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AIRBORNE ELECTHONSONETIC SURVEY REPORT
CONWEST EXPLORATIOH COMPANY LIMITED
PICKIF LAVE AREA: ONTAFTC

NITF NO. 13004
JULY 1971

QuestorSurveysLimited, 20CbnsoRd.,Rexdale.Ontario.Canada




















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SURVEY PROCENURE




 the anstriments.


$\therefore$ aumber of ancinious tarnds hiseiaying good conductivit? were intercepted duriry zi.e INDUT survey. They could be cue to the foliowiag sources:-

(ii) structural eEfects, i.e. geoicgical contacts

Fiere was very iictie, if a.y, concuctive overburden pacied wo during the survey.
fhat could be considered a gcological contact is a lo:.g innear trenc tiak runs east-west through the main block of the survey arac. At several iocations along this trenci several zones of goae conductivity have been sutlined for further discussion laver in the report. It is possible that greater concentrations of mineralization in the se areas are responsible for the strong E.if. responses.

Conductive irtercepts were also picked up or. the few lines that were flown on what is know to be Groups 5 and 6.
zone "A"
Besides having a good E.M. response, the zone dispiays sood conductivicy. There are two parailei conGistors in this 20.2 with the most southerly one naving gocd magnetic correiation. The intercept having whit cowid be regarded $a_{\text {, }}$, ine besi conductivity i: this zone is incercept 4 A. rie geolosy is quite sketchy in this area, but it is thought to be basic and acidic volcanics. however, this wouid have to be verified in the field. This zone is regardec as being possibly associated with Lie UVEX copper-nickei find.
zone "E"
A strong E. $\mathrm{A}_{\mathrm{L}}$ response is associated with the zone anci there is good magnetic correlation. thert is a possibilit $\because$ that the zone is associated with the old Kapkichi Nickel Mine. A horizontal 200 E E.M. survey is recommended.

## zone "C"

The zose dispiays good conductivity and has good
direct magnetic corselation. I.s with ane "A", the geology is sketchy, but it is possible that tine conductor is associatec wich basic and acianc voiciniss. A hotizontal loop E.M. survey is suggested.

## zone "0"

The zone has good concuctivity and has good direct magnetic correiation. Gine LiEter has values in the ozder of $500=01500$ gamaas. It is feit that the cunductor couid be due to an iron Ermation. whe formation was ficked up wien flying both in a north-south anc east-west direction. Ground work is suggested to cetermine the make-up of the iron formation.

2one "E" Besices displaying good conductivity, tiae zone has good direct magnetic correlation. It would appacr that tiis zone is on the same horizon geologically as zone "J". Intercept 35 A has a slow decay rate suggestang aase metal possibilities. Ground work is suggested.

Zone "F"
Intercepts 68 A and 69 A in this zone display strong E.M. responses and show good conductivity. Buth anomalies have good magnetic correlation. The zone is
within the greenstone beit, but any correiation of the anomalies with detailed geology is not possi: ". 2one " $F$ " appears to be on the same aorizon as zones " $D$ " ar. ${ }^{3}$ " $E^{\prime \prime}$. A ground survey is suggested to determine the source.
zone "G"
Two short parailel conductors make un the zone und they both have good E.M. responses. Good direct magnetic correiation is on the southerly conductor, in the orcier of 170 gammas. A ground survey is recommended.

Zone "ti"
With the exception of intercept 60 D , which has a gooc E.M. xusponse, the remainder of the zone only has a fair response. There is no magnetic correlation associatec with the zore, so it is possibie that graphite or pyrite might be the cause of the anomaly. Ground work would have to be carried out to confirm this.

Zone "J"
The zose displays fair to good conductivity with magnetic correlation on the most eastern of the two conductors. Intercept 57 A shows a strong E.M. response and it is possible that it is within the volcanics. A vertical



## Conductor ：

Mhis tra天心 disuiays a＝uncoz＂．N．response and shows soot conouctivity．snexs is axaect magretic corie－ sation associated with tae concustor．Intercept $\quad$ o a os Jocuted close to a road and thus the conauctor shoula de checked $4 \rightarrow 5$ a growno zero．nsissance survey．

Die treat saraizais a moaz near the cid Cearral
 a stiong E．M．response and sãws good concuctivity．mhere is mo magnetic correlation associated witi the trend sug－ gesting tre zresence ofeitaer pyrite or graphite．A Grouna reconnaissance survey is recommencied．

 ãçatic correiation．It is possible that pyrite is the ～こびら •

Conductor fit inss good armplitude definition and has good ciarect magnetic correzation．Tine trond shoula be jocked at EO：base t．eal possibilities．

Coñactor $F 5$ has a strong E．M．response and nas good direct magnetic correlation．Fowards the eastern portion of the corductor，the magnetics are in the order

Cf 3000 gammas sucgesting the preserice of iror forminion. A grownt reconnaissance survey is reconrenden for an: three conductors.

