

BOSWELL RIVER MINES LTD.

REPORT ON

AIRBORNE GEOPHYSICAL SURVEY

DAN GROUP

105 B-3 60° 10'N 131° 6'W

Watson Lake M.D. Y.T.

Survey Flown March 27, 1968

by

WATERTON AERONAUTICS & EXPLORATIONS LTD.

Interpretation by

P. H. SEVENSMA, Ph.D., P. Eng.

April 18, 1968.

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## ILLUSTRATIONS

Fig. 1	Airborne Em Survey & Claim Location	1" = $\frac{1}{2}$ mile
Fig. 2	Waterton Electromagnetic Airborne Survey	1" = 1 mile
Fig. 3	Airborne Survey & Topography	1:50,000
<u>In Pocket:</u>	3 Waterton Maps	1" = 1000'

## 1. INTRODUCTION

The Dan Group of 10 claims, and since expanded to 82 claims, has been staked in 1966 to cover a showing and float of crudely banded to massive pyrrhotite, carrying sphalerite, galena and minor chalcopyrite interbedded with slightly skarny and metamorphic argillites within a series of Mississippian-Devonian clastics with some limestone, chert and volcanics. These series are intruded by dioritic differentiates of the Ram stock, which is a saussuritized quartz monzonite.

It is known that in this area other showings in place and occurrences of float exist of similar pyrrhotite, carrying varying proportions of sphalerite and of galena with often a high content of silver.

It is believed that these stratabound pyrrhotite zones present excellent targets for the discovery of multimillion ton sulphide bodies which may carry commercial quantities of silver.

As several valleys present good cross sections of the sedimentary series in the vicinity of the dioritic intrusives, an airborne reconnaissance electromagnetic survey flown at about right angles to the bedding was selected as the most appropriate tool to pinpoint at low cost conductive zones, one or more of which may reflect the presence of sulphide bodies.

The area is in general covered with talus and/or overburden of relatively modest thickness, with extensive vegetation, and is for the most part well drained.

Both the geology and the morphology create therefore conditions which are favorable for an effective use of an airborne method.

## 2. PROPERTY, LOCATION & ACCESS

At the time of the survey, the property consisted of the following claims, all located on claim sheet 105 B-3. (See Fig. 1)

Dan 1 - 10	Grant Nos. Y13401 - Y13410
Dan 11 - 66	Grant Nos. Y22800 - Y22855
Dan 67 - 82	No Grant Nos. Allotted Yet.

These claims are located mostly at elevations between 3600' and 4300'. They are accessible by an old 15 mile long jeep road from mile 722 on the Alaska Highway.

Snowfall in the area is moderate, water and timber supplies are good, with the timberline at about 4800'.

The road distance is slightly over 100 miles from Watson Lake; the nearest supply center.

### 3. HISTORY AND GEOLOGY

These have been described in a previous report dated July 26, 1967.

The original showings in this area were discovered in 1946 by prospectors working for Hudson Bay Mining & Smelting Company.

Minor drilling was done by this Company in 1952, and some trenching in 1964.

Between 1951 and 1961, the area was mapped geologically and aeromagnetically by personnel of the Geological Survey of Canada.

Boswell River Mines Ltd. acquired one of the original showings in the summer of 1966, and staked additional ground early in 1968 to cover other reported occurrences.

To the West, and South West, various claim groups have been staked off and on through the years by various individuals, but no significant work has been carried out, except for some drilling by H. B. M. & S. Company on what is now called the Mod Group.

Sample data on occurrences in the area are far and few between. Both the reported and the observed abundance of pyrrhotite suggest large tonnages.

## History & Geology Cont'd

Reported assay data vary from no lead or silver to 20% lead and 125 oz/t silver; zinc is always present as dark brown to black sphalerite; chalcopyrite is very minor.

The best reported silver assays are from the occurrences nearest the diorites and it is noteworthy that at the Pure Silver Mines prospect, 16 miles to the SW, quartz veins in similar diorites show grades of the order of magnitude of 0.2 oz/t Au, 30 oz/t Ag, 3% Pb and 7% Zn across widths of 2'-4'. Similar high silver/lead ratios have been reported from showings and float in the area covered by the airborne survey and the area immediately adjoining to the West.

### 4. AIRBORNE SURVEY

#### A. General

The search for massive pyrrhotite bodies within a sedimentary-volcanic series of low to moderate conductivity is best conducted by electromagnetic methods, as pyrrhotite zones exhibit a high conductivity and a good conductivity-contrast against the surrounding rocks.

Unless the pyrrhotite is accompanied by magnetite, its magnetic contrast against the wallrocks is too weak to be identified by reconnaissance airborne methods.

The method selected is the one used by Waterton Aeronautics and Explorations Ltd., which uses a fixed wing aircraft and is simple and low-cost.

