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GEOPHYSICAL SURVEY REPORT

on an

AIRBORNE MAGNETOMETER AND AN

AIRBORNE RADIOMETRIC SURVEY

of

A Portion of the

Highland Valley Area

Located

In the

Southern Interior of British Columbia

Latitude 53° 30'N Longitude 121° 00'W

N.T.S. 92I

by

Geo-X Surveys Ltd.
Vancouver, B.C.

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PREFACE

Magnetic susceptibility may change perceptibly from one lithologic unit to another; thus accurate detailed mapping of the geomagnetic field often provides valuable information about subsurface geology, even in heavily drift covered areas. Aeromagnetic surveying can aid in the delineation of buried contacts and disruptions, or the location of areas of possible plutonic differentiation. Often local magnetic patterns associated with known ore bodies can be identified, and the existence of similar variations in magnetic intensity elsewhere may lead to the discovery of new ore bodies.

Radioactivity may likewise vary from one rock type to another and can be used as a geological mapping tool. Both the total gamma ray count and the K-40 are used as indirect geologic aids. The measurement of K-40 is particularly useful in that potassium -40 is in greater abundance in acidic intrusives, and related rocks and frequently (associated with K-feldspars) in areas of certain varieties of hydrothemal alteration. However, the usefulness of this method is somewhat limited because of the variation in overburden thickness and extent, and variation in terrain clearance.

INTRODUCTION

During the month of January, 1970 some 1600 line miles of combined airborne magnetometer and spectrometer surveying were conducted. This report describes the survey procedure, data acquisition and data reduction.

LOCATION AND ACCESS

The Highland Valley area is located roughly between the villages of Ashcroft and Merritt in the southern central portion of the province of British Columbia. The portion of the Highland Valley covered by this survey involves some 143 square miles. Figure 1 shows the survey area with respect to a general claims map of this portion of the Highland Valley.

Access to the Highland Valley is by all weather road from either Ashcroft or Merritt.

GENERAL SETTING

The survey area lies within the Thompson Plateau physiographic subdivision of British Columbia. This area is characterized by a gently rolling upland surface of moderate relief with prominences up to just

over 5500 feet. The highest point in the immediate area is Gnawed Mountain (5,953 feet). The elevation decreases rather rapidly to the north, towards the Highland Valley road, and more gently to the east and west.

The area was occupied by Pleistocene ice and a mantle of drift covers a large part of the bedrock. The general area is underlain dominently by Coast Intrusives of granite, granodiorite and quartz diorite (Guichon Batholith) which is overlain to the east and north by patches of Miocene Kamloops group volcanics. The batholith is a composite one and is composed of several ages and phases of intermediate and acidic intrusives.

AIRBORNE FIELD PROCEDURE

The aeromagnetic and aeroradiometric data were measured and recorded along 144 flight lines flown in an east-west direction at an average terrain clearance of 500 feet and with an average line spacing of some 600 feet. Five tie lines were flown consecutively in a north-south direction.

The survey was flown in a fixed wing aircraft, towing an airfoil sensor. A proton magnetometer, DiGRS 2000 spectrometer, digital and chart recorders, camera and

altimeter were mounted in the aircraft. The magnetometer, spectrometer and chart recorders continuously measured and recorded the magnetic field intensity, terrain clearance and radiometric data (Total count, K-40, Tl-208, Bi-214). At one second intervals, the magnetic and radiometric intensities and fiducial number were recorded on punch tape by the digital recording system. At thirty second intervals, the time and line number were punched on the tape. At two second intervals, a split image camera simultaneously photographed (1) the terrain, and (2) the clock and fiducial display panel. Thus each terrain photograph is bordered by a photograph of the clock and fiducial number.

The terrain clearance was measured with a Bonzar pulse type radar altimeter and recorded by a G-2000 chart recorder.

Solar flare warning and predictions, issued daily at the Space Disturbance Forecast Center in Boulder, Colorado, were used to schedule flights during magnetically quiet periods. The punch tape, chart and strip photograph processing is described in the following section. Instrument specifications are located in Appendix I.

