
Central Meridian: 129 °W
Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 0 - 180°, with an average line spacing of 150m.

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.

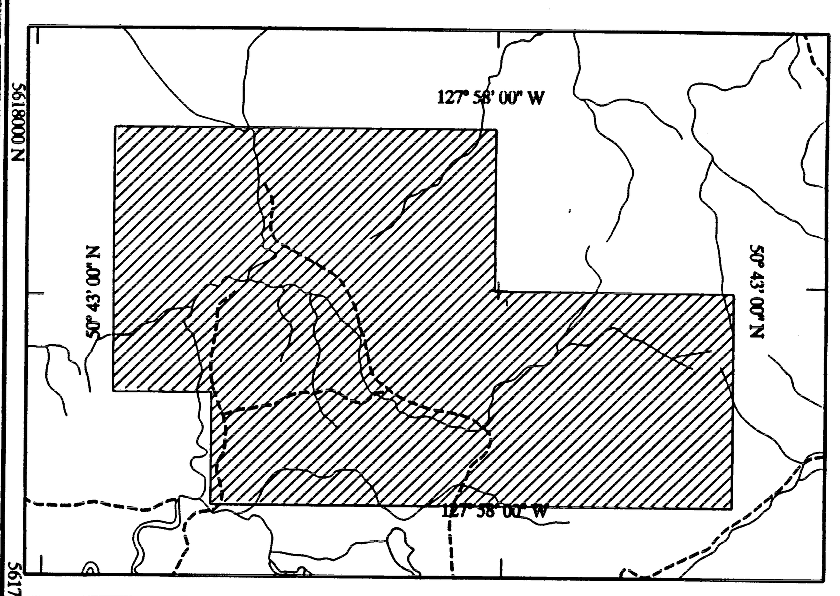
Calculation of conductance is based on the response of the 4600 Hz coaxial data, and forms the basis for anomaly classification.

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
Magnetite

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,147



JORDEX RESOURCES INC.

VERTICAL MAGNETIC GRADIENT

EXPO PROPERTY

BRITISH COLUMBIA

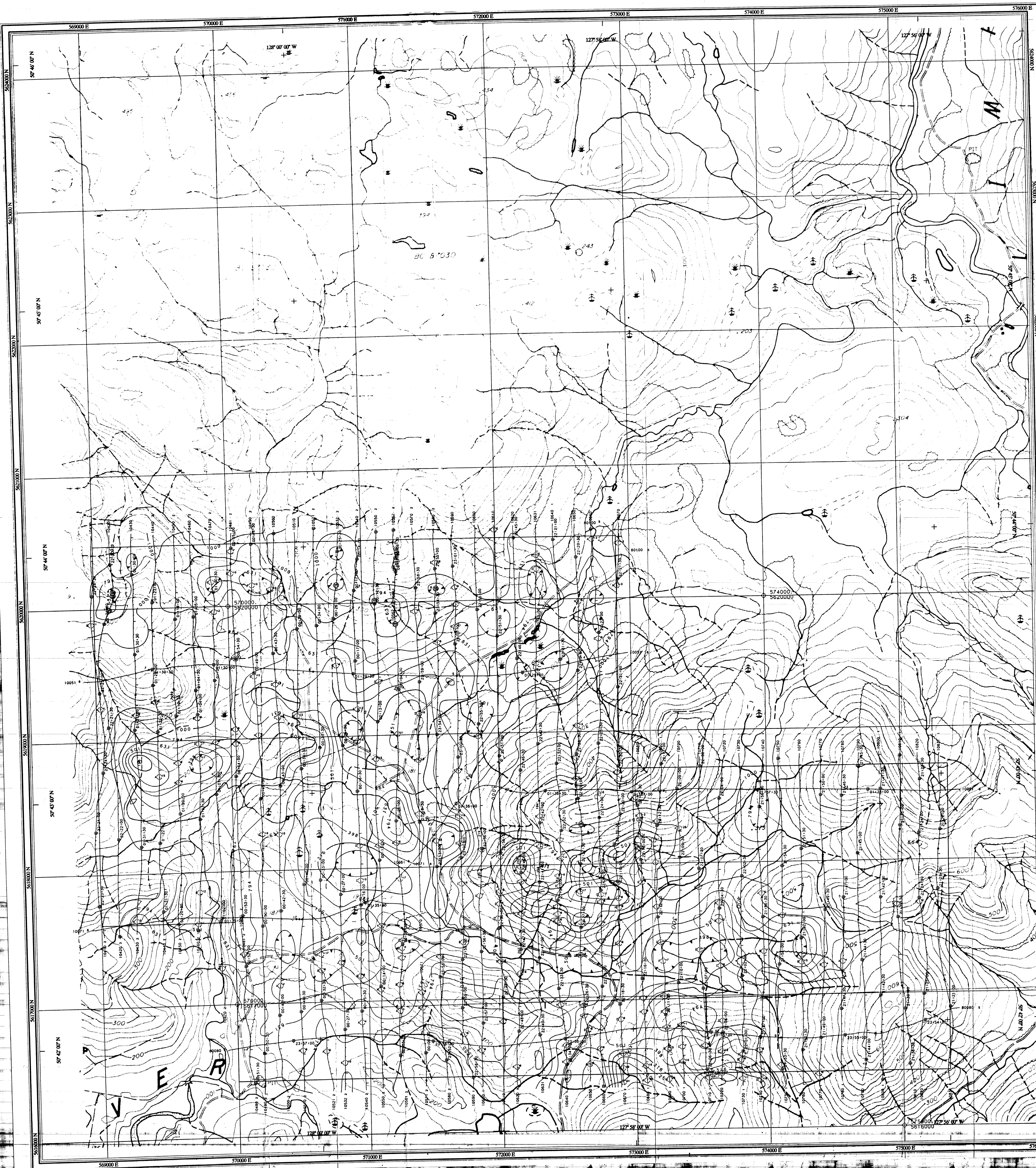
SCALE 1:10 000

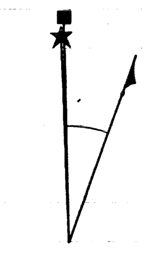
250 0 100 200 500 1000 metres

AERODAT INC.

