093 G
Antler Project

AIRBORNE ELECTROMAGNETIC SURVEY

WOLLEX EXPLORATION

TASPAI CREEK AREA, B.C.

FILE NO. 24025 AUGUST, 1982

Questor Surveys Limited, 6380 Viscount Road, Mississauga, Ontario L4V 1H3

CONTENTS

INTRODUCTION

This report contains our interpretation of the results of an airborne electromagnetic survey flown in the Taspai Creek Area, British Columbia, on June 12 and 14, 1982.

The survey mileage was 58.6 line kilometres and the survey was performed by Questor Surveys Limited. The survey aircraft was a Shorts Skyvan C-FQSL and the operating base was Prince George, British Columbia.

The area outline is shown on a 1:250,000 map at the end of this report. This is part of the National Topographic Series sheet number 93G.

The following were the personnel involved with the airborne survey:

Pilot	B. McKenna
Co-Pilot	L. Jewers
Operator	K. Graham
Engineer	S. Mill
Crew Chief	K. Sherk

MAP COMPILATION

The base map is an uncontrolled mosaic constructed from National Air Photo Library 1:75,158 photographs. This mosaic was used to produce a map at a scale of 1:10,000 on stable transparent film from which white prints can be made.

Flight path recovery was accomplished by comparison of the 35mm film with the mosaic in order to locate the fiducial points. These points are approximately 1400 metres apart.

SURVEY PROCEDURE

Terrain clearance was maintained as close to 122 metres as possible, with the E.M. Bird at approximately 45 metres above the ground. A normal S-pattern flight path using approximately one quarter mile turns was used. The equipment operator logged the flight details and monitored the instruments.

A line spacing of 60 metres was used.

RESULTS

The survey area is situated roughly 45 kilometres east of Prince George, British Columbia.

It is a small rectangular shaped block, comprised of 20 lines totalling 58.6 kilometres, with a flight direction of approximately N 70° E.

A relatively thin covering of glacial deposits extends with monotonous uniformity over much of the area. Bedrock is everywhere poorly exposed but outcrops are sufficiently well distributed to permit a reasonable interpretation of the major geological features. In the vicinity of CONDUCTOR 1, the bedrock conductors are interpreted to be close to 60 metres deep. The rock types, as indicated on geology MAP 49-1960, is of Paleozoic age and consists of grey to buff chert, argillite, basalt and related pyroclastic rock.

There are two major faults, one on either side of the survey area (east and west) which apparently were the controlling factors in the Paleozoic rocks being thrust to the northeast onto the Upper Triassic rocks near Bowron River (located to the northeast of the survey area).

The flight path recovery was very difficult in this area because of the extensive bush cover with no topographical features to aid in the navigation. Correlation between magnetic peaks and INPUT responses aided in the finalization of the flight path recovery and the eventual plotting of the INPUT anomalies. Ground positioning for ground geophysical exploration should be relatively accurate in order that all conductors are covered.

There were very few conductors intercepted within the survey area. The most outstanding of the five selected is CONDUCTOR 1. It traverses the entire survey block in a NNW-SSE direction and displays fair to good conductivity along its entire length. Direction of dip is to the west and ranges from 20° in the north to 60° in the south. It is normal to receive two responses in the up-dip direction while only receiving one response in the down-dip direction. Most lines in this survey were flown east as it was the easiest direction for navigational purposes. In any event, all east lines have two responses and one will notice quite a space between the two anomalies. This is due to the large map scale (1:10,000) and also due to the amount of dip of the conductor. The shallower the dip of the conductor, the wider the spacing between anomalies; eg. anomalies 10122A and B. Two areas along this trend where further ground work is definitely warranted are between lines 10010 and 10040 and also, between lines 10143 and 10170. These two areas exhibit the best chances.

CONDUCTOR 2 is thought to be a weak flanking zone to CONDUCTOR 1. It has limited strike extent to the north but may continue to the south. Follow-up is suggested in this area.

CONDUCTOR 3 is broken up into three parts, 3A, 3B and 3C. The latter zone displays the best response and has a much slower decay rate. The broadness of the response may be an indication of the flight line being flown parallel to or at an oblique angle to the strike of the conductor.

CONDUCTORS 4 and 5 display very weak INPUT responses and may, in fact, be due to conductive overburden. However, CONDUCTOR 4 could be related to some structural effect such as a geological contact. A ground VLF-EM survey may be the technique to intercept CONDUCTOR 4. Further work is not recommended for CONDUCTOR 5.

