REPORT
OF
MAGNETOMETER
AND
HORIZONTAL LOOP E.H.
SURVEYS
18 CLAIM GROUP, LOTS 10 & 11, AND N½ OF S½ LOT 9, CONCESSION 3
GRAHAM TOWNSHIP
DISTRICT OF SUDbury
ONTARIO

18 Mining Claims: S-153528 - 153537 Inclusive
S-153543 - 153550 Inclusive

JUNE 1, 1973
G. H. CLUFT
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SUMMARY

A horizontal loop Ronka E.M. survey and a magnetometer survey were carried out over 18 claims located in Graham Township, District of Sudbury, Ontario in Concession 3, occupying Lots 10 and 11 and the NW* of the SE Lot 9.

A number of scattered relative magnetic highs and a few lows were recorded. Numerous eastward trending scattered, weak E.M. conductors were outlined. Many of the magnetic and E.M. anomalies were related to metasedimentary pelite bands, some of which were weakly mineralized by pyrrhotite, pyrite, and chalcopyrite. Some anomalous E.M. readings appeared to be caused by topography.

An assessment report submitted in June 1972, described the geology and the linecutting in this block.

Geophysical maps accompanying this report are overlain on geology maps submitted in the June 1972 report.
MAGNETOMETER AND HORIZONTAL LOOP E.M. SURVEYS OF LOTS 10 AND 11, AND THE NORTH HALF OF THE SOUTH HALF LOT 9, CONCESSION 3, GRAHAM TOWNSHIP, DISTRICT OF SUDBURY, ONTARIO.

18 MINING CLAIMS: S-153528 - 153537 Inclusive and S-153543 - 153550 Inclusive

LOCATION AND ACCESS

The property consists of 18 contiguous claims S-153528 to S-153537 inclusive and S-153543 to S-153550 inclusive, in Graham Township. These claims are located as follows:

Claims S-153543 to S-153550 - Lot 11, Con. III ) North of the south shore of Vermilion River

Claims S-153528 to S-153531 )- Lot 10, Con. III )

Claims S-153532, S-153533 - N½ S½ Lot 9, Con. III

The claim group is approximately 12 miles southwest of the City of Sudbury, Ontario. It lies approximately ¾ of a mile north of Highway 17 and ½ mile north of the C.P.R. railway.

The property is accessible by trails and several old diamond drill roads north of Highway 17 in Lot 9, Concession III Graham Township.

PROPERTY OWNERSHIP

The 18 claims in the map area are recorded under the name of Falconbridge Nickel Mines Limited, Falconbridge, Ontario.

WORK SUBMITTED

This geophysical report describing a magnetometer and a horizontal loop electromagnetic survey is submitted by Falconbridge Nickel Mines Ltd.,
Falconbridge, Ontario, for a total of 40 days assessment work credit per claim or a total of 720 days assessment work credit for the 18 claim group. This is based on 20 days assessment work credit per claim for each of the two geophysical surveys. The geophysical work was performed equally on the 18 mining claims described above by personnel of Falconbridge Nickel Mines Limited, Falconbridge, Ontario.

DATES OF WORK PERFORMED

The geophysical survey field work was carried out during November and December, 1969 with map preparation and geophysical interpretations done in January 1970 and April 1973.

GEOLOGICAL DATA

The 18 claim map area covers a portion of a volcanic belt (containing both mafic and acidic volcanics) and a sedimentary belt, both of which trend east-northeast across the township.

This volcanic belt through Graham Township is approximately ¾ to 1½ miles wide. It is bounded on the north by the younger Creighton granite and on the south by a younger sequence of metamorphosed pelites (McKim formation), conglomerates (Ramsay Lake conglomerate), quartzites (Wahnapitae quartzite), and intrusive gabbro bodies (Sudbury gabbro). All these rock types have been affected by brecciation, i.e. Sudbury breccia. Younger dykes of olivine diabase trend northwestward cutting all these rock types.