Date Flown : JULY 1997
NTS : 92L/12, 102I/9
Project : J9772 Map Ref : 1 - 4

(4)





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 : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°

APPARENT RESISTIVITY

Apparent resistivity calculated from the measured 800 Hz coplanar EM response, assuming a resistive half-space (200m) model. Average sensor elevation was 30m.

Map contours are in ohm·m, at logarithmic intervals, in multiples of those listed below:

0.1 log(ohm·m)
0.5 log(ohm·m)
2.0 log(ohm·m)

FLIGHT PATH

North American Datum 1927
Clarke 1866 Ellipsoid
Local Transformation: DX=-10.0 DY=158.0 DZ=187.0
UTM Projection
Central Meridian: 129 °W
Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 0 - 180°, with an average line spacing of 150m.

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.

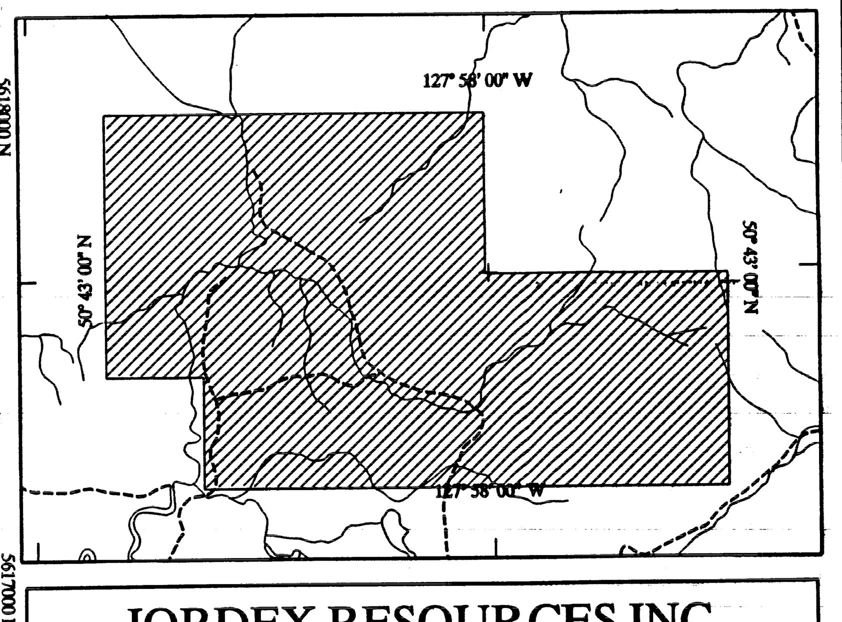
Calculation of conductance is based on the response of the 4600 Hz coaxial data, and forms the basis for anomaly classification.

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
Magnetite

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,147



JORDEX RESOURCES INC.

APPARENT RESISTIVITY
800 Hz COPLANAR

EXPO PROPERTY
BRITISH COLUMBIA

SCALE 1:10 000

250 0 100 200 500 1000 metres

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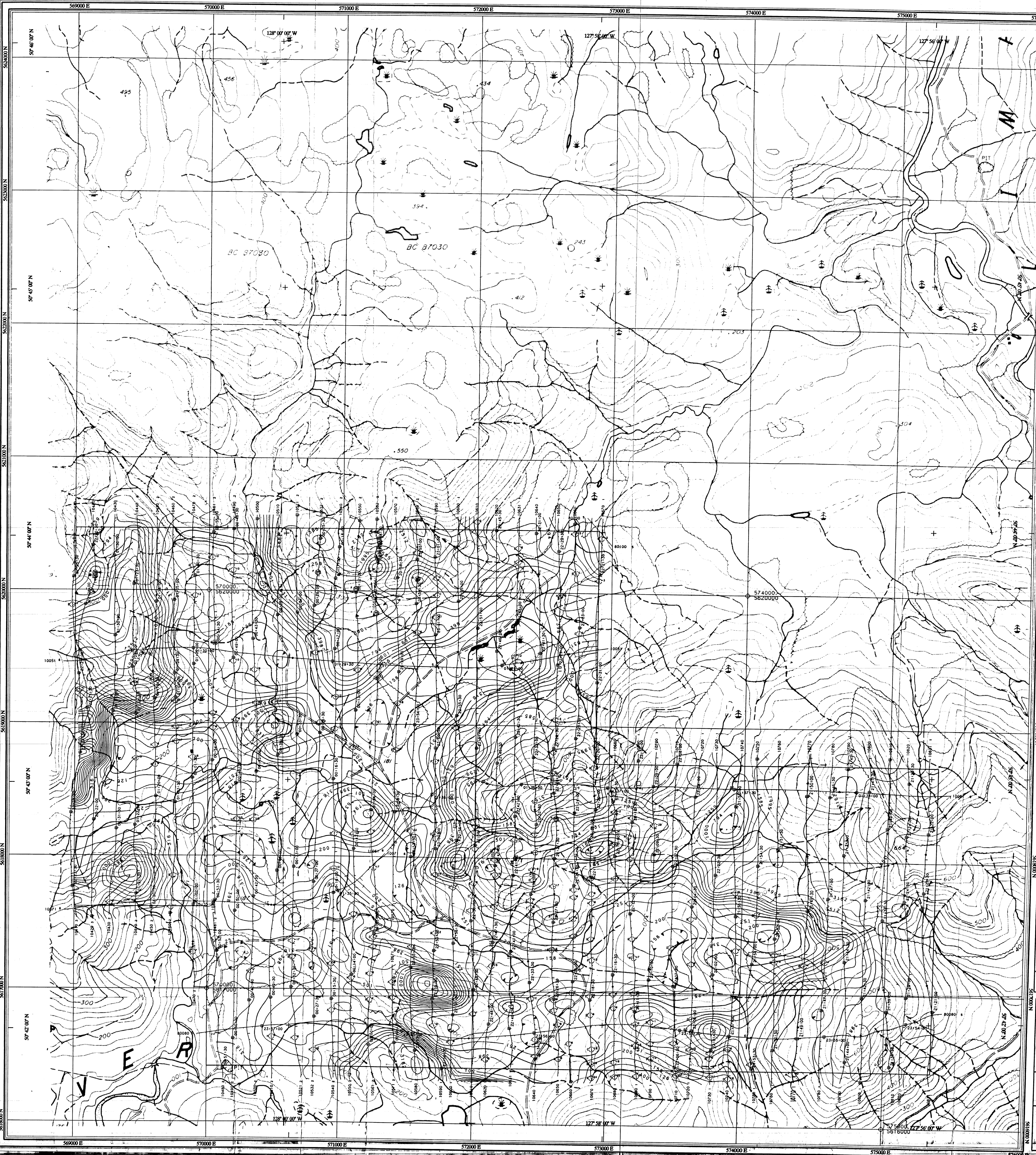
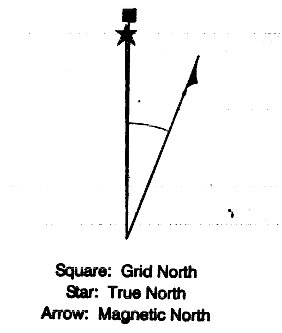
AERODAT INC.