In summary, the two areas along CONDUCTOR 1 are recommended for further work as well as CONDUCTOR 3C. It should be noted that a good portion of the survey area displays a resistive background and one questions the existence of chert and argillite in this area. These two rock units are typically stratigraphically layered with graphite. This may, in fact, be the source for the existing conductors.

QUESTOR SURVEYS LIMITED

R. J. de Carle

R. J. deCarle,
Chief Geophysicist.

APPENDIX

EQUIPMENT

The aircraft is equipped with a Mark VI INPUT (R) airborne E.M. system and Sonotek P.M.H. 5010 Proton Magnetometer. Radar altimeters are used for vertical control. The outputs of these instruments together with fiducial timing marks are recorded by means of galvanometer type recorders using light sensitive paper. Thirty-five millimeter continuous strip cameras are used to record the actual flight path.

(I) BARRINGER/QUESTOR MARK VI INPUT (R) SYSTEM

The Induced Pulse Transient (INPUT) system is particularly well suited to the problems of overburden penetration. Currents are induced into the ground by means of a pulsed primary electromagnetic field which is generated in a transmitting loop around the aircraft. By using half sine wave current pulses and a loop of large turns-area, the high output power needed for deep penetration is achieved.

The induced current in a conductor produces a secondary electromagnetic field which is detected and measured after the termination of each primary pulse. Detection is accomplished by means of a receiving coil towed behind the aircraft on four hundred feet of cable, and the received signal is processed and recorded by equipment in the aircraft. Since the measurements are in the time domain rather than the frequency domain common to continuous wave systems, interference effects of the primary transmitted field are eliminated. The secondary field is in the form of a decaying voltage transient originating in time at the termination of the transmitted pulse. The amplitude of the transient is, of course, proportional to the amount of current induced into the conductor and, in turn, this current is proportional to the dimensions, the conductivity and the depth beneath the aircraft.

The rate of decay of the transient is inversely proportional to conductivity. By sampling the decay curve at six different time intervals, and recording the amplitude of each sample, an estimate of the relative conductivity can be obtained. By this means, it is possible to discriminate between the effects due to conductive near-surface materials such as swamps and lake bottom silts, and those due to genuine bedrock sources. The transients due to strong conductors such as sulphides exhibit long decay curves and are therefore commonly recorded on all six channels. Sheet-like surface materials, on the other hand, have short decay curves and will normally only show a response in the first two or three channels.

The samples, or gates, are positioned at 334, 498, 744, 1072, 1482 and 1974 micro-seconds after the cessation of the pulse. The widths of the gates are 164, 164, 328, 328, 492, and 492 micro-seconds respectively.

For homogeneous conditions, the transient decay will be exponential and the time constant of decay is equal to the time difference at two successive sampling points divided by the log ratio of the amplitudes at these points.

(II) SONOTEK P.M.H. 5010 PROTON MAGNETOMETER

The magnetometers which measure the total magnetic field have a sensitivity of 1 gamma and a range from 20,000 gammas to 100,000 gammas.

Because of the high intensity field produced by the INPUT transmitter, the magnetometer results are recorded on a time-sharing basis. The magnetometer head is energized while the transmitter is on, but the read-out is obtained during a short period when the transmitter is off. The precession frequency is being recorded and converted to gammas during the 0.2 second interval when there is no power in the transmitter loop.

For this survey, a lag factor has been applied to the data. Magnetic data recorded on the analogue records at fiducial 10.00 for example would be plotted at fiducial 9.95 on the mosaics.

DATA PRESENTATION

The symbols used to designate the anomalies are shown in the legend on each map sheet, and the anomalies on each line are lettered in alphabetical order in the direction of flight. Their locations are plotted with reference to the fiducial numbers on the analog record.

A sample record is included to indicate the method used for correcting the position of the E.M. Bird and to identify the parameters that are recorded.

All the anomaly locations, magnetic correlations, conductivity-thickness values and the amplitudes of channel number 2 are listed on the data sheets accompanying the final maps.

GENERAL INTERPRETATION

The INPUT system will respond to conductive overburden and near-surface horizontal conducting layers in addition to bedrock conductors. Differentiation is based on the rate of transient decay, magnetic correlation and the anomaly shape together with the conductor pattern and topography.

Power lines sometimes produce spurious anomalies but these can be identified by reference to the monitor channel.

