

INTERPRETATION OF AEROMAGNETIC SURVEY  
TROUT RIVER AREA, NORTHWEST TERRITORIES, CANADA  
FOR  
INDORE GOLD MINES, LIMITED  
AUGUST 25, 1953

GRAVITY METER EXPLORATION COMPANY  
Houston, Texas

## **SUMMARY**

This report covers the interpretation of the aeromagnetic survey of some 150 square miles in Northwest Territories, Canada. The interpretation of these data shows that the igneous and metamorphic rocks, commonly called the "basement rocks" lie at a general level at about 2000 ft below sea level. Three residual anomalies indicative of local relief of this basement surface are shown in the southwestern portion of the survey. They are all downgraded and are not highly recommended as indications of possible structure.

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Maps

Observed Aeromagnetic Map, with regional basement contours superimposed at an interval of 500 ft. Also superimposed are the individual basement depth estimates.

Second Vertical Derivative Aeromagnetic Map, with residual anomalies and outlines of local areas of interest superimposed. The contour interval of the derivative map is  $10 \times 10^{-15}$  cgs.

## INTRODUCTION

The interpretation of these aeromagnetic data attempts to resolve the observed magnetic anomalies into the two categories of intrabasement and suprabasement anomalies. The intrabasement anomalies are those, which because of their large areal size and large amplitude, must originate from large magnetization contrasts in the basement (i. e. igneous or metamorphic) rocks. These large magnetization contrasts are assumed to originate at the basement surface and to extend infinitely downward with vertical sides. With these assumptions estimates of the depths to the tops of these anomalously magnetized bodies may be made; these depths are a measure of the thickness of the sedimentary section.

After these large features are resolved and are employed for the determination of the sedimentary thicknesses, residual anomalies may remain which may be placed in other categories. The category of principal interest is the suprabasement type. These are the anomalies which are of such shape and amplitude that they can be assumed to be caused by relatively thin sheets of magnetized rock, for example, from relief of the basement surface. Another group includes disturbances from the ground surface, which in this area are assumed to arise from the erratic distribution of glacial materials. These produced sharp and erratic anomalies which are easily separable from those related to basement rocks.

The analysis is based on a study of the observed data together with a second vertical derivative map. The second vertical derivative approximates the curvature of the observed magnetic field; red shading on the derivative map indicates areas of positive curvature while those shaded yellow are areas of negative curvature. All observed anomalies have curvature or derivative anomalies and, in general, the derivative anomalies, which are large in area and in amplitude, are those from the large observed, or intrabasement anomalies.

Also in a general way the small and sharp derivative features are the anomalies which are not intrabasement in origin and which, therefore, may be indicative of local basement relief, surface disturbances, and other sundry causes. Therefore, the derivative map assists the resolution of the intrabasement and suprabasement features although it is at the same time affected by any other anomalies that may be present.

THE OBSERVED AEROMAGNETIC MAP (scale 1 in = 1 mi., Contour interval 10 gamma)

The observed data are dominated by generally north-south magnetic trends which are disturbed by minor positive and negative axes. These features are considered to emanate from polarization contrasts within the basement rocks so that most of the disturbances observable on the original magnetic map are considered intrabasement effects.

These intrabasement features provide the basis for making estimates of the depth to the surface of the basement rocks to indicate the thickness of the sedimentary section. The individual depth estimates are plotted on the observed magnetic map; the figures are in hundreds of feet below sea level. Those with underlines are graded according to their dependability good, fair and poor indicated by three, two and one underlines, respectively. A fourth category is followed by the letter "s" which indicates that the estimate was made with the assumption that local relief of the basement is present.

The basement depth estimates are contoured at an interval of 500 ft. This contouring develops a regional feature which is a nose plunging southwestward from the northeast corner of the map from a level of -1500 ft to -2500 ft. This broad general nosing is probably the most dependable result of this interpretation.

THE SECOND VERTICAL DERIVATIVE AEROMAGNETIC MAP (scale 1 in = 1 mi. Contour interval  $10 \times 10^{-15}$  cgs.)