Date Flown : JULY 1997
NTS : 92L/12, 102I/9
Project : J9772 Map Ref : 1-5A





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 : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°

APPARENT RESISTIVITY

Apparent resistivity calculated from the measured 4175 Hz coplanar EM response, assuming a resistive half-space (200m) model. Average sensor elevation was 30m.

Map contours are in ohm·m, at logarithmic intervals, in multiples of those listed below:

0.1 log(ohm·m)
0.5 log(ohm·m)
2.0 log(ohm·m)

FLIGHT PATH

North American Datum 1927
Clarke 1866 Ellipsoid
Local Transformation: DX=-10.0 DY=158.0 DZ=187.0
UTM Projection
Central Meridian: 129 °W
Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 0 - 180°, with an average line spacing of 150m.

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.

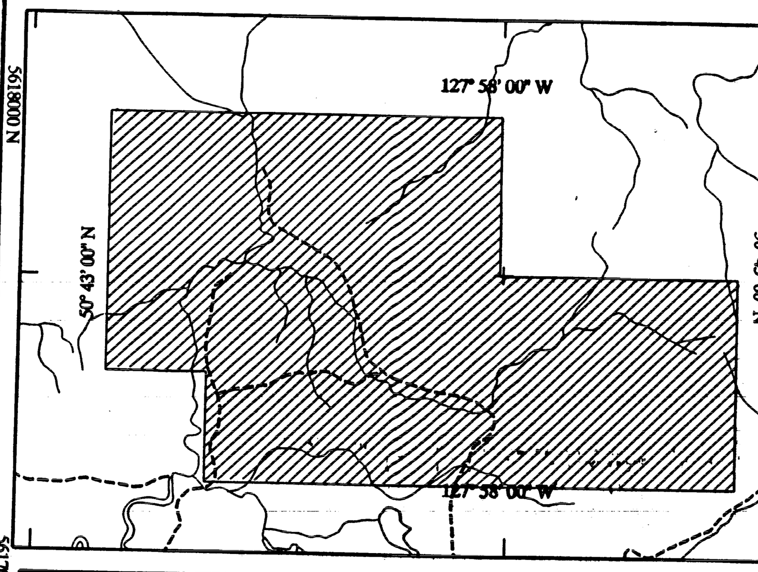
Calculation of conductance is based on the response of the 4600 Hz coaxial data, and forms the basis for anomaly classification.

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
Magnetite

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,147



JORDEX RESOURCES INC.