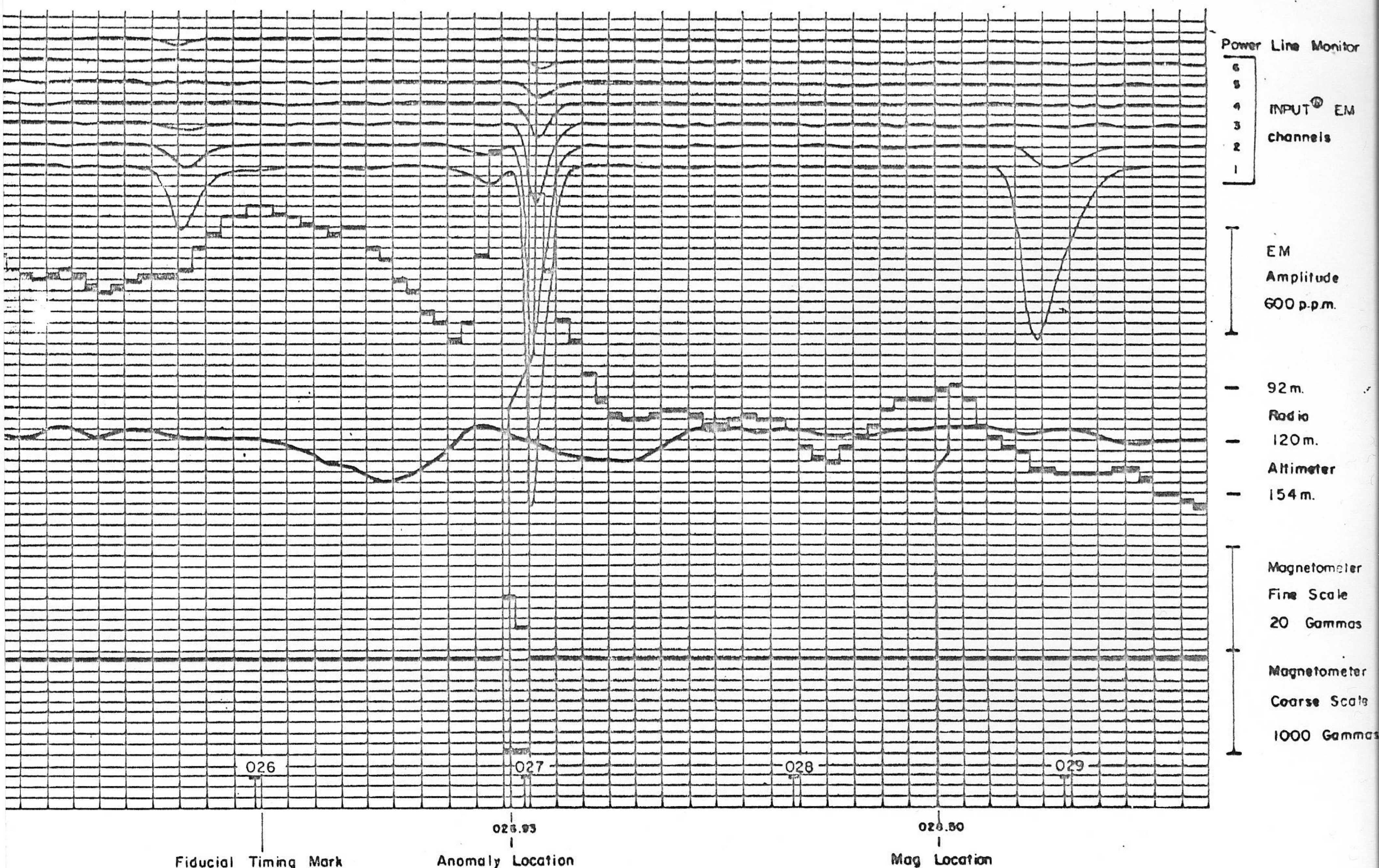
Railroad and pipeline responses are recognized by studying the film strips.

Graphite or carbonaceous material exhibits a wide range of conductivity. When long conductors without magnetic correlation are located on or parallel to known faults or photographic linears, graphite is most likely the cause.