Airborne Survey Cont'dB. Method

This method incorporates the combined readings from a fluxgate magnetometer, a nucliometer and an electromagnetic unit recorded on 8 mm. film and timed electrically to enable the readings to be entered on a grid of a chosen scale.

To give the most accurate forms to the anomalies, level lines are flown over the area, and a fixed-wing aircraft is chosen as the most suitable vehicle for this purpose.

Any inaccuracy in the timed readings due to airspeed error is calculated out before the readings are entered on the grid.

All the instruments are set on "0" over a predetermined spot near the survey area and this adjustment is made after each 1½ hours of survey.

Station-keeping is accomplished by flying between two lines drawn on a map with a scale of 1:50,000 and referring to land features. A directional gyro is also used, set to true heading by astro compass. Altitude of the level lines is usually 500 ft. over the highest point of ground along the line.

Ground checks from over twenty areas have found the accuracy of the method to be between 250 and 500 ft. on a 500 ft. grid.

Fluxgate Magnetometer: PMF-3 Sharpe, adjusted to return to "0" fast enough for the movement of the aircraft. Readings are in units of 100 gammas.

Airborne Geophysical Survey Method Cont'd

Nucliometer: Detectron - DR229, 24 tubes, which is more suitable for airborne work. Readings are in units of .005 MT/HR.

Electromagnetic: 55 ft. cable attached to the bottom of the aircraft. A small 10 oz. bird is drawn behind the aircraft as a receiver, powered by its own mercury cell. A magnetic field is transmitted through the cable at a thousand cps. and the receiver is tuned to "0". The receiver coil is set at 90° to the transmitted field, and, being very sensitive, only 30% of its receiving power is used. This indicates electromagnetic activity in the area, such as disseminated sulphides, which usually read 3 to 6; heavy sulphides 10 to 15. It also picks up other electrical fields besides those produced by the transmitted field.

## 5. Results of Survey

### A. General

The Survey was flown on March 27, 1968 under favorable weather conditions.

Ground elevations of the surveyed area lie mostly between 3800' and 5500' and flight elevations used were between 4500' and 6000'.

Due to the technique of flying at constant elevation on each line, the lower lying areas were flown at a terrain clearance exceeding the normal 500' with a general dampening effect on the instrument responses.

In general, response locations should be within 500' of the points shown on the maps.

### B. Magnetics

Due to the variation in terrain clearance and to instrument orientation problems on some lines, the magnetic data indicate the broad trends only.

As the broad magnetic trends are known from G.S.C. Map 1306 G, flown at a nominal 1000' above the ground, and as the trends in the present survey broadly correspond to these known trends, a detailed analysis is superfluous. (See Fig. 2)

### Survey Magnetism Cont'd

In general, pyrrhotite bodies of the type known in this area, are believed to have a relatively weak magnetic contrast against the surrounding formations and a sensitive helicopter survey flown at a constant instrument ground clearance of about 150' would be required to have a chance to identify anomalies that could be associated with bodies of this type.

#### C. Radiation Survey

Significantly higher than background values, of intensity 2 at the instrument setting used in this survey, were encountered in 13 scattered locations. In addition, a definite cluster of 4 values of 2 and 6 values of 1 was located in area 1. As this cluster is associated with a significant electromagnetic response and with a weak magnetic anomaly, it is of possible significance as an indication of mineralization.

No response was obtained from the monzonite body exposed in area 4 and none of the scattered values is thought to be of interest, except possibly for two slightly clustered groups in area 3.

There are no comparative data available on radiation characteristics of ores and rocks in the Yukon.

In the present survey, the above described cluster and the two indefinite ones, are related to a conducting zone and could be of some significance. (See Figure 2)

#### D. Electromagnetic Survey

The formations covered by this survey were found to have relatively high background noise, signifying that they are mildly conductive throughout.

This fact is known on the original Dan Group, where some drilling by H. B. M. & S. Co. in the early fifties encountered sericitic and graphitic schists.

Background conductivity is ascribed to the scale values of 1 to 4 in this survey.

Strongly conducting material is reflected by values of 8-10 at normal terrain clearance; in the lower lying areas values of 5-8 may, however, be just as significant.

In this type of formational environment, massive sulphide bodies may be associated with conductive formations, as in the original Dan showing.

Formational EM anomalies can therefore not be ruled out as possible sources of mineralization. Anomalies of this type tend to have gentle gradients and to be long and broad.

Short anomalies of medium to high intensity and with steep gradients are more likely to reflect the presence of conductive sulphides, especially pyrrhotite.

Other generally favorable factors are coincidence with a magnetic and/or a radiation anomaly.

In correlating the responses on adjacent lines, the writer has taken into account the known NW strike of the formations.