APPARENT RESISTIVITY
4175 Hz COPLANAR

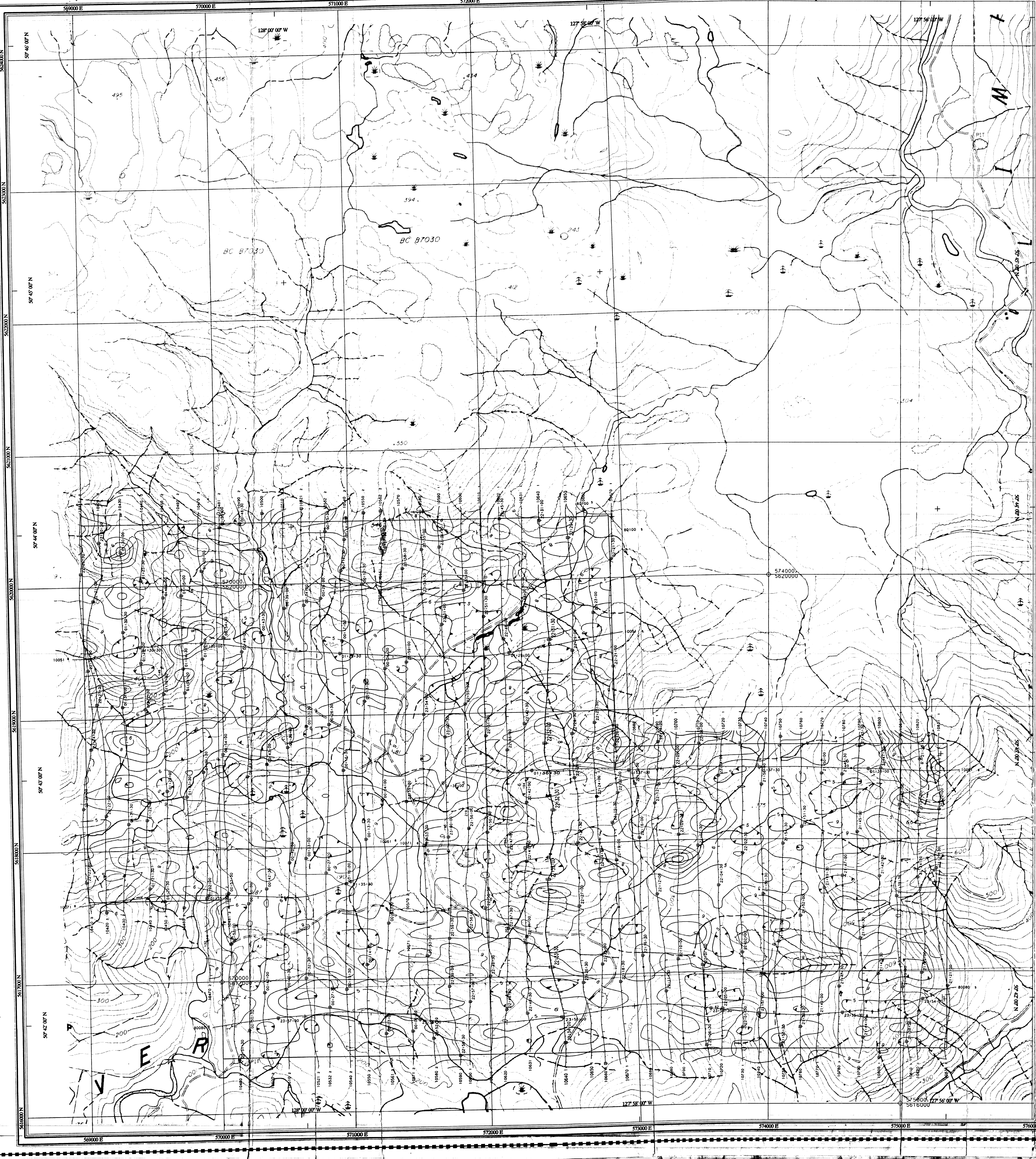
EXPO PROPERTY
BRITISH COLUMBIA

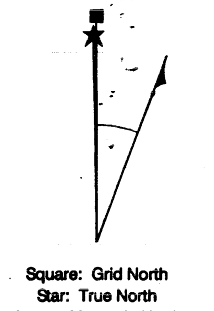
SCALE 1:10 000

250 0 100 200 500 1000 metres

aerodat
AERODAT INC.

Date Flown : JULY 1997
NTS : 92L/12, 102I/9
Project : J9772 Map Ref : 1 -5B





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 : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°

RADIOMETRICS

Uranium count radiometric contour data measured by a 256 channel spectrometer system mounted in the helicopter at an average sensor elevation of 60m. Corrections were made for cosmic and background emissions, Compton scatter, and altitude variation.

Map contours are in counts/second, and are multiples of those listed below:

1 cps
5 cps
25 cps

FLIGHT PATH

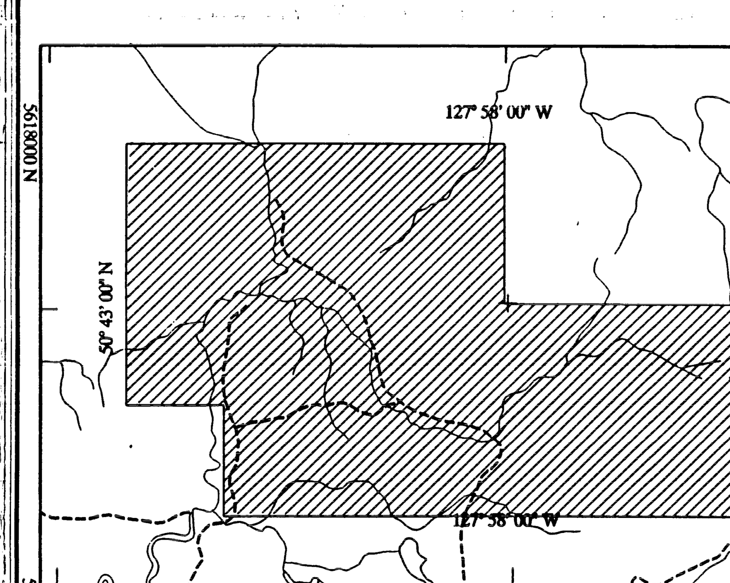
North American Datum 1927
Clarke 1866 Ellipsoid
Local Transformation: DX=-10.0 DY=158.0 DZ=187.0
UTM Projection
Central Meridian: 129 °W
Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 0 - 180°, with an average line spacing of 150m.

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

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,147



JORDEX RESOURCES INC.