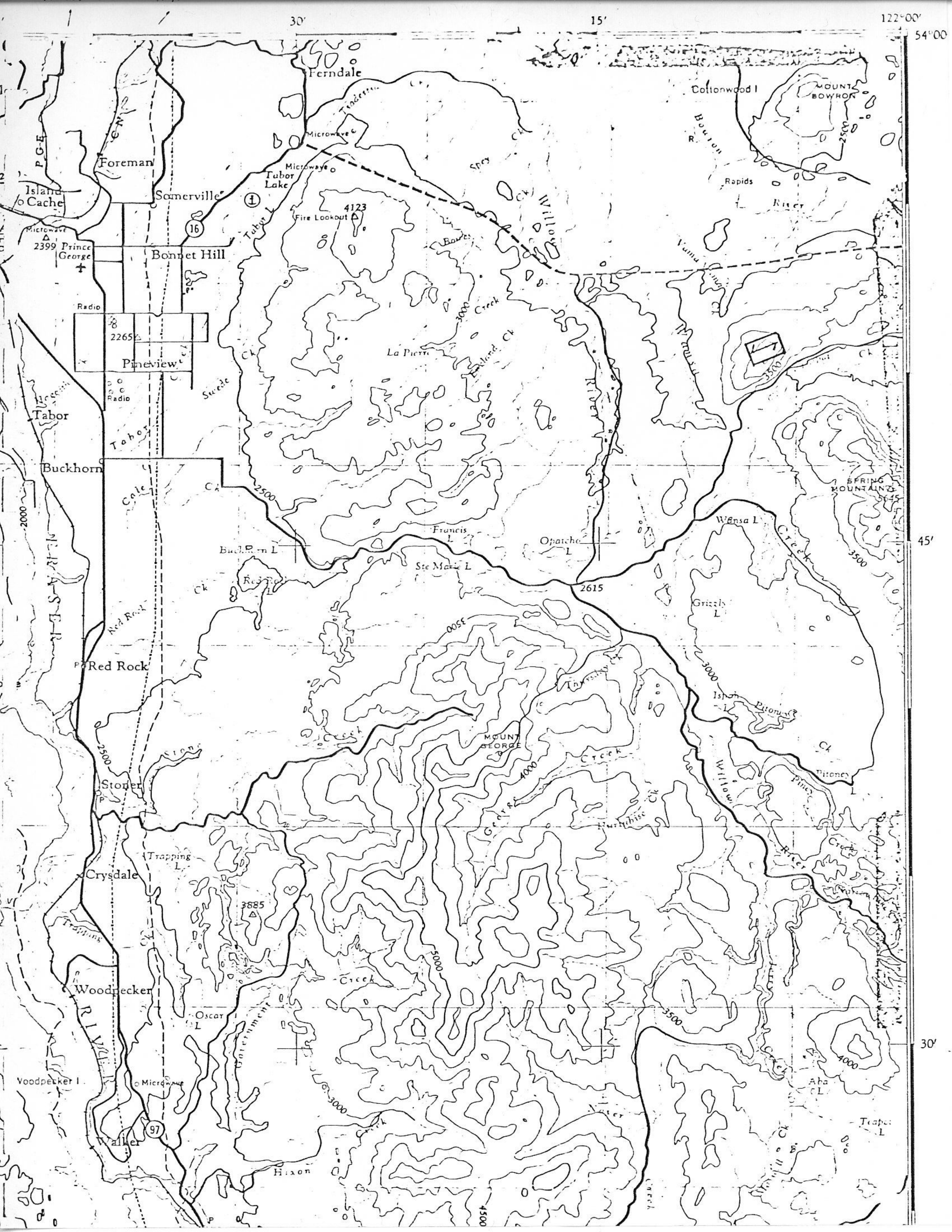
Contact zones can often be predicted when anomaly trends coincide with the lines of maximum gradient along a flanking magnetic anomaly. It is unfortunate that graphite can also occur as relatively short conductors and produce attractive looking anomalies. With no other information than the airborne results, these must be examined on the ground.

Serpentinized peridotites often produce anomalies with a character that is fairly easy to recognize. The conductivity which is probably caused in part by magnetite, is fairly low so that the anomalies often have fairly large response on channel #1; they decay rapidly, and they have strong magnetic correlation. INPUT E.M. anomalies over massive magnetites show a relationship to the total Fe content. Below 25 - 30%, very little or no response at all is obtained, but as the percentage increases the anomalies become quite strong with a characteristic rate of decay which is usually greater than that produced by massive sulphides.

Commercial sulphide ore bodies are rare, and those that respond to airborne survey methods usually have medium to high conductivity. Limited lateral dimensions are to be expected and many have magnetic correlation caused by magnetite or pyrrhotite. Provided that the ore bodies do not occur within formational conductive zones as mentioned above, the anomalies caused by them will usually be recognized on an E.M. map as priority targets.