DATA PROCESSING

The data processing consisted of 4 steps discussed under the following headings:

(1) Flight line positioning

(2) Paper tape editing and magnetic tape generation

(3) Variable selection and grid interpolation

(4) Mathematical analysis, computation, contouring

1. FLIGHT LINE POSITIONING

(a) Photographic Location Data

Terrain photographs taken in flight are bordered by an image of the clock-fiducial display. On each line certain prominent topographical features are recognized by comparing the terrain photograph with an air-photograph mosaic. The fiducial numbers associated with these features are marked on the line and data points are then evenly distributed along the line between these known positions.

(b) X-Y Location

An arbitrary rectangular coordinate system was superimposed on the flight line data observed by (a) above, with +Y north and +X east. The position of each data point is uniquely described by X (distance east of origin) and Y (distance north of origin).

2. PAPER TAPE EDITING AND MAGNETIC TAPE GENERATION

A listing of the contents of the paper tapes was made using an IBM computer as the data were transferred from paper tape to magnetic tape. The listing was examined and machine and operator errors corrected. A unique "sequence number" was given to each data point and its coordinates (position) calculated. Thus the magnetic data tape consists of a series of "field records", each field record comprising a sequence number, the X,Y coordinates of the point and the data from that point.

3. VARIABLE SELECTION AND GRID INTERPOLATION

The field records described above contain five magnetic and gamma ray spectrometer data, only one or one combination of which may be mapped at any one time. The variable to be mapped, (Z), is calculated or directly transferred to a work tape whose format is described by; sequence number, X,Y,Z.

The spectrometer data tape was input to programs obtained from Varian Associates, Palo Alto, California. These programs take the flight line data and by mathematical manipulation interpolate the 'random' linear data points to the intersection point of a uniform grid covering the area. This process also involves a controllable amount of filtering and/or smoothing.

The magnetometer data was input to a cubic spline function interpolator program. This program uses a technique considered to be more suitable for the data from this survey.

4. MATHEMATICAL ANALYSIS, COMPUTATION, CONTOURING

The interpolated grid obtained by the processes described above is most suitable for various forms of computerized mathematical analysis (i.e.) trend surface removal, Fourier filtering, etc.) or may be directly input to the mapping program. The contour mapping program produces a plot tape which enables maps to be produced offline on any compatible plotter. These plots are then checked and title blocks drafted on to produce the final map.