The derivative map develops very clearly the positive and negative indications of the observed data. The red areas are those of positive curvature of the observed data and the yellow areas are those of negative curvature. Furthermore, it is a reasonable generalization to state that the red areas overlie portions of the basement which are more highly polarized or which contain more ferromagnetic minerals than those portions of the basement which underlie the yellow areas.

Three low grade residual features have been resolved from the observed and derivative data. These are superimposed on the derivative map and are contoured as residual anomalies, at an interval of 5 gammas. These contours indicate the local departure of the magnetic field from that of a smooth basement surface and thus are indicative of local relief of the basement surface. The three residual features seem to be of the same general orientation and habit as the intrabasement anomalies, and, therefore, are not highly recommended as indicative of local basement relief.

1-F in the southern central portion of the survey is the best developed of the residual anomalies and conforms very well to a derivative anomaly which, on the other hand, may be caused by a very low relief intrabasement feature. 2-P in the west-central portion of the survey is indicative of a fault trace, downdropped to the west from a fault anomaly with maximum amplitude of 12 gamma. 3-P is immediately west of 2-P and, like 1-F, is very difficult to resolve from intrabasement effects in the same area.

CONCLUSION

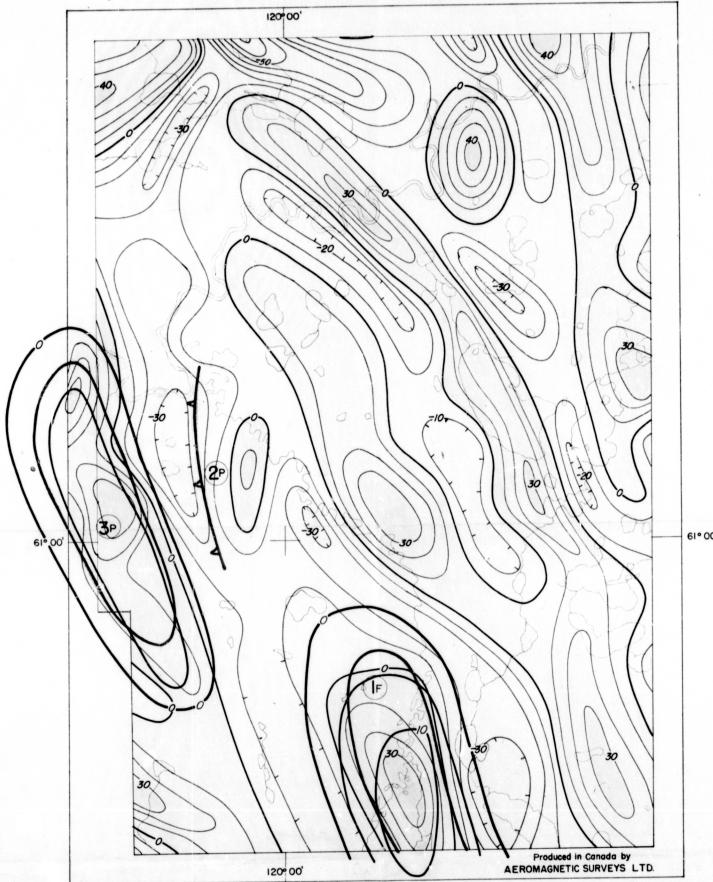
The aeromagnetic survey indicates that the basement in this area is very shallow and generally at -2000 ft. The basement depth estimates tend to develop a broad nosing from

the northeastern corner of the survey which plunges from -1500 ft in that area to -2500 ft in the southwestern corner of the survey. This is probably the most dependable result of the interpretation. The three residual features, possibly indicative of local basement relief, are not highly recommended.

GRAVITY METER EXPLORATION COMPANY

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INDORE GOLD MINES LIMITED  
PETROLEUM PERMITS 349 & 373 N.W.T.  
1953 AEROMAGNETIC SURVEY



SCALE  
1 Inch = 1 Mile

SECOND VERTICAL DERIVATIVE MAP

CONTOUR INTERVAL  $10 \times 10^{-6}$  G.S.