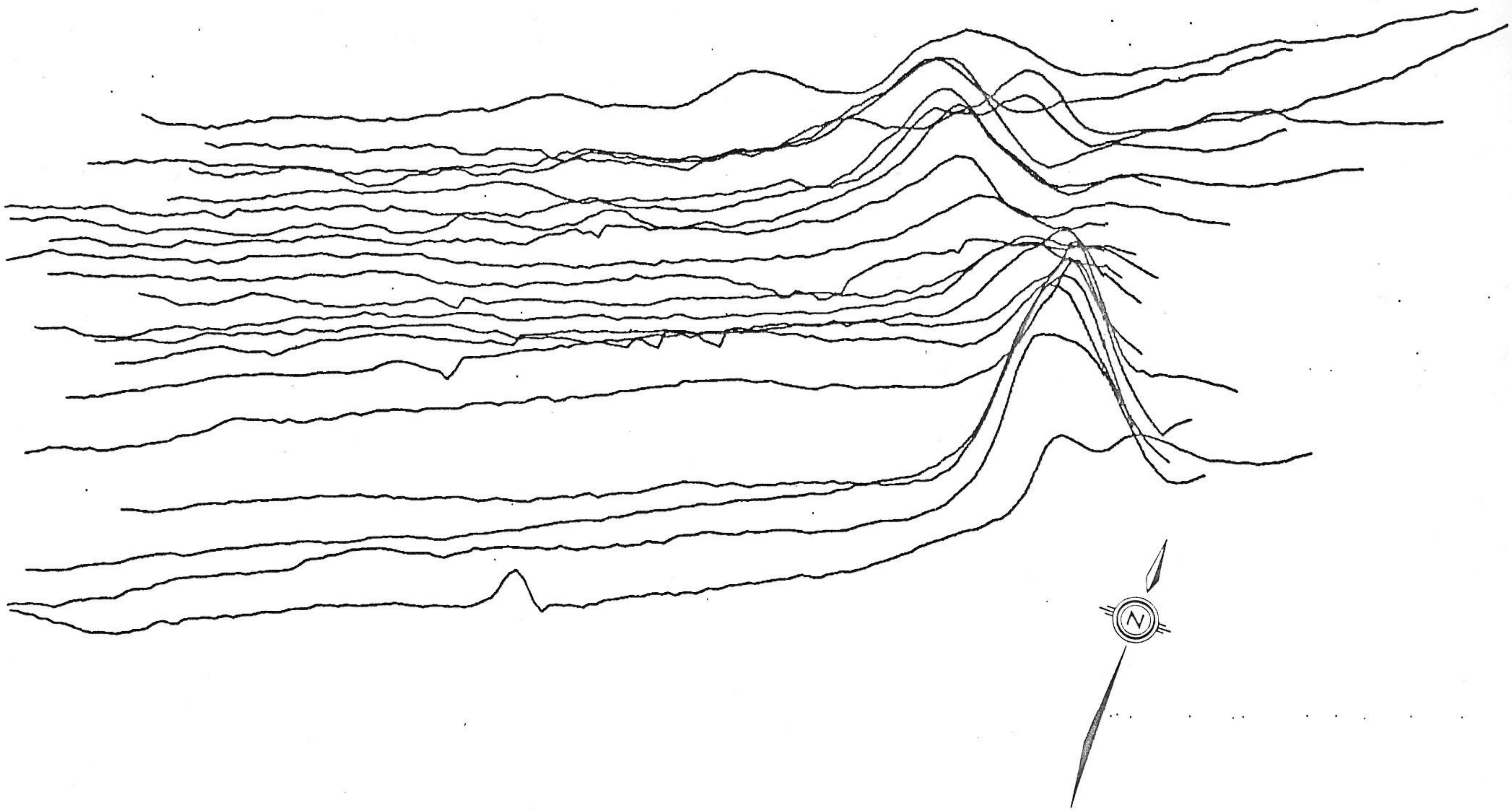
Representative INPUT®, Magnetometer and Altimeter Recording


30'
15'
122°00'
54°00'
45'
30'
Ferndale
Cottonwood R
MOUNT BOWRON
Microwave
Foreman
Somerville
Tabor Lake
Island Cache
Microwave
2399 Prince George
Bonnet Hill
Fire Lookout 4123
Spey Ck
Willow
Rapids
River
Radio
2265
Pineview
La Pierre
Creek
Swede Ck
Radio
Tabor
Buckhorn
Cale Ck
2500
3000
3500
SPRING MOUNTAIN
Wansa L
Francis L
Opatcho L
Buckhorn L
Ste Marie L
2615
Red Rock
Grizzly L
Red Rock
FRASER
MOUNT GEORGE
4000
Stoner
Stone
Crysdale
Trapping L
3885
Woodpecker
Oscar L
Government
5000
Woodpecker I
Microwave
Walker
97
16
Hixon
4500
Aha L
Teapot L
Pitoney L
Ispah L
Creek
Ck
RIVER