DATA PRESENTATION

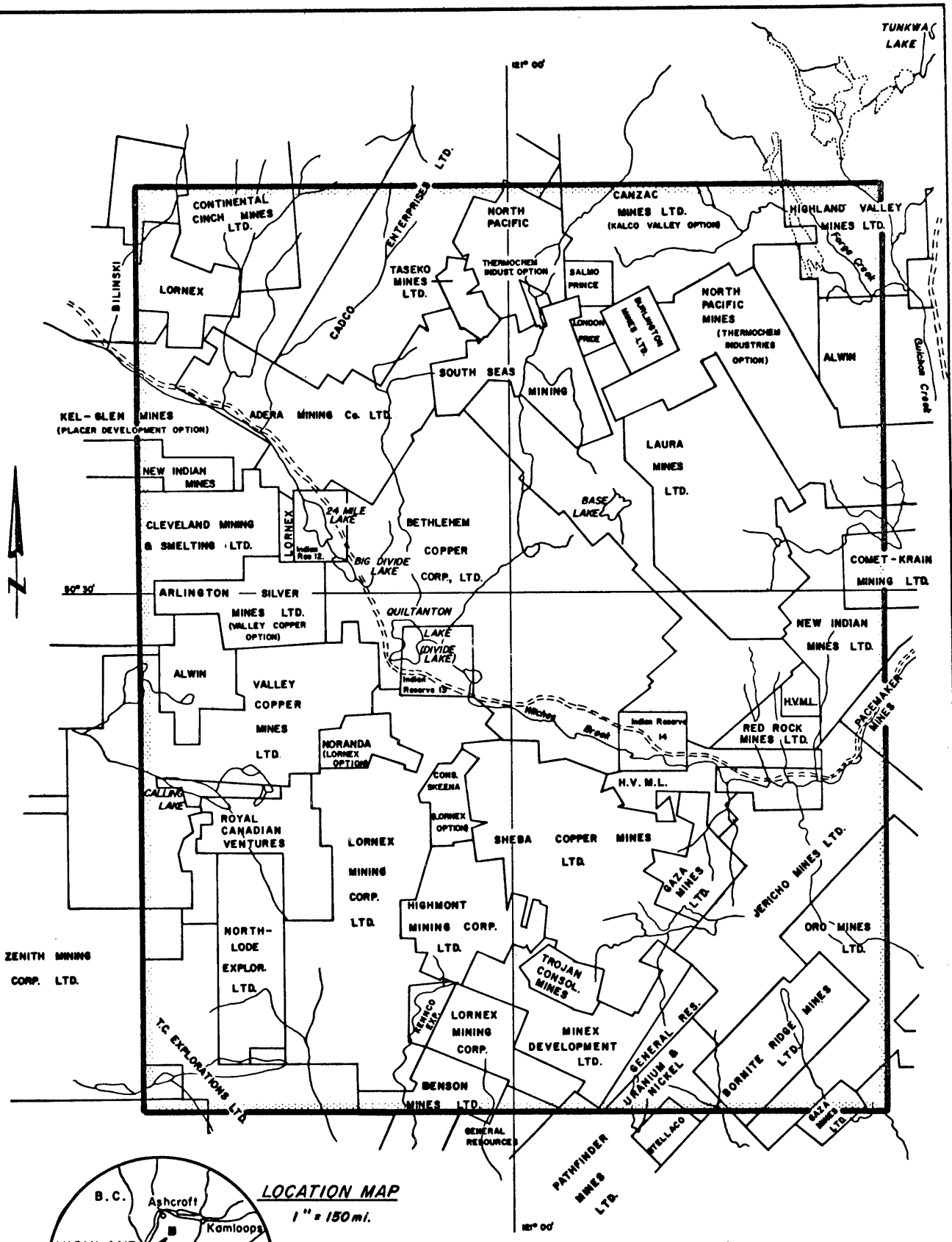
The data is presented in two map sections, a north section and a south section at a scale of 1"=1000 feet, and consists of the following:

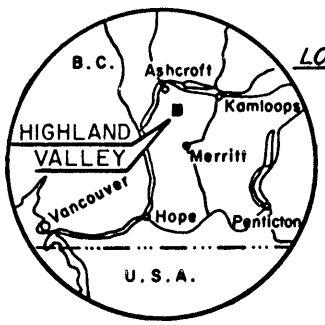
(1) One single weight photomosaic

(2) One total field aeromagnetic viewfoil overlay of contour map (red)

(3) One Potassium 40 viewfoil contour map

(4) One balck line mosaic showing flight lines.





LOCATION MAP
1" = 150 mi.

AIRBORNE MAGNETOMETER & SPECTROMETER SURVEYS OVER A PORTION OF THE HIGHLAND VALLEY AREA BY GEO-X SURVEYS LTD.