URANIUM COUNT RADIOMETRICS

EXPO PROPERTY

BRITISH COLUMBIA

SCALE 1:10 000

250 0 100 200 500 1000 metres

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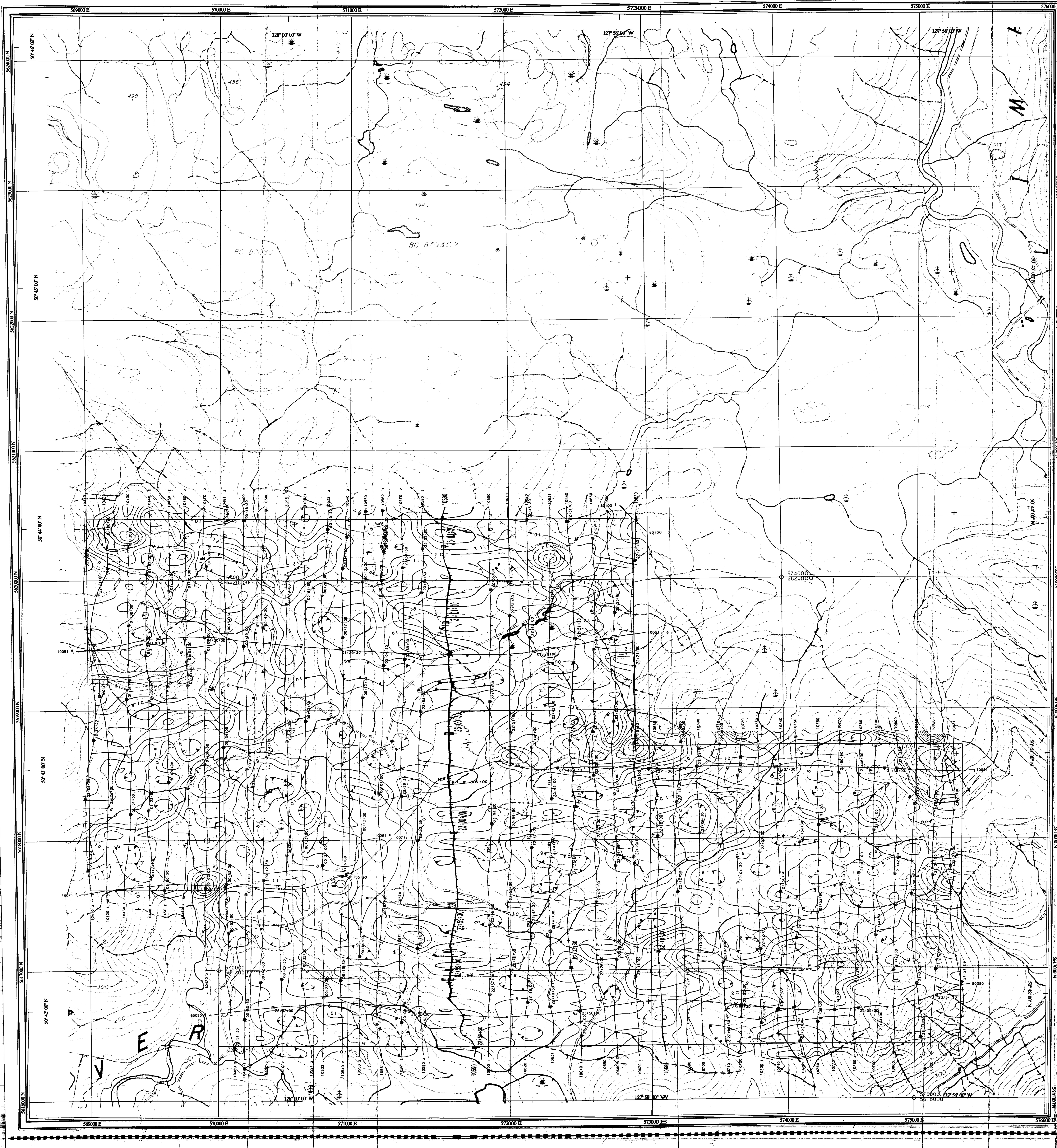
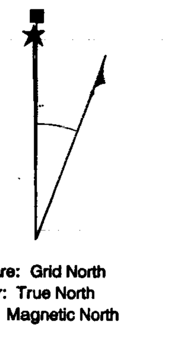
Date Flown : JULY 1997
NTS : 92L/12, 102I/9
Project : J9772 Map Ref : 1 -5A





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

Grid North - True North : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°

RADIOMETRICS

Thorium count radiometric contour data measured by a 256 channel spectrometer system mounted in the helicopter at an average sensor elevation of 60m. Corrections were made for cosmic and background emissions, Compton scatter, and altitude variation.

Map contours are in counts/second, and are multiples of those listed below:

1 cps
5 cps
25 cps

FLIGHT PATH

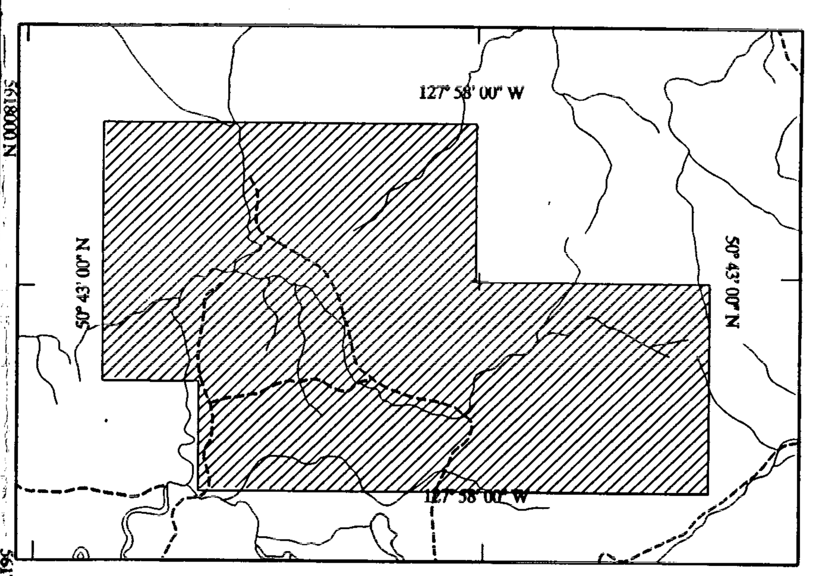
North American Datum 1927
Clarke 1866 Ellipsoid
Local Transformation: DX=-10.0 DY=158.0 DZ=187.0
UTM Projection
Central Meridian: 129 °W
Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 0 - 180°, with an average line spacing of 150m.

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

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,147



JORDEX RESOURCES INC.