The norite contact of the nickel irruptive lies approximately 2 miles northwest of the granite-volcanic contact.
Within the metavolcanic belt are numerous relatively narrow bands of metapelite and a few granite dykes and plugs. Pelite bands can generally be traced from several hundred feet to over a mile along strike. Many pelite bands are weakly to moderately mineralized with disseminated pyrite, pyrrhotite, and chalcopyrite. Some minor disseminated sulphides occasionally occur in the mafic volcanics. Scattered old pits and trenches and a few diamond drill hole collars provide evidence of former exploration activities in the township.

Some of the interbedded metapelite bands particularly on lines 256 and 260 at 00 to 50°S. contained up to 10% fairly fine grained disseminated pyrite, pyrrhotite, and traces of chalcopyrite. This type of mineralization was found in numerous other narrow metapelite bands outside the map area.

Weakly disseminated pyrite, pyrrhotite, and chalcopyrite occurred in a small area 200' west of 2400°S. on line 252 in mafic metavolcanics. An old pit was also found at that location. No other pits or trenches were found within the map area, but a number were located on mineralization elsewhere.


The geology of this 18 claim group is described in detail in a geological report submitted for assessment by Falconbridge Nickel Mines Limited in June, 1972.
Other assessment work previously submitted by Falconbridge Nickel Mines Limited on this 18 claim group consisted of the following diamond drill holes:

- GRA-12, 730' deep, -65°N, on claim S-153536 at 370'S on line 252, submitted in May, 1971.

**CONTROL - LINSCUTTING**

Geophysical surveying was carried out along grid lines running north-south and cut at 400' intervals across all claims. The lines were chained and marked with numbered pickets every 100'.

The lines form part of a larger grid system which is tied in to a surveyed base line located just to the north of the presently described map area. An east-west surveyed tie line along the south extremity of claims S-153532 and S-153533 in the N½ of the S½ Lot 9 Concession 3, accurately established the end position of lines 216 to 236.

Approximately 72,100' (or 13.66 miles) of lineage was cut on this claim group. This figure was made up of 69,450' of grid lines and 2,650' of tie lines.

A total of approximately 692 stations on 100' centers were established along the grid lines. Geophysical readings were made, in general, every 50' for a total of approximately 1280 readings for
the magnetometer survey and approximately 1322 readings for the E.M. survey.

The linecutting was submitted for assessment in June, 1972.

PERSONNEL

Geophysical surveying was performed by Falconbridge Nickel Mines Limited personnel. The work was supervised by Mr. R.H. Tays, formerly Geophysical Foreman, Falconbridge Nickel Mines Limited, 685 Murdoch Avenue, Noranda, Quebec, under the general direction of Mr. G. H. Cluff, Senior Field Geologist, Falconbridge Nickel Mines Limited - Sudbury Operations, Falconbridge, Ontario.

THEORY AND METHOD OF SURVEYS

Magnetometer Survey

In carrying out the magnetometer survey, a Sharrap MFL Fluxgate magnetometer was employed. This instrument is a vertical component type and operates by means of a fluxgate system which is operated by battery. The readings are taken from a meter on the face of the instrument and are read in gamma values. Therefore, no correction is necessary except for the diurnal and instrument drift.

The fluxgate system works on the principle that a battery current is passed through two coils which are arranged within a secondary winding. These coils are so arranged that the magnetic field set up in them is equal. If, however, an external magnetic field exists, it creates an in-balance in the system which results in a measurable
voltage which is proportionate to the strength of the external field. The voltages are measured on a meter on the face of the instrument which is divided in gamma values. A detailed explanation of the fluxgate system can be found in "Applied Geophysics for Engineers and Geologists" by Griffith and King.

The magnetometer survey was conducted by taking readings with the Fluxgate magnetometer at fifty foot intervals along the lines of the grid. Corrections for diurnal variations in magnetic intensity and for instrument drift were made by the usual procedure of reading a magnetic base station at frequent intervals and by distributing the observed variation over the readings taken during that interval. Magnetic base stations were established along the surveyed base line located just to the north of this claim group. These stations were located at the junction of each grid line and the base line on 400' centers. Other magnetic base stations were located on grid lines within the claim group as shown on the magnetometer plan.

The exact location of base stations was repeatable, in that the base of the magnetometer was rested on a picket, cut to a suitable length. Other stations were read with no special height or position controls. The operator stopped opposite the picket and made an observation. The "bulls eye" levelling system and automatic gimbal suspension built into the instrument were deemed adequate for the accuracy requirements of the survey. Following the necessary corrections, the readings were plotted in gamma values on the map. Magnetic readings could not be taken in certain areas on a few lines because of wide creeks, ponds, and marshes.
The accuracy of this instrument is considered plus or minus $0.5\%$ of full scale on the 1,000 to 10,000 gamma ranges and $1.0\%$ of full scale on the 30,000 to 100,000 gamma ranges. The sensitivity is 20 gamma/div. on the 1,000 gamma scale, and decreases proportionate to the increased scale range.

**Horizontal Loop E.M. Survey**

The horizontal loop E.M. survey carried out on this property employed a Ronka MKIII horizontal loop E.M. unit. The MKIII instrument is a dual frequency design which operates at 410 CPS or 2400 CPS of which the 2400 CPS frequency was employed on this property.

The field procedure is as follows: a transmitter coil is carried along a line followed by a receiver coil and console unit. The coils are separated by a two hundred foot length of compensation cable. An electromagnetic field is induced into the ground by the transmitter coil, transmitting at a selected frequency. The transmitted signal is received in the receiver coil and the in phase and out of phase components are measured by the circuitry in the console and recorded in percentage of phase shift. If no secondary field is present (due to a conductor beneath the surface of the ground) the primary field from the transmitter only will be received and the response will be zero in phase and out of phase readings. However, if a secondary field is present a negative phase response will be observed for both the in phase and out of phase components. These responses are in proportion to the nature and strength of the conductor. The usual response pattern over a conductor
is, as the leading coil approaches the conductor a positive effect will be observed which is called the positive shoulder. When the configuration has moved to a point where the conductor is beneath the mid-point between the two coils, a maximum negative response will be observed and as the coils move off to the opposite side of the conductor a second positive shoulder will be observed. The nature and shape of the profile is determined by the composition of the conductor and its physical location in relation to the surface of the ground. The depth of penetration is a function of the coil separation usually considered equal to 2/3 the separation.

The readings, taken on 50' stations, are plotted at the midpoint between the transmitter and receiver coil and are shown as percentages. The values are then profiled to outline the anomalous regions. Readings at the south ends of some of the lines were not taken because of very steep topography.

A further explanation of the theory may be found in "Mining Geophysics, Methods in Geochemistry and Geophysics" by D.S. Parasnis and in "Interpretation Theory in Applied Geophysics" by F. S. Grant and G. F. West.

GEOPHYSICAL INTERPRETATION

Summary of Geophysical Work

Geophysical survey maps - Plate 1 (Magnetometer Survey) and Plate 2 (Horizontal Loop E.M. Survey and Interpretation) - are overlain on geological maps (as previously submitted for assessment) which
show all pertinent data such as lot, concession, claim and grid lines and numbers, topographic features and key map.

A number of scattered relative magnetic highs and a few lows (negatives) were recorded over the claims. The general magnetic trend was east-west. Most of these anomalies were related to metasedimentary pelitic bands, some of which were weakly mineralized.

Numerous eastward trending, scattered, weak E.M. conductors were outlined, several of which were related to weakly disseminated sulphides in pelite bands. One stronger E.M. conductor also caused by sulphides occurred adjacent to the Concession 3/4 line in Lots 10 and 11. Some anomalous E.M. readings appeared to be caused by topography.

**Magnetometer Survey (Results and Interpretation)**

In carrying out the magnetometer survey of this area, the magnetometer was set to provide a background of approximately 400 to 500 gammas. Readings were taken every 50' along all lines except in areas with deep marshes and ponds.

The majority of the property produced background type magnetic readings between 0 and 1,000 gammas. A few scattered readings were from 1000 to 3625 gammas. The highest readings of 8920 gammas occurred on L-264W. at 800S. over marshy ground adjacent to an interpreted band of unmineralized pelite. A few isolated negative readings were recorded throughout the property.

Most of the relative magnetic highs and lows occurred over, or adjacent to, metasedimentary pelite bands of which most, but not all,
contained weak pyrrhotite, pyrite, and chalcopyrite dissemination, generally only several per cent by volume. Most anomalous zones were outlined from single isolated readings or several consecutive readings mainly along single lines. In only several cases did an anomalous zone extend across 400' to an adjacent grid line.

The trend of the magnetic anomalies was east-west to east northeast similar to the strike of the volcanic-sedimentary bands.

With the exception of the local anomalies over some areas of the pelite bands, there was little magnetic background difference among any of the rock types. There is a suggestion that the metasedimentary quartzite-greywacke area in the southern part of the claim group has a lower magnetic background than the volcanics in the rest of the property.

The observed magnetic intensities, correlated for diurnal variations and instrument drift, have been plotted on the attached plan (Plate 1) along with the interpretation. This plan is overlain on the geological plan (previously submitted for assessment) for easier correlation. Iso magnetic lines have been contoured - the 500 and 1000 gamma lines and at 1000 gamma intervals thereafter.

Horizontal Loop E.M. Survey (Results and Interpretation)

Readings were taken every 50' along all lines. Readings at the south ends of some of the lines were not taken because of very steep topography.

Numerous scattered weak E.M. conductors were outlined trending east-west to northeastward across the claim group. These weak anomalies
occurred overlying all rock types found on the property. As can be seen from Plate 2, some of these conductor axes extend across as many as four grid lines (up to approximately ¼ mile in strike length).

Some of these weak conductors were caused by nearby surface sulphides as indicated from geological mapping.

The conductor indicated at 2600S. on L-260W. which overlies mafic volcanic rocks, has been interpreted from geology as striking northeastward to 2300S. on L-252W. where it corresponds with a moderate magnetic anomaly. This conductor thus crosses a small pit containing minor disseminated sulphides located in the greenstone between lines 256 and 252. No other sulphides were noted in the greenstone in this area. From 2300S. on L-252W., it is uncertain whether this anomaly extends eastward over acidic volcanics to the eastern edge of the claim group or continues to overlie the mafic volcanics and strikes northeast to 1600S. on L-248. If it does the latter, it crosses a band of mineralized pelite within the greenstone.

Another weak conductor located at 1500S. on L-280W. and L-276W. is also likely related to weakly disseminated sulphides. An outcrop of mafic volcanic rock at 1500S. on L-272W. contains a narrow band of weakly mineralized pelite containing pyrrhotite, pyrite, and chalcopyrite. Since this pelite is on strike with the E,M. conductor, the pelite band probably extends under the overburden and is the cause of the anomaly. Strangely, no anomaly overlies the exposed sulphides at 1500S. on L-272W. A negative magnetic reading
occurs at 1500S. on L-272W. followed at 1700S. by a magnetic high of 3625 gammas.

Since none of the other weak E.M. conductors on the property is associated with any known surface mineralization, the reasons for their existence are unknown. However, since many of these conductors are in overburden covered areas, it is possible that in the volcanic portion of the property, narrow mineralized bands of pelite occur under the overburden and could account for some of the E.M. anomalies.

As well as the outlined weak conductors, there are a number of readings which might appear anomalous, but are believed to be due to topographical effects. Values thought to be due to topography have been indicated by the symbol (T). In rugged or hilly topography, the coils may become mis-aligned. This usually results in negative in-phase values (often large) and zero or low out-of-phase values.

Only one strong E.M. anomaly was outlined on this property. It occurred at the beginning of L-256W to L-268W. adjacent to the Concession 1/4 line. It definitely was caused by disseminated sulphides, up to 10% by volume, in a band of pelite within greenstone. A moderate magnetic anomaly is associated with it.

A plan of the survey showing the readings and interpreted conductors (Plate 2) is overlain on the geological plan (previously submitted for assessment) for easier correlation.
APPENDIX

I Statistical Data

Number of feet of grid lines on 400' centers 69,450'
Number of 100' stations 692
Number of magnetometer readings on 50' centers 1,280
Number of E.M. readings on 50' centers 1,322

II Instruments Used

Magnetometer

Sharpe Fluxgate MF1 Magnetometer Ser. No. 21003.
Direct read out on five scales to 100,000 gammas.
Full scale deflection on most sensitive scale 1,000 gammas.
Sensitivity: 20 gamma/div. on most sensitive scale.
Measurement: The vertical component of the magnetic field.
Plotting: Readings plotted in gamma values after being corrected for diurnal and instrument drift.

Ronka E.M. Unit

Ronka dual frequency HK111 horizontal loop E.M. unit Ser. No. 112.
Frequency employed: 2400 CPS.
Coil separation: 200'
Measurement: Percentage of in phase and out of phase variation of the vertical component of the combined field.
Sensitivity: 1% or 1:100.
Plotting: Results are plotted in percentage of in phase and out of phase shift.
DECLARATION

I, G. H. Cluff, the undersigned, herewith certify that I am a 1958 Bachelor of Science graduate in Honours Geology in the Faculty of Science of McMaster University, Hamilton, Ontario, and hold a Master of Science, Applied, degree (1962) in Mineral Exploration from McGill University, Montreal, Quebec.

I have been practicing my profession since graduation for a total of 15 years.

I am a member in good standing of the Canadian Institute of Mining and Metallurgy and of the Association of Professional Engineers of the Province of Ontario.


GHC:dr
DECLARATION

I, Reginald H. Tays, the undersigned, herewith certify I have had the following experience in geophysical surveying, employed as an instrument operator, party chief and field supervisor.

Four years with Geo. Explorers Limited, 1953 to 1957 under the supervision of Mr. Donald J. Salt (professional engineer) and twelve years with Falconbridge Nickel Mines Limited, 1957 to 1969. During this period I worked under the supervision of Mr. D. J. Salt (prof. eng.) and Mr. H. David KacLean (professional geophysicist).

I have personally supervised the geophysical work outlined in the above report.

R. H. Tays.
Mr. J. M. Hughes  
Regional Director  
Ministry of Natural Resources  
P.O. Box 130  
Sault Ste. Marie, Ontario  
P6A 5L2  

ATTENTION: Mr. E. Craig  

Dear Sir:  

Re: Mining Claims S.153528 et al, Graham Township, File 2.1248  

The Geophysical (Electromagnetic & Magnetometer) assessment work credits as shown on the attached statement have been approved as of the date above.  

The mining recorder should inform the recorded holder of these mining claims and so indicate on his records.  

Yours very truly,  

[Signature]  

for J. R. McGinn  
Director  
Lands Administration Branch  

Enclosure  

cc: Falconbridge Nickel Mines  

/cc: Resident Geologist  
Sudbury, Ontario
**TECHNICAL ASSESSMENT WORK CREDITS**

Recorder Holder: Falconbridge Nickel Mines Ltd.
Township or Area: Graham Twp.

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<td>153543 to 50 inclusive</td>
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**NOTICE OF INTENT TO BE ISSUED**

☐ Credits have been reduced because of partial coverage of claims.

☐ Credits have been reduced because of corrections to work dates and figures of applicant.

☐ NO CREDITS have been allowed for the following mining claims as they were not sufficiently covered by the survey:

*The Mining Recorder may reduce the above credits if necessary in order that the total number of approved assessment days recorded on each claim does not exceed the maximum allowed as follows: Geophysical – 80; Geological – 40; Geochemical – 40;*
SEE ACCOMPANYING MAP(S) IDENTIFIED AS
GRAHAM-0019-#1
GRAHAM-0019-#2
GRAHAM-0019-#3

LOCATED IN THE MAP CHANNEL IN THE FOLLOWING SEQUENCE (X)
GEOLOGICAL MAP
LOTS 10, 11, AND 1/2 OF 1/2 LOT 9
CON III GRAHAM TWP.
SUBMITTED FOR ASSESSMENT CREDIT BY
FALCONBRIDGE NICKEL MINES LTD.
SCALE: 1" = 500'
DATE OF SURVEY: JULY, AUGUST 1969
SIGNATURE OF GEOLOGIST:

A STRONOMIC
NORTH

GEOLOGIC MAP
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