Electromagnetic Survey Cont'd

Tight N to NNW trending folds are known, and overturned isoclinal folding, although not proven, is expected to be present. Strong point anomalies or anomalies shown on two lines only are of considerable interest.

Taking these various factors into consideration, the writer has rated the electromagnetic responses as follows:

1. Good - Those having several favorable characteristics: strength, steep gradient, associated magnetics and/or radiation.
2. Medium - Those with strong response that correlate with adjacent lines and which have at least in part a good gradient.
3. Indifferent - Long indefinite anomalies with variable conductivity and doubtful correlation.

This interpretation is portrayed on the attached maps. See Figs. 1, 2 & 3) It is of interest that area 5 survey (tie lines) provided a strong response of 10 about where the original Dan showing is located and that a number of significant responses have been obtained over area 4, where a number of showings have been staked off and on.

In this same area, a number of strong responses correlate well in relation to the known monzonite intrusive and as a result, this area is considered a good prospecting target area, where an additional 16 claims should be staked.

Area 3 was found to be excellent prospecting ground and there is one strong local anomaly picked up on two adjacent lines which is especially interesting, with a steep gradient and limited lateral extent. This is the most promising anomaly of the survey. An additional 24 claims are warranted in this valley, with possibly 12 more to cover the Southern part of the surveyed area.

#### E. Summary

The value of the survey resides principally in the electromagnetic responses obtained, a number of which present very good exploration targets. In area 1, three good targets have been located in the general area where pyrrhotite float has been found. In area 2, results are indifferent, partly due to high terrain clearance, but the conductors correspond relatively well to those of area 1 in the overlap.

Areas 3 and 4 both show considerable response of good type. Area 5, flown at high elevation, gave a strong response near the Dan showing.

The survey has provided good guidance by identifying those areas where bulldozer base lines or base "trails" should be cut for a reconnaissance prospecting and soil sample follow-up.

Due to somewhat high terrain clearance over the lower lying areas, the weaker responses obtained over this terrain may still be significant.

It should be remembered that medium and indifferent conductors may also conceal sulphide bodies and should not be ruled out as targets.

The writer favors the strong, short conductors, the best example of which lies about 1 3/4 mile North of the South boundary of area 3, with a response of 10 on two adjacent lines.

## 6. FOLLOW-UP PROGRAM

### A. General Outline

The results of the electromagnetic survey indicate clearly that the following program of bulldozer prospecting is the most likely to provide results.

1. Open up the Dan showing area, especially by trenching the area about 700' ESE of the known showing, where large blocks of float are present.

2. From this area, follow approximately the 4100' contour to the SE and S, cutting the overburden sufficiently to take a soil sample every few hundred feet and trench the area where float has been previously found by prospectors, and any other area where mineralization is encountered.

If no sulphides are encountered in the areas of the attractive anomalies, cut some additional widespread lines up and down the slope and take soil samples every 200', using the EM map as guide.

3. Move the bulldozer West and SouthWest of the original showing, and cut a bulldozer line, with soil samples every few hundred feet, to the SW boundary of the property and trench any area where signs of mineralization are encountered.

Follow-up Program

4. Cut out the location lines of the outside claims along the West boundary of the claims and survey by tape and compass the claim locations in this area and tag the posts. Stake any additional ground that is of interest in this area, using a bulldozer line as a location line, with soil samples in the vicinity of the conductors.

5. As soon as interesting soil sample results become available, return to the area of interest for additional soil sampling, if possible by using again the bulldozer.

6. Carry out reconnaissance EM as indicated by the results of 1-5.

7. While bulldozer cutting is in progress, or shortly thereafter, map geologically areas of outcrop accessible from the bulldozer line, tying in to the soil sample pickets.

8. Carry out Winkie drill sampling on the most attractive of the established showings.

B. Proposed Time-Table

May 10th, 1968 - Move in, set up camp.

May 13th - Move in bulldozer and fuel.

Provide for a minimum of 200 cat-hours, with a provision for an additional 100 hours as results warrant.

Completion of points 1-7: about June 15th, 1968, depending upon results.

Winkie drilling can start about that time.

C. Proposed Surveying and Tagging

1. Cat-Trails - Select the location of the main bulldozer tote-trails to follow areas of light overburden, and traversing preferably below areas of heavy overburden, if any.

Keep the main trails down-slope from the conducting zones.

2. Picket clearly all sample points.

3. Survey by compass, tape and altimeter the main bulldozer tote-trails, using the soil sample pickets.

4. Tag and tie in, by compass, tape and altimeter, all claim posts lying within a few hundred feet of the main bulldozer tote-trails.

