Report to
George Cressy, Jr., and
CKN Explor. & Devel. Co. Ltd.
on a Geophysical Survey
of the NIK claims
by
Sherwin F. Kelly, P. Eng. 7/71

REPORT ON A
GEOPHYSICAL SURVEY

OF NIK MINERAL CLAIMS
NOS. 5 to 12

at

NICOLA LAKE, MERRITT, B. C.
50°, 120°, S. W.

by

SHERWIN F. KELLY, P. ENG.
GEOPHYSICIST AND GEOLOGIST

to

GEORGE CRESSY JR.
OWNER OF THE CLAIMS
and
CKN EXPLORATION