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RONKA EM 16

ELECTROMAGNETIC SURVEY 63 2615

Three Duck Gold Mines Limited

Arethusa Lake, Chester Township, Ontario

by

W. Walker, F.G.A.C.

Summary

A Ronka Em16 survey on the Three Duck Gold Mines Limited property has delimited a series of major and minor conductors. The major ones appear to be related to faults, but of the several smaller conductors, those in the northeast of the property are near or at known gold veins.

Introduction

The property comprises four unpatented claims, S118910 to 118912 inclusive and S121594 in Chester Township, Sudbury Mining Division, Ontario.

The present EM16 survey is aimed at locating further gold bearing veins on the Three Duck Gold Mines property. Drilling, under the supervision of A. L. Reading, was performed on the No. 2 vein in the northeast of the property in 1948, and the No. 3 and 4 veins, 300 and 400 feet closer to Arethusa Lake were channel sampled at that time. These veins should be relocated and tied into the present grid system.

A short drilling programme to check faults evident on the aerial photographs was undertaken in December 1967 and January 1968. Several of the present conductors are near to and parallel to these faults, and differences are probably the result of the scale difference between the aerial photographs (1320ft. to the inch) and map (100ft to the inch). This lack of control may also be reflected in the drill siting. A magnetic survey in 1965 was at a wider spaced grid (400ft) than is suitable, to judge from the results.

General Geology

The property has not been mapped geologically. H. C. Laird mapped the Three Duck Lakes area and published his results as Ontario Dept. of Mines Vol. 41, part 3, 1932. By present geological considerations, we would consider the Three Duck area as part of a late Archaean (3200-2500 m.y.) island arc or volcano-sedimentary tectonic basin complex, with syntectonic granite in the core of the belt occupying much of Chester and Benneweiss townships. The gold of the Three Duck Camp is associated with this syntectonite granite. Early NNW faults have controlled dyke emplacement and are known to be mineralised at Weeduck Lake, a mile or so to the north-west. Most gold veins in the camp strike within a few degrees of east-west however.

Equipment and Technique.

Any electromagnetic equipment is based on measuring how much conductors in the ground affect an electromagnetic signal. A transmitter and receiver are therefore required. The penetration, or depth to which conductors can be detected, is a function of the distance between the transmitter and receiver. The EM16 utilises the U. S. Navy's Very Low Frequency (VLF) transmitters, in the present case NAA, Cutler, Maine, and NSS, Annapolis, Maryland, and so a) does away with the need for a transmitter on the property, b) can penetrate to a greater depth, and c) gives readings in all four quadrants of the compass by utilising both transmitters, rather than two as is usual: in other words there is no need to assume that any ore body must lie in say the E-W quadrant. On the present survey, two maps were prepared, one for the E-W survey based on the Annapolis transmitter, the other on the N-S survey, based on the Cutler transmitter. As may be seen from these maps, the N-S survey picked up the main E-W conductor, and the E-W survey picked up the main N-S conductor: with either one on its own, half the information would be missing.

The distance between the maximum positive and negative readings is about the same as the distance from the ground surface to a point somewhat above the centre of the effective area of the conductive body.

In practice, readings were taken on both stations every 100 feet along lines spaced 200 feet apart. Two readings are taken on each station, for in-phase and quadrature. In general in-phase readings are related to conductors in the bedrock, whereas from quadrature one may interpret some idea of conductive overburden.

Survey Results

A characteristic of the EM16 is that it readily detects conductors. Identification of these conductors is a prime concern of the geologist. In the present instance, a couple of years ago I interpreted E-W fault systems in the north and south of the SW claim, faulting at Arethusa Lake, and a NNW fault leading north from the west end of the Lake. None of these faults, evident as depressions has been traced out on the ground, but the systems are closely followed by conductors. With the exception of that under Arethusa Lake, each conductor has an effective centre of comductive at a depth of 50 to 200 feet and so must have its top at or near the bedrock surface. The reversed response of the quadrature also indicates that the feature relates to bedrock rather than overburden. While I would wish to ascertain relationships on the ground, my present inclination, based on limited drilling, is to downgrade the ore potential of these features.