5. Soil Sampling: 10 line miles, one sample every 200': approximately 270 soil samples.

Analyse all samples for Cu, Pb and Zn, and for Ag all those samples assaying over 50 ppm Pb. Use Whitehorse Assay Office.

D. General Considerations

The sequence of this program has to be kept very flexible, and the discovery of significant amounts of sulphide in place could lead to major modifications, especially where the grade is commercial.

The overall purpose of the program should remain the discovery of as many occurrences in place as possible, and before completion of the program, bulldozer trails should be cut up both valleys in areas 3 & 4.

Showings should at all times have precedence over soil sampling.

E. Staking

Staking is estimated as follows:

West of Dan:	12 claims
*Area 4, SW of Dan:	16 claims
*Area 3, S of Dan:	24 claims
Area 3, Southpart, not urgent	<u>12 claims</u>
Total	<u>64 claims</u>

\* Staking and recording before bulldozer work is preferable, to use this work as assessment credit, in those areas marked with an asterisk.

7. OPERATING COST ESTIMATE

Based on a crew of Bulldozer Operator, Field Manager, Geologist,

Two Prospectors and One Cook.

A. Firm

Bulldozer, 200 hours @ \$40.00 including mobilization & fuel	\$ 8,000
Transportation: 4 wheel drive, @\$0.50 a mile 1600 miles	\$ 800
Camp Set Up	\$ 1,000
Food, 200 men days @ \$5.00	\$ 1,000
Wages, 5 Men Crew	\$ 4,500
Soil Samples, 300 @ \$4.00	\$ 1,200
Miscellaneous Expenses, Radio Rental, Assaying, Field Maps, etc.	\$ 1,000
EM Surveying, 10 line miles @ \$100.00	\$ 1,000
Staking & Recording, 64 claims @\$30.00	\$ 2,000
Travelling, C.P.A., pick-up	\$ <u>1,000</u>
	\$21,500

Operating Cost Estimate - Firm

Carried Forward	\$21,500	
Overhead, 10%	\$ <u>2,200</u>	
	\$23,700	
Contingencies, 10%	\$ <u>2,300</u>	
	\$26,000	
Engineering, Consulting	\$ <u>3,000</u>	
Total Cost		\$ <u>29,000</u>

B. Contingent

If another 100 hours of bulldozer time are required @ \$40.00,  
total estimated added cost is, double this amount \$8,000

Provision for subsequent Winkie drilling, 1600' @ \$5.00 .....	\$ <u>8,000</u>
Total Contingent Expenditures	\$ <u>16,000</u>
Total Budget in case of Success	\$ <u>45,000</u>

8. SUMMARY

The airborne electromagnetic survey has revealed a number of very good targets, two of which are known to lie over sulphides in place in areas 1 and 4, and three of which are located in an area where abundant pyrrhotite float has been reported. Eight other target areas of comparable quality are known, mostly on open ground.

Ten other anomalies are considered medium quality targets.

A firm follow-up program of \$29,000 has been prepared, which in case of success would require an additional \$16,000 - to prepare any discoveries for a more extensive investigation, and a total budget of \$45,000 is recommended for this project.