RESIDUAL CONTOURS  
INTERVAL 5 GAMMA



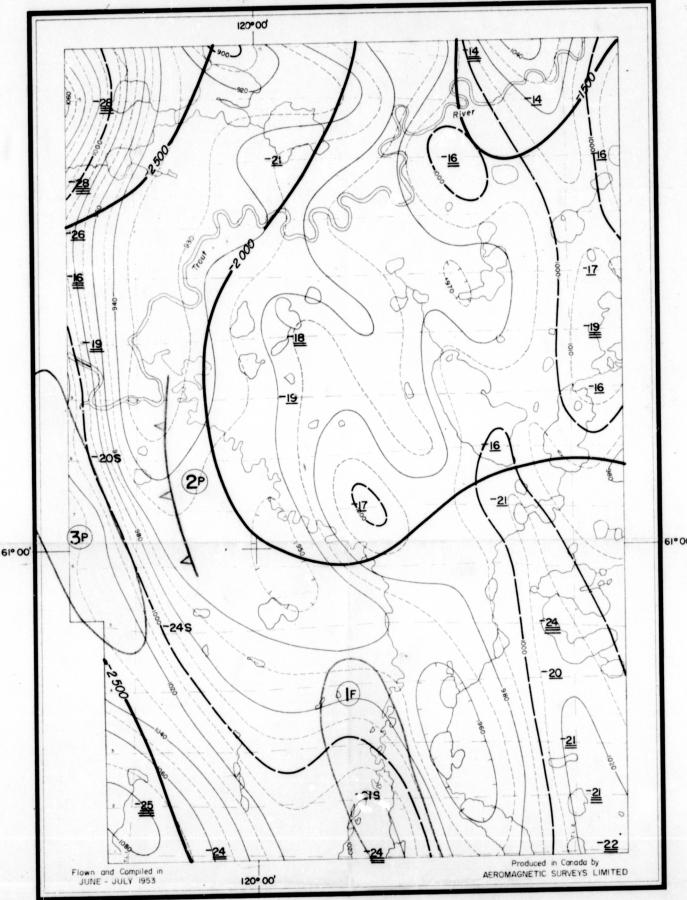
LOCAL AREA OF INTEREST  
FAULT

CALCULATED BY

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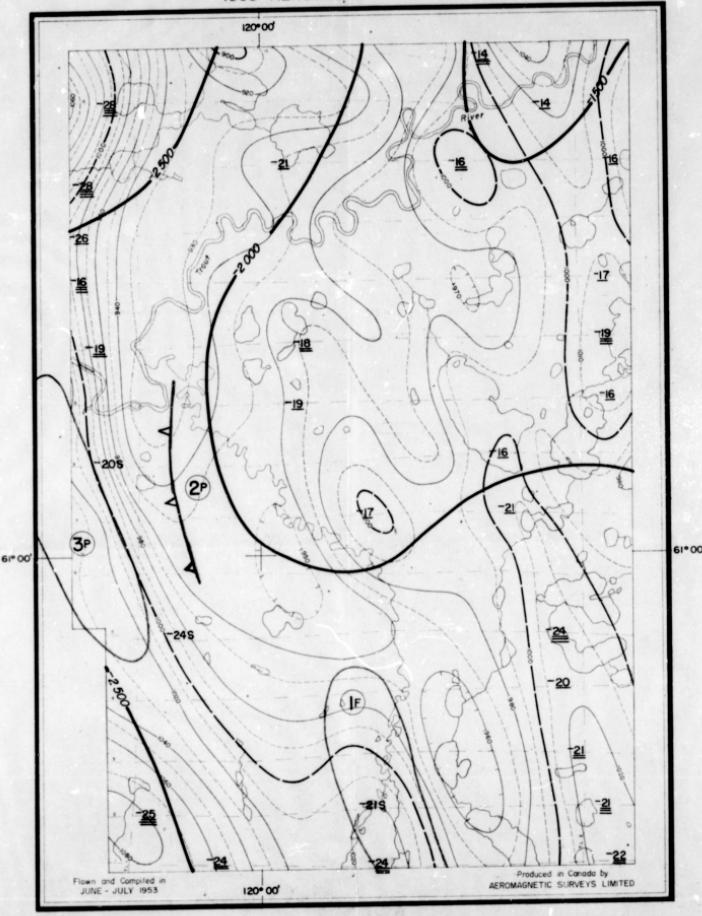