Concactor 6
Fine concuctor nis a siong Z. A. zesponse unt has
 to be the cause. frozizortà: loop E.N. and magnatometer survey is recommenced.

Conevactor $\#$
The conductor has a mocicate E.M. response having no magnetic correlation. Non-magnetic sulphides or minor graphite coula be ti.e cainse. ì grour. $\exists$ reconnaissance survey is suggested to determine fine cause.


## APPENDIX

## EQUIPMENT

The aircraft ace equipped with Mark $V$ INPUP airborne E.M. systems and Barringer AM-104 proton precession magnetometers. Nadar altimeters are used for vertical control. The outputs of these instruments tegether with fiducial timing marks are recozded 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) MARK V 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 area-turns, 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 afrcraft. 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 condicilvicy 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 bottoms 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 sesponse in the firat two or three channels.

The samples; or gates, are positioned at 260 . 480, 744, 1096, 1536 and 2064 micro-seconds after the cessation of the pulise. The widths of the gates are 220, $220,308,39 \%, 484$ and 528 micro-seconds respectively.

For homogeneous conditions, the transient decay will be exponential and the time corstant 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) BARRINGER AM-104 PROTON PRECESSION MAGNETOMETER

The AM-104 magnetometer which measures the total magnetic field has a sensitivity of 5 gammas and a range from 20.000 gammas to 100.000 gammas.

Because of the high intensity field produced by the INPUT trarismitter, the magnetometer results are recorded on 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. Using this technique, the head is energized for 1.15 seconds and then the transmitter is switched off for 0.15 seconds while the precesseion frequency is being recorded and converted to gammas. Thus a magnetic reading is taken every 1.3 seconds.

## 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 alphebetical order in the direction of flight. Their locations are plotted with reference to the fiducial numbers on the visicorder record.

A sample record is included at the end of the report identifying the method used to correct for the position of the E.M. "Bird" and identifies the parameters on each channel. Occasionally, a question mark may be shown alongside the anomaly symbol. This may occur when the response is very weak and there is some doubt as to whether or not it is caused by turbulence of compensation noise caused by large changes in the positon of the "bird" relative to the aircraft.

All the anomaly locations, magnetic correlations, and the amplitudes of channel number are listed on the data sheets accompanying che final maps.

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

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

Radiroad and pipeline responses are recognized by stadying 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 ines 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.

Serpentized 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 of ten have a 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 guite strong with a characteristic
rate of decay which is usually qreater 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 laterai 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 monalies caused by them will usualiy be recognized on an E.M. map as priority taxgete.


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## Questor Surveys Limited

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| Anomaly Number | Fiducial | $\begin{array}{c\|} \text { Number } \\ \text { of } \\ \text { Charneis } \end{array}$ | Charnel <br> 4 <br> Amplitude | Direct Magnetic Correiation | Flanking Magnetic Peak |  |
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|  |  |  |  |  | Location | Value |
| 58 A | 380.05 | 3 | - | - |  |  |
| 59 H. | 311.25 | 3 | - | - |  |  |
| S. | -3\% | 4 | 10 | - |  |  |
| 60 A | 328.21 | 3 | - | - |  |  |
| 13. | . 62 | 5 | 20 | 1202 |  | - |
| c. | . 81 | 6 | 30 | - |  |  |
| D. | 32211 | 6 | .20 | - |  |  |
| CLA | 400.11 | 3 | - | - |  |  |
| $62 A$ | 36226 | 3 | - | - |  |  |
| $B$. | . 94 | 3 |  |  |  |  |
| 63 At | rall2 | 3 | - | - |  |  |
| 3. | 50 | 3 | - | - |  |  |
| 64 c2 | $365 \% 10$ | $s$ | - | - |  |  |
| 13. | $36 \%$ 01 | 3 |  | - |  |  |
| 65 H | Mc. 28 | 5 | .20 | - |  |  |
|  | 411.3 | $\alpha$ | - | - |  |  |
| $C$ | 32 | 2 | - | - |  |  |
| 6212 | 143.13 | 2 | - | $25 x$ |  |  |
| 68 1t | 35226 | 6 | . 50 | $130 \%$ |  |  |
| 62 H | 421.96 | 6 | 30 | $20 \%$ |  |  |
| 20.12 | 31730 | 3 | - | - |  |  |
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| Anomaly Number | Fiducial | $\begin{array}{c\|} \hline \text { Number } \\ \text { of } \\ \text { Charnels } \end{array}$ | $\begin{gathered} \text { Channel } \\ 4 \\ \text { Amplitude } \end{gathered}$ | Direct Magnetic Correlation | Flanking Magnetic Peak |  | Remarks |
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| H | . 65 | 4 | $15^{\circ}$ | - |  |  |  |
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| 3. | <20.36 | 6 | 15 | - | 120.30 | 4 ys 2 |  |
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## NOTES

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