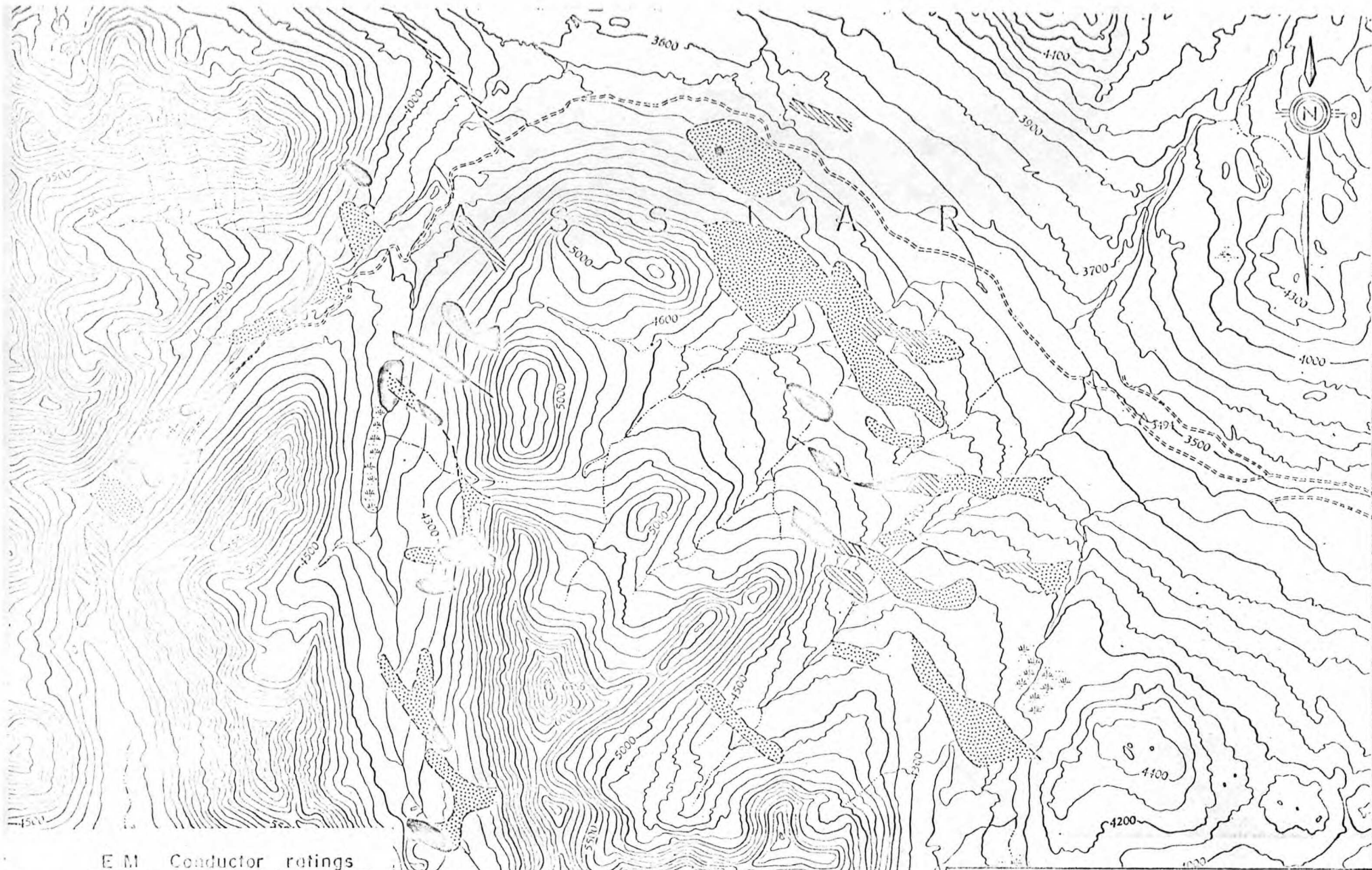
Respectfully submitted,

A handwritten signature in cursive script, reading "P. H. Sevensma", written over a horizontal line.




PHS/cm

P. H. Sevensma, Ph.D., P. Eng.

April 18, 1968.  
Vancouver, B.C.



EM Conductor ratings