THORIUM COUNT RADIOMETRICS

EXPO PROPERTY

BRITISH COLUMBIA

SCALE 1:10 000

250 0 100 200 500 1000 metres

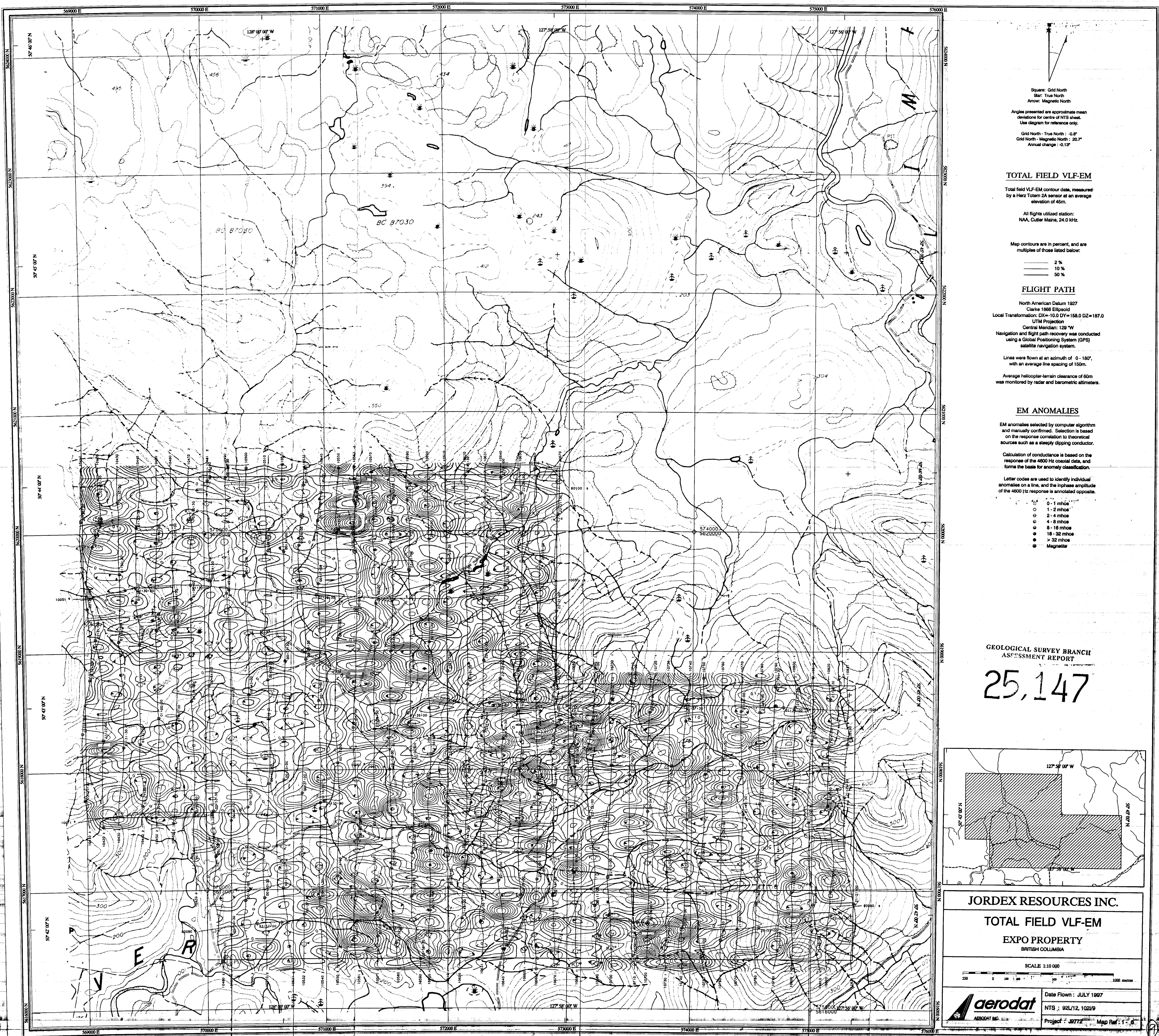
AERODAT INC.