-110 MAGNETIC DEPTH ESTIMATES  
(HUNDREDS OF FEET)  
= GOOD - FAIR - POOR  
S LOCAL BASEMENT RELIEF  
AREA OF POSSIBLE LOCAL BASEMENT RELIEF  
G = GOOD F = FAIR P = POOR  
FAULT

STRUCTURAL CONTOUR MAP  
ON THE  
BASEMENT SURFACE  
DRAWN FROM MAGNETIC DEPTH ESTIMATES  
CONTOUR INTERVAL 500 FEET

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CONTOUR INTERVAL ..... 10 GAMMA  
ALTITUDE ..... 2500 FEET ABOVE SEA LEVEL  
MEAN FLIGHT LINE SPACING ..... 1 MILE  
FLIGHT LINES ..... 1P, 2P, 3P, 4P

SCALE  
1 Inch = 1 Mile

500 GAMMA .....  
100 GAMMA .....  
20 GAMMA .....  
-20 GAMMA .....  
MAGNETIC DIP

-110 MAGNETIC DEPTH ESTIMATES  
(HUNDREDS OF FEET)

GOOD FAIR POOR

S LOCAL BASEMENT RELIEF

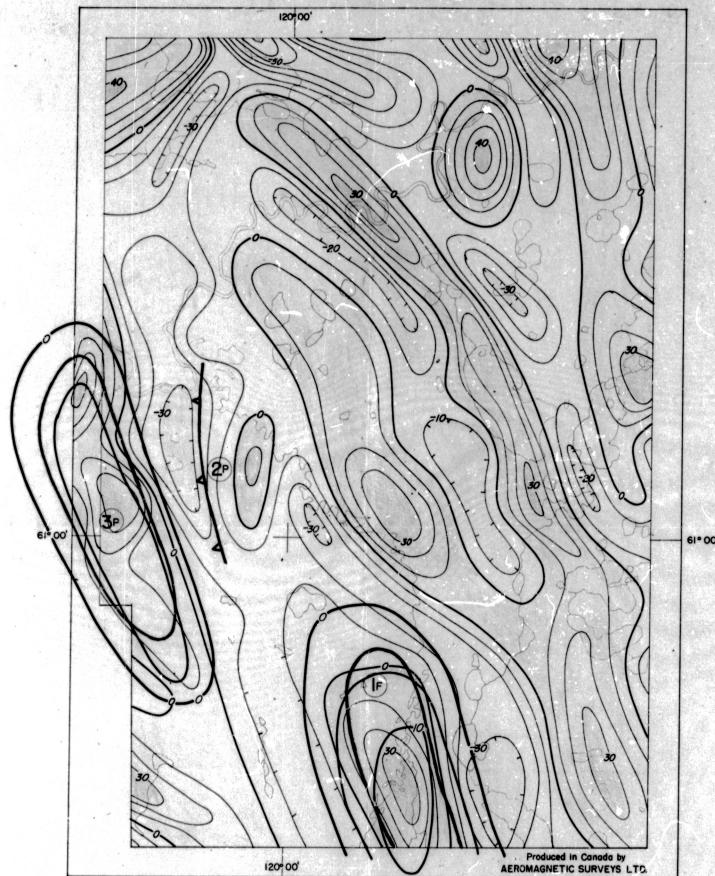
AREA OF POSSIBLE LOCAL BASEMENT RELIEF  
G = GOOD F = FAIR P = POOR

FAULT

STRUCTURAL CONTOUR MAP  
ON THE  
BASEMENT SURFACE  
DRAWN FROM MAGNETIC DEPTH ESTIMATES  
CONTOUR INTERVAL 500 FEET

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SCALE  
1 inch = 1 Mile

SECOND VERTICAL DERIVATIVE MAP

CONTOUR INTERVAL  $10 \times 10^{-15}$  CGS

RESIDUAL CONTOURS  
INTERVAL 5 GAMMA



LOCAL AREA OF INTEREST  
FAULT

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