-  Good
-  Medium
-  Indifferent

*P. H. Sevensma*

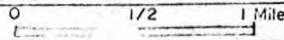
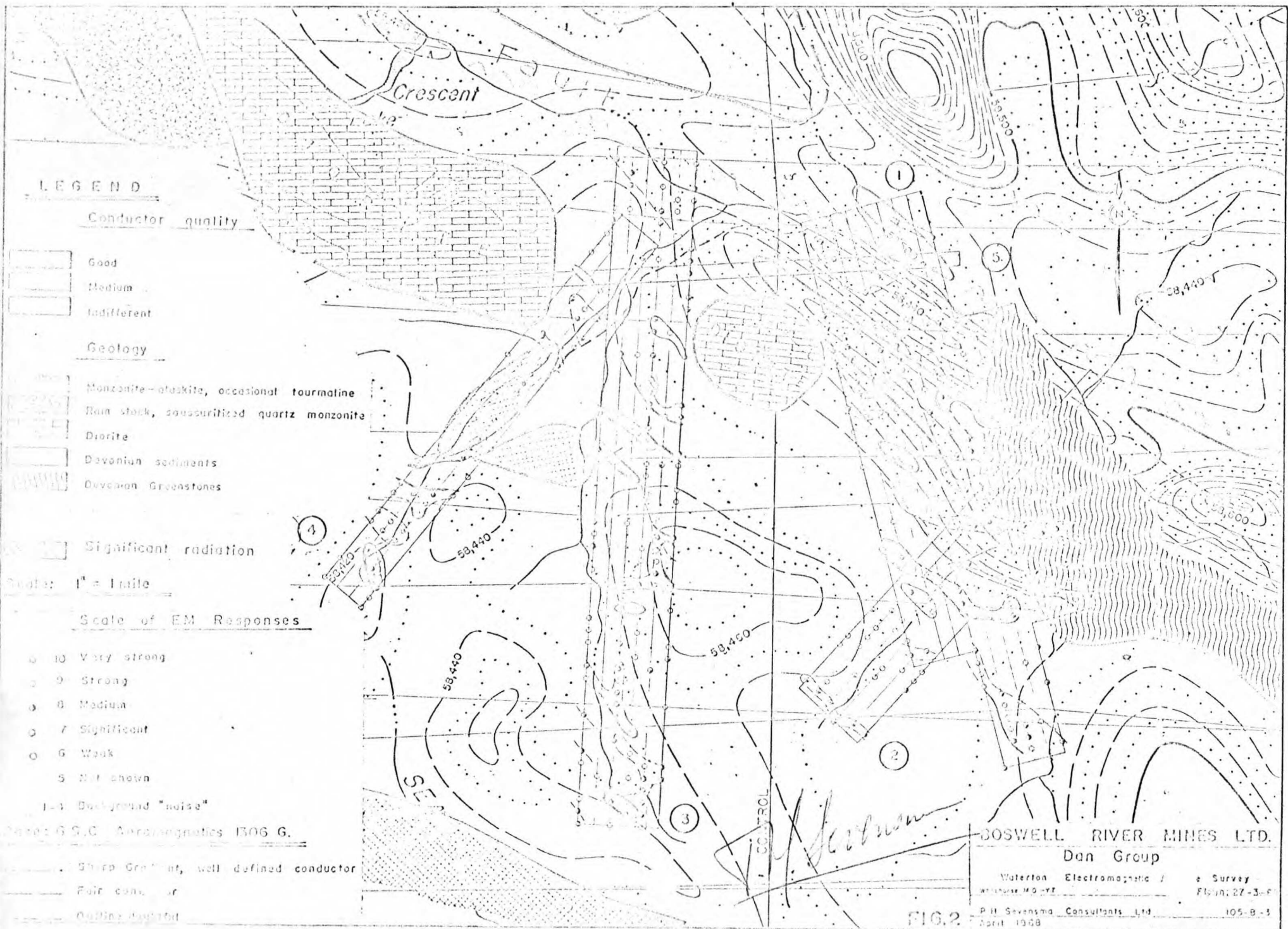
DOSWELL RIVER MINES LTD.	
DAN GROUP	
Airborne Survey and Topography	
P. H. Sevensma Consultants Ltd.	105-B-3
April 1968,	Scale: 