Date Flown : JULY 1997

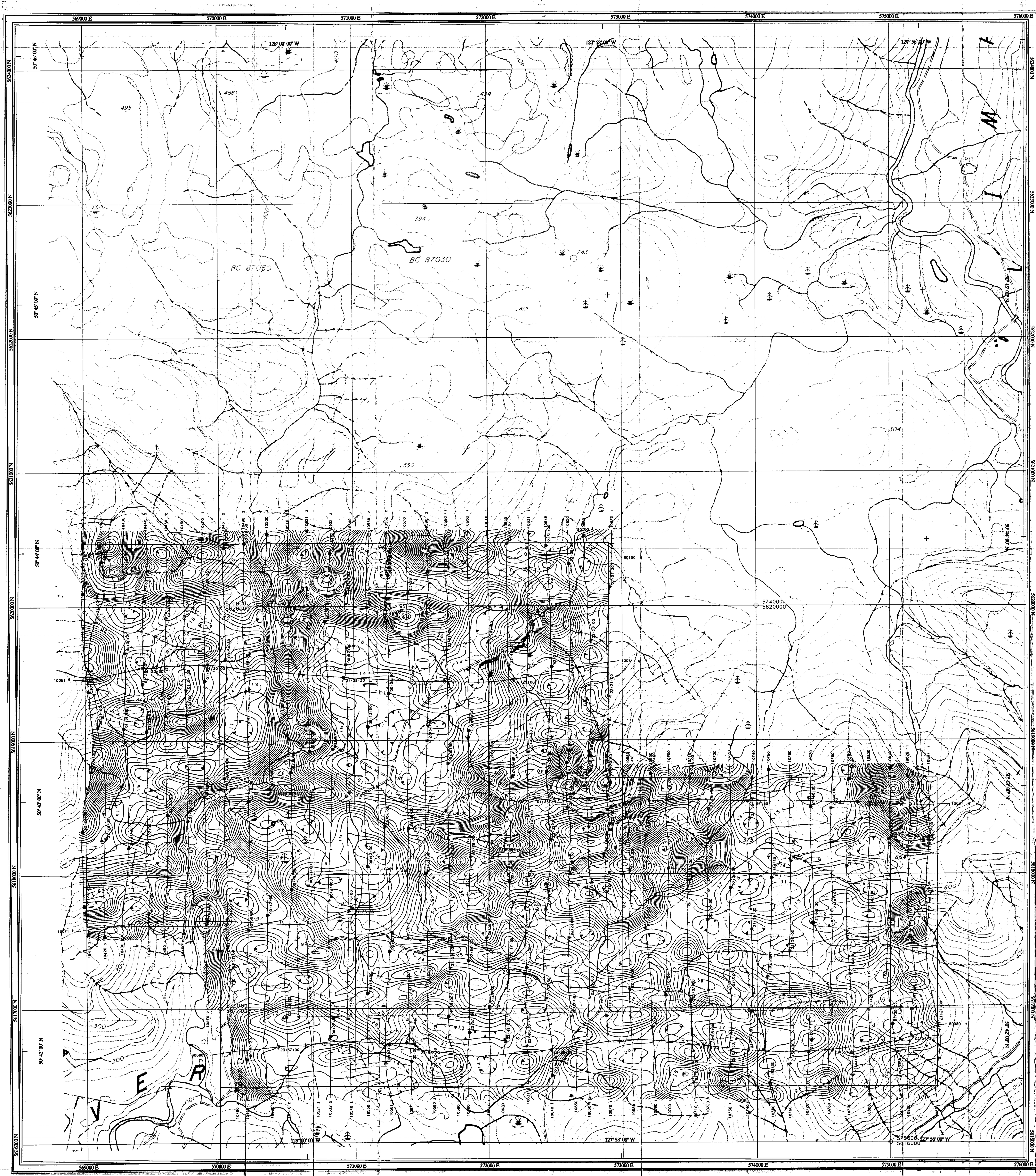
NTS : 92L/12, 102I/9

Project : J9772 Map Ref : 1 -5B

8



BC 87030
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 : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°
TOTAL FIELD VLF-EM
Total field VLF-EM contour data, measured by a Herz Totem 2A sensor at an average elevation of 45m.
All flights utilized station: NAA, Cutler Maine, 24.0 kHz.
Map contours are in percent, and are multiples of those listed below:
2 %
10 %
50 %
FLIGHT PATH
North American Datum 1927
Clarke 1866 Ellipsoid
Local Transformation: DX=-10.0 DY=158.0 DZ=187.0
UTM Projection
Central Meridian: 129 °W
Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.
Lines were flown at an azimuth of 0 - 180°, with an average line spacing of 150m.
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
Magnetite
GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT
25,147
JORDEX RESOURCES INC.
TOTAL FIELD VLF-EM
EXPO PROPERTY
BRITISH COLUMBIA
SCALE 1:10 000
250
0
100
200
500
1000 metres
AERODAT INC.
Date Flown : JULY 1997
NTS : 92L/12, 102I/9
Project : J9772
Map Ref : 1 - 6



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 : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°

RADIOMETRICS

Potassium count radiometric contour data measured by a 256 channel spectrometer system mounted in the helicopter at an average sensor elevation of 60m. Corrections were made for cosmic and background emissions, Compton scatter, and altitude variation.

Map contours are in counts/second, and are multiples of those listed below:

1 cps
5 cps
25 cps

FLIGHT PATH

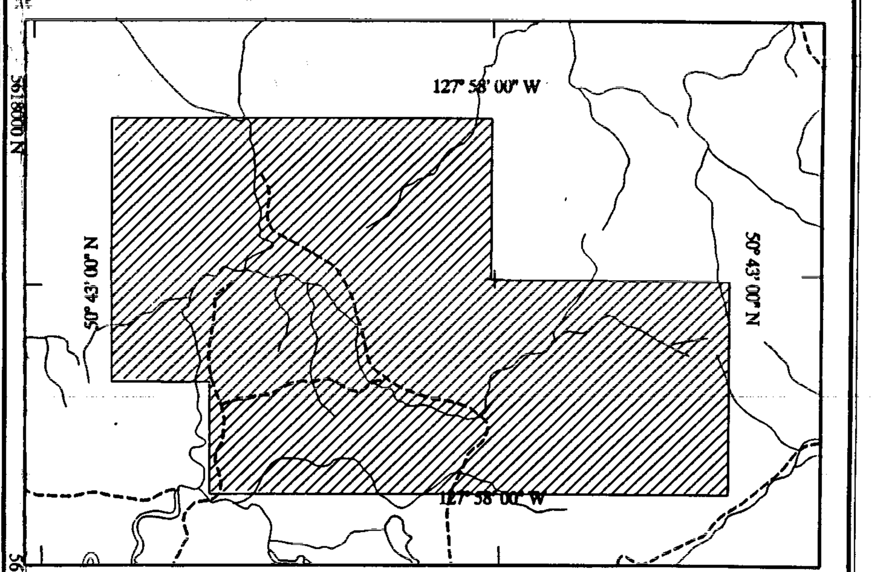
North American Datum 1927
Clarke 1866 Ellipsoid
Local Transformation: DX=-10.0 DY=158.0 DZ=187.0
UTM Projection
Central Meridian: 129 °W
Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 0 - 180°, with an average line spacing of 150m.

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

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,147



JORDEX RESOURCES INC.