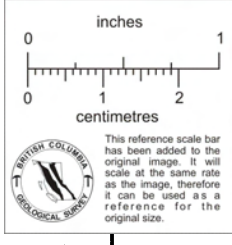
EQUIPMENT

VARIAN PROTON MAGNETOMETER V4937A
VARIAN DIGITAL RECORDER SDV4991
PLANE: TWIN BEECHCRAFT - EXCALIBUR 800.
DIGRS 2000 SPECTROMETER

0 1 2 (APPROX) MILES

DATE: APRIL, 1970

FIG. 1



APPENDIX I

INSTRUMENT SPECIFICATIONS

Aircraft

Type and Model:	Excalibur 800 (Beechcraft Twin Bonanza modified by Swearingen Aircraft, San Antonio, Texas)
Power:	Two 400 H.P. Lycoming 10-720-AIA engines.
Gross Weight:	7900 pounds
Empty Weight:	5300 pounds
Useful Load:	2600 pounds
Fuel Capacity:	230 gallons (U.S.)
Performance at 7900 lbs. Gross:	Climb - 1535 feet per minute (at sea level) Cruise - 230 miles per hour. Range - 1200 miles.

APPENDIX I

SPECIFICATIONS OF THE V-4937A MAGNETOMETER SYSTEM

Performance

Range:	20,000 to 100,000 gamma (worldwide)
Sensitivity:	± 1/2 and ± 1 gamma in any field.
Sampling Rate:	manual and "clock" operation permits any timing sequence.

Power Requirements

22-30 V, 6 amps for magnetometer, 60 watts for analog recorder and 100 watt maximum for digital recorder.

Physical Specifications

Console:	size - 19 x 17 x 24 inches; Weight 68 lbs.
Analog Recorder:	dual channel - 15 x 10 x 10 inches, 30 lbs.
Scanner-coupler:	fucical counter, ident. control, 24 hr. clock, 40 lbs.
Recorder:	size - 14 x 11 x 28 inches; Weight 41 lbs.

Data Output

Digital Recording:	BCD 1-2-4-8 (four line output) "O" state - 18 to -30v through 100K ohms 1 state -1 to +3v through 100k ohms
Print Command:	Positive going 12 to 25v pulse; 15M second.
Auxiliary Channels:	A & B for radio altimeter and navigation equipment.
Analog Recording:	Galvanometric -1 mA full scale into 1500 ohms Potentiometric: 100mV full scale. Minimum load resistance 20K Full scale resolution of the least most significant digits of the total geomagnetic field 0-99, 0-999 at 1 gamma sensitivity; 0-49, 0-499 at 1/2 gamma sensitivity.

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SPECIFICATION OF THE EXPLORANIUM DIGRS - 2000 SPECTROMETER

Crystals Three 6" x 4" NaI (TI) each coupled to three photomultiplier tubes.

Spectrum Stabilization Pulse height at output of detector maintained constant by spectrum stabilization using Cesium 137 as reference. Cesium 137 has an ultra-stable single gamma emission at 662 MeV, and half life of 32 years.

Channels Four. Each independently adjustable for E (peak energy level of channel-count) and E (range of energy level counted)

Approximate values used:

	E	E
Potassium 40	1.47 Mev	150 Kev
Bismuth 214	1.76 Mev	180 Kev
Thallium 208	2.62 Mev	270 Kev
Total count	2.05 Mev	1.2 Kev

Differential Linearity 1%

Resolution Better than 8.3% at .662 MeV & 1000 V

Mechanical Configuration - Designed to conform to TID - 20893

Recommended U.S.A. electrical and mechanical standard for nuclear instruments and power supplies.

Temperature Stability - Approximately .1% per °C

All pulse and analog processing circuiting is temperature compensated. Integrated circuits used throughout.

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Instrument Specifications

Camera

Type:	Neyhard Automax 35 m.m. pulse camera
Model:	G-2 with auxiliary data box
Pulse Rate:	Up to 10 frames per second
Film Format:	0.738" x 0.738" square picture with 0.200" x 0.738" data area.
Magazine:	Mitchell 400 foot 35 m.m.
Lenses:	(a) 17 m.m. F/14 Super-Takumar Fish-eye (b) 35 m.m. F/2.0 Super Takumar
Data Box:	(a) 24 hour Accutron Clock (b) Frame counter (c) Available for optional feature
Dimensions (less magazine):	8 3/8" high, 4 1/2" deep, 6 1/4" wide.
Weight (less lens and magazine):	12 lbs.