FIG. 3

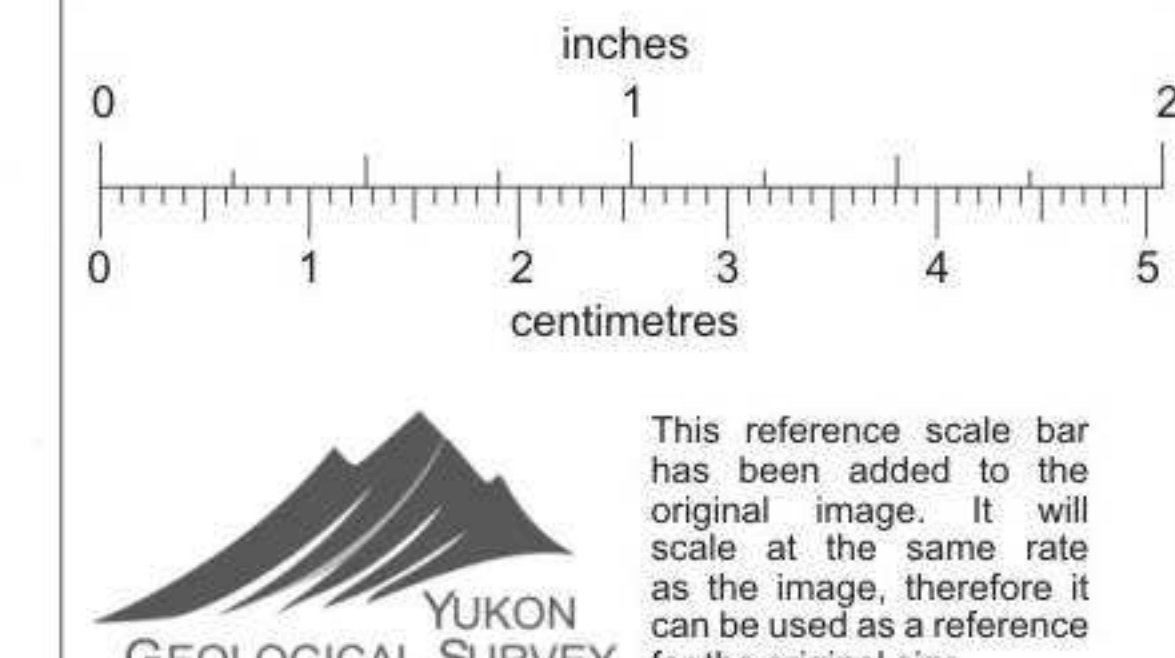
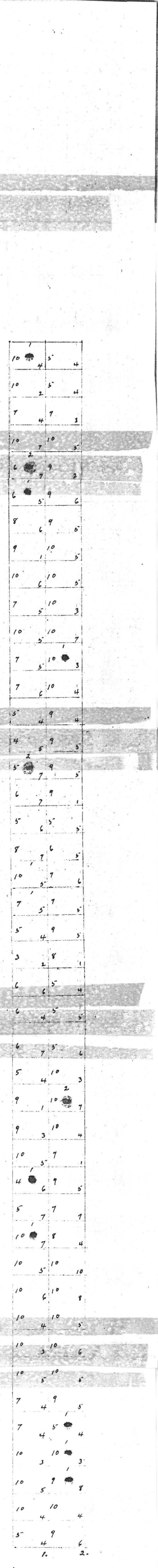
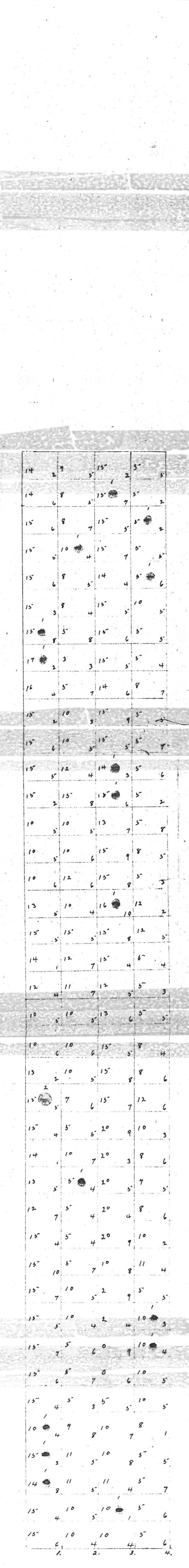
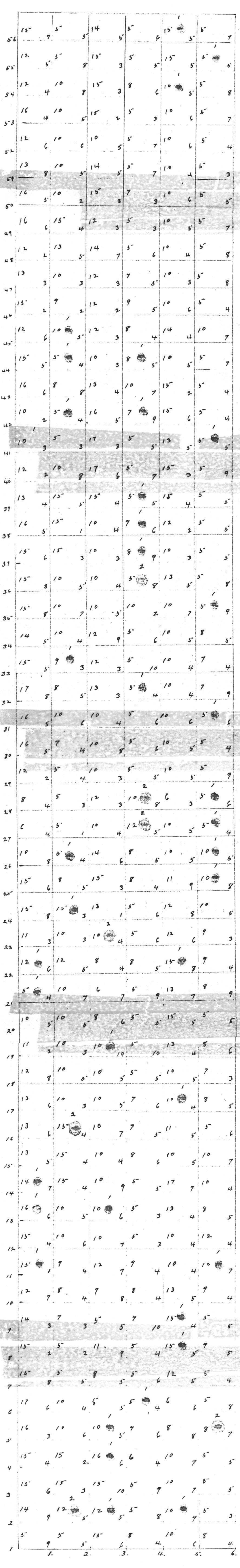


Pages 6 S.C. Aeromagnetics 1306 G.