STACKED INPUT EM PROFILES

CHANNEL 1 AMPLITUDE

SCALE 1 : 24 138



#24025

ANOMALY	FID	CHS	CH1 AMP	CH2 AMP	SIEMENS	MAG	VALUE
10010A	89.05	4	450	210	5	0.00	0
10010B	89.28	6	600	360	9	0.00	0
10010C	93.00	2	120	60	NC	0.00	0
10020A	87.86	6	1260	720	6	0.00	0
10020B	88.05	5	960	420	4	0.00	0
10030A	83.88	5	780	480	9	0.00	0
10030B	84.04	5	1440	750	5	0.00	0
10040A	80.60	5	660	420	8	0.00	0
10040B	80.75	5	1290	690	5	0.00	0
10050A	74.50	2	80	30	NC	0.00	0
10050B	77.10	5	660	420	7	0.00	0
10050C	77.22	4	1080	540	5	0.00	0
10060A	72.93	4	480	240	5	0.00	0
10060B	73.12	4	1080	450	3	0.00	0
10070A	69.30	3	480	210	4	0.00	0
10070B	69.44	4	750	360	4	0.00	0
10080A	65.50	4	360	180	5	0.00	0
10080B	65.75	3	720	280	4	0.00	0
10090A	58.78	2	90	30	NC	0.00	0
10090B	61.85	3	420	180	3	0.00	0
10090C	62.00	3	510	180	3	0.00	0
10090D	62.25	2	300	90	NC	0.00	0
10100A	55.00	1	120	-	NC	0.00	0
10100B	55.40	1	90	-	NC	0.00	0
10100C	58.05	3	360	150	3	0.00	0
10100D	58.33	3	290	100	2	0.00	0
10111A	53.85	3	150	60	3	0.00	0
10111B	54.10	3	300	120	3	0.00	0
10111C	54.60	3	240	90	3	0.00	0
10122A	50130	3	420	180	3	0.00	0
10122B	50.70	2	210	90	NC	0.00	0
10130A	44.89	2	130	30	NC	0.00	0
10130B	44.75	2	170	80	NC	0.00	0
10130C	46.12	4	510	240	4	0.00	0
10130D	46.45	3	180	90	3	0.00	0
10142A	40.88	2	120	50	NC	0.00	0
10142B	42.00	4	690	350	3	0.00	0
10142C	42.47	3	130	60	5	42.55	100

ANOMALY	FID	CHS	CH1 AMP	CH2 AMP	SIEMENS	MAG	VALUE
10151A	36.50	2	90	30	NC	0.00	0
10151B	37.65	4	750	330	4	0.00	0
10151C	38.13	2	90	60	NC	38.20	100
10160A	9.20	3	420	120	2	0.00	0
10160B	9.50	5	480	270	10	0.00	0
10160C	11.12	2	90	15	NC	0.00	0
10170A	14.75	2	120	15	NC	0.00	0
10170B	15.65	2	270	90	NC	0.00	0
10170C	15.90	4	720	240	3	0.00	0
10170D	16.45	2	120	30	NC	16.50	60
10180A	17.80	2	120	30	NC	0.00	0
10180B	18.44	3	510	150	3	18.15	50
10180C	18.70	3	210	120	6	0.00	0
10180D	19.05	3	210	120	6	0.00	0
10180E	20.30	1	60	-	NC	0.00	0
10190A	22.35	2	70	30	NC	0.00	0
10190B	23.60	2	160	30	NC	0.00	0
10190C	24.50	2	210	70	NC	0.00	0
10190D	24.78	3	450	180	3	0.00	0
10200A	27.60	3	420	150	3	0.00	0
10200B	28.18	4	240	150	9	0.00	0
10200C	28.92	2	50	15	NC	0.00	0
19010A	97.80	2	70	15	NC	0.00	0
19020A	94.60	3	390	180	5	0.00	0
19020B	95.08	2	240	60	NC	0.00	0
19020C	95.42	2	150	30	NC	0.00	0
19020D	95.90	2	60	30	NC	96.00	8