POTASSIUM COUNT RADIOMETRICS

EXPO PROPERTY

BRITISH COLUMBIA

SCALE 1:10 000

250 0 100 200 500 1000 metres

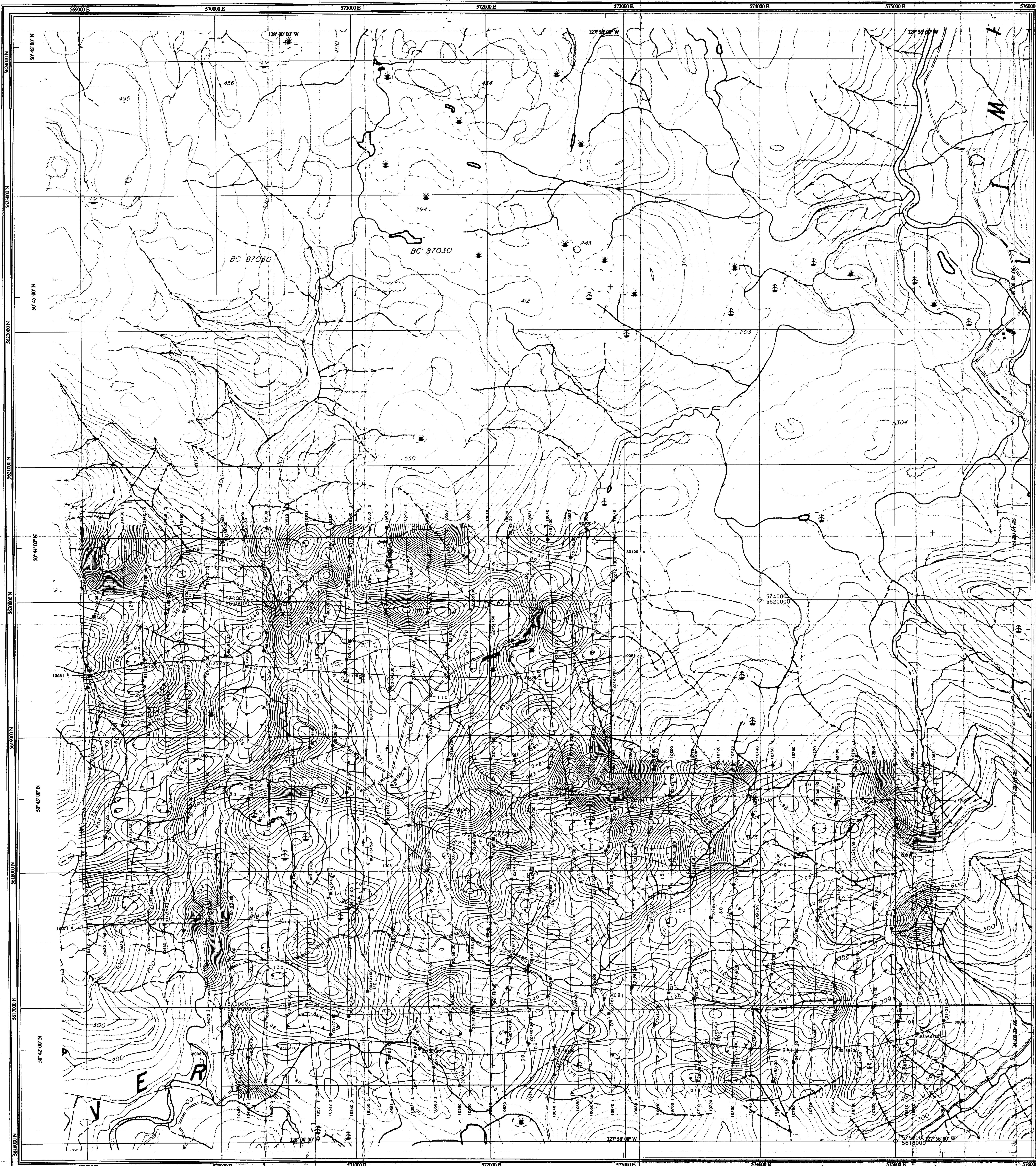
AERODAT INC.

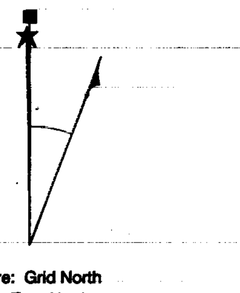
Date Flown : JULY 1997

NTS : 92L/12, 102I/9

Project : J9772 Map Ref : 1 -7C

10





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 : -0.8°
Grid North - Magnetic North : 20.7°
Annual change : -0.13°

RADIOMETRICS

Total count radiometric contour data measured by a 256 channel spectrometer system mounted in the helicopter at an average sensor elevation of 60m. Corrections were made for cosmic and background emissions, Compton scatter, and altitude variation.

Map contours are in counts/second, and are multiples of those listed below:

10 cps
50 cps
250 cps

FLIGHT PATH

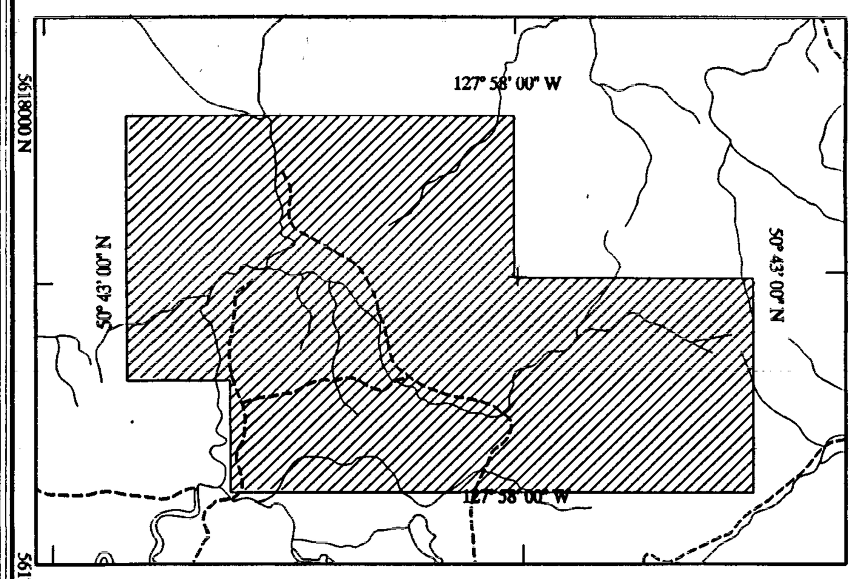
North American Datum 1927
Clarke 1866 Ellipsoid
Local Transformation: DX=-10.0 DY=158.0 DZ=187.0
UTM Projection
Central Meridian: 129 °W
Navigation and flight path recovery was conducted using a Global Positioning System (GPS) satellite navigation system.

Lines were flown at an azimuth of 0 - 180°, with an average line spacing of 150m.

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

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

25,147



JORDEX RESOURCES INC.

TOTAL COUNT RADIOMETRICS

EXPO PROPERTY

BRITISH COLUMBIA

SCALE 1:10 000

250 0 100 200 500 1000 metres

aerodat
AERODAT INC.

Date Flown : JULY 1997
NTS : 92L/12, 102I/9
Project : J9772 Map Ref : 1 -7D