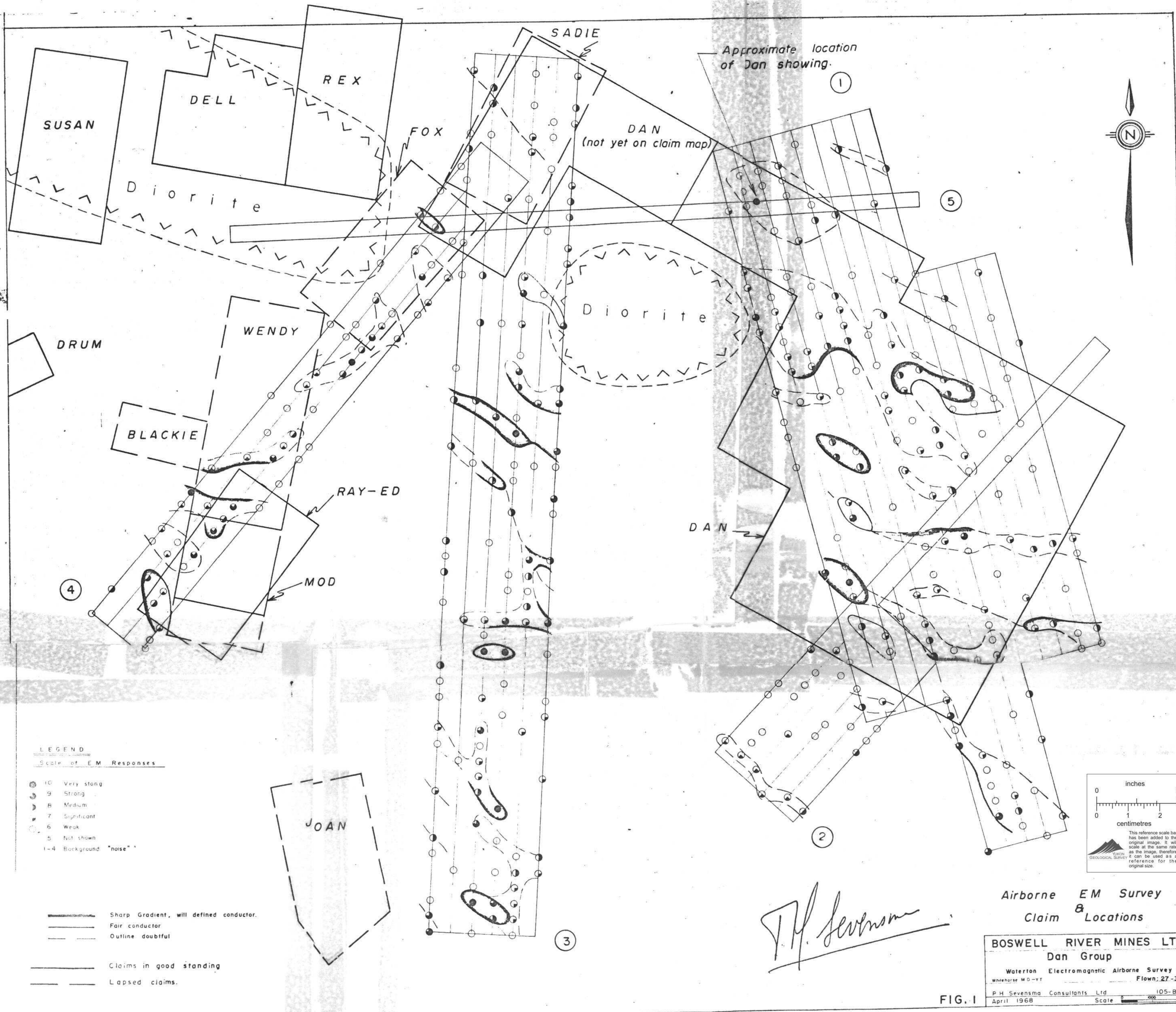
Sharp Gradient, well defined conductor  
 Fair conductor  
 Outline indicated

DOSWELL RIVER MINES LTD.  
 Dan Group  
 Waterton Electromagnetic Survey  
 Waterton 100-101  
 Flight: 27-3-6  
 P.H. Stevens & Consultants Ltd. 105-B-1  
 April 1968

FIG. 2





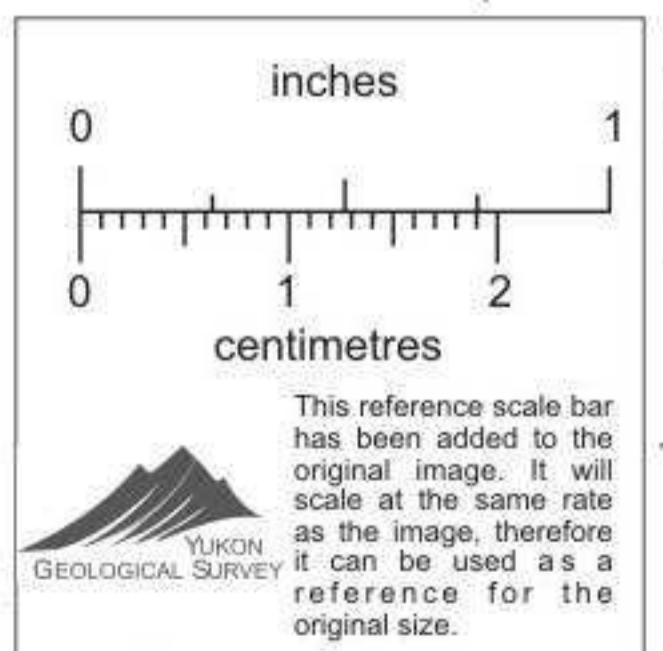


**LEGEND**  
Scale of E.M. Responses

- 10 Very strong
- 9 Strong
- 8 Medium
- 7 Significant
- 6 Weak
- 5 Not shown
- 1-4 Background "noise"

- Sharp Gradient, well defined conductor.
- Fair conductor
- Outline doubtful

- Claims in good standing
- Lapsed claims.



Airborne EM Survey  
Claim Locations

*J.H. Severson*

**BOSWELL RIVER MINES LTD.**  
Dan Group  
Waterloo Electromagnetic Airborne Survey  
Whitehorse MD-YT Flown: 27-3-68  
P.H. Severson Consultants Ltd. 105-B-3  
April 1968 Scale 1:1000

FIG. 1