A number of lesser conductors remain, in both N-S and E-"W quadrants. Three north of Arethusa Lake must be very close to the gold veins, and I therefore regard these small conductors as guides to veining, and all similar structures have priority for further work. The E-W conductors are all near surface and can probably be tested by stripping (test first for bedrock) or short hole (Winkie) drilling. The E-W conductors are not as clearly defined because the 200 foot spacing (E-W) is double that of the station spacing (N-S).

Conclusions

Some small conductors appear to be related to known gold veins. There are several similar conductors on the property. Larger conductors are probably related to faults.

Recommendations

1. Map the gold veins.
2. Map the faults.
3. Fill in the EM16 survey at N-S conductors on 100 foot lines.
4. Reinterpret all data.
5. Test bedrock depth with a rod at conductors.
6. Strip or drill conductors.

Respectfully submitted,

CHEW-WALKER ASSOCIATES

W. Walker, F.G.A.C.

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ADDENDUM

1. Principle of Operation

The VLF-radio stations operating for communications with submarines have a vertical antenna. The antenna current is thus vertical, creating a concentric horizontal magnetic field around them. When these magnetic fields meet conductive bodies in the ground, there will be secondary fields radiating from these bodies. This equipment measures the vertical components of these secondary fields.

The EM16 is simply a sensitive receiver covering the frequency band of the new VLF-transmitting stations, with means of measuring the vertical field components.

The receiver has two inputs with two receiving coils built into the instrument. One coil has normally vertical axis and the other is horizontal.

The signal from one of the coils (vertical axis) is first minimized by tilting the coil. The tilt-angle is calibrated in percentages. The remaining signal in this coil is finally balanced out by a measured percentage of a signal from the other coil, after being shifted by 90^0. The axis of this coil is at right angles to the axis of the first coil. This coil is kept normally parallel to the primary field.

Thus, if the secondary signals are small compared to the primary horizontal field, the mechanical tilt-angle is an accurate measure of the vertical real-component, and the compensation II/2 - signal from the horizontal coil is a measure of the quadrature vertical signal.

2. Station Selection

The selection of a transmitting station is done by a plug-in unit inside the receiver. The equipment takes two units simultaneously. A switch is provided for quick station-changing.

The magnetic field lines are always at right angles to the direction of the transmitting station. Thus where a station is to the east of the survey area, its N-S field will make the best intersection with E-W conductors.

In practice, in Northern Ontario readings on the following two stations cover both E-W and N-S quadrants of the compass: Station NAA, Cutler, Maine, Frequency 17.8Kc is to the east Station NSS, Annapolis, Maryland, Frequency 21.4Kc is to the south.

When the cover on top of the instrument is removed, the appropriate plugs can be inserted.

Survey lines should be made approximately along lines at right angles to the direction of the station being used, i.e. run the survey north or south when using NAA, and east or west when using NSS. Four readings are taken at each station, in phase and quadrature facing south on NAA, west on NSS.

3. Taking a Reading

To take a reading, first orient the reference coil on the lower end of the handle along the magnetic lines. Rock the instrument back and forth for minimum sound intensity in the headphone. Use the volume control to set the sound level for comfortable listening. Then use your left hand to adjust the quadrature component dial on the front left corner of the instrument to further minimize the sound. After finding the minimum signal strength on both adjustments, read the inclinometer by looking into the small lens. Also mark down the quadrature reading on the front edge of the instrument.

While travelling to the next location you can, if you wish, keep the instrument in operating position. If abrupt changes in the position occur while travelling, you might take extra stations to accurately pinpoint the details of the anomaly.

The dials inside the inclinometer are calibrated plus and minus percentages, and in degrees. Either ones can be used. If the instrument is facing 180^{0} from the original direction of travel, the polarities of the readings will be reversed. When plotting the readings, care should be taken to correct the polarities. The important thing is to know the actual physical tilt-angle of the instrument. The lower end of the handle will, as a rule, point towards the conductor. The instrument is so calibrated that when approaching the conductor, the angles are positive in the in-phase component.

4. Plotting the Results

For easy interpretation of the results, it is good practice to plot the actual curves on the paper, using suitable scales for the percentage readings as well as horizontal distances over the ground.

5. Interpretation

The determination of depth can be done with fair accuracy with this instrument by noticing the horizontal distance between the maximum positive and negative readings. This should be the same as the actual depth from the ground surface to the center of the effective area of the conductive body. This point is not the center of the actual body, but somewhat closer to the upper edge.

A vertical sheet type of conductor, if it comes close to the surface, gives a sharp cross-over of large amplitude and slow roll-off on both sides.

When looking at the plotted curves, one notices that two adjacent conductors may modify the shape of the anomalies for each one. In cases like this, one has to look for the steepest gradients of the vertical (plotted) field, rather than the actual zero-crossings.

Sometimes the quadrature-component shows a reversed polarity compared to the in-phase readings. This can be due to the conductive overburden on top of the area of deeper (better) conductor. The vertical secondary field penetrating through the overburden has negative quadrature component.

THREE DUCK GOLD MINES LTD.

ARETHUSA LAKE, CHESTER TWP., SUDBURY MINING DIVISION, ONTARIO.

RONKA EM-16 ELECTROMAGNETIC SURVEY

100 0 100 200 300 400 FEET

VLF STATION N.A.A. CUTLER, MAINE, READING SOUTH.

READINGS: W.R. MILLER, PLOTTING & INTERPRETATION: W. WALKER F.G.A.C.

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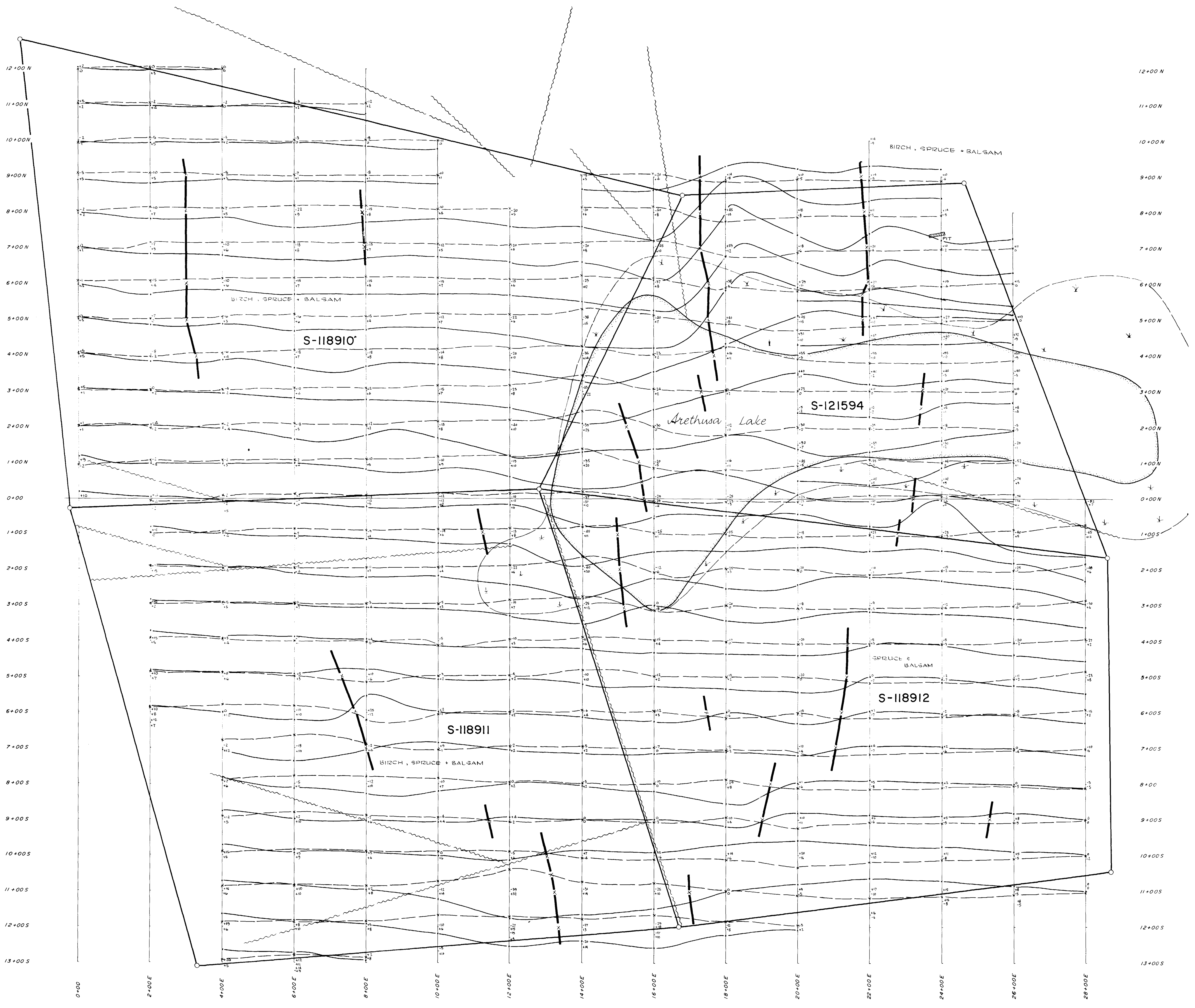

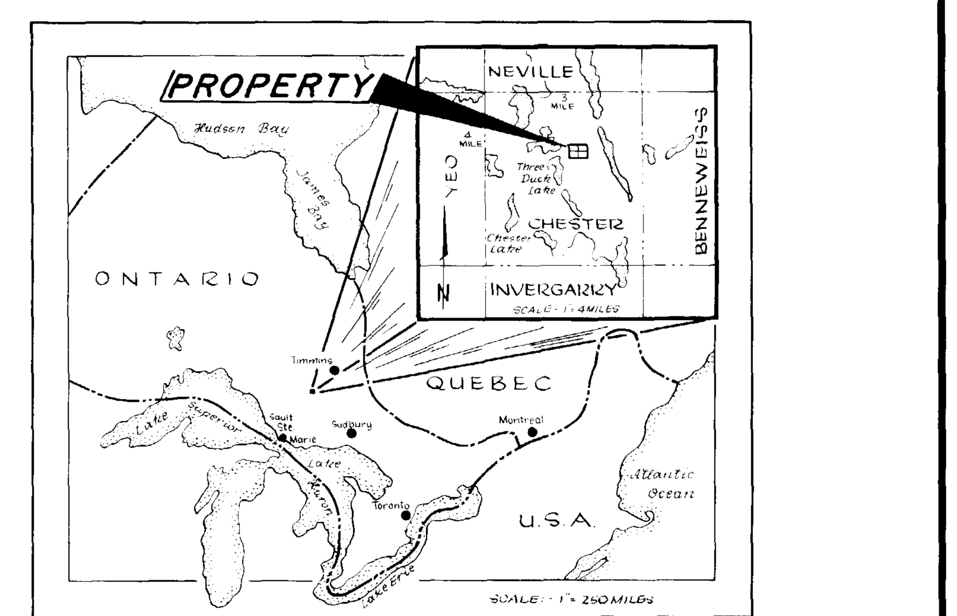

QUADRATURE PLOT
IN PHASE PLOT

IN PHASE READINGS
QUADRATURE READINGS
POSITIVE READINGS ARE PLOTTED NORTH OF PICKET.
NEGATIVE READINGS ARE PLOTTED SOUTH OF PICKET.
SCALE OF PROFILE : 1 inch to 50% of tilt
CONDUCTOR

NOTE: SEE COMPANION SHEET NAA, READING SOUTH

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V.L.F. STATION N.A.A. CUTLER, MAINE, READING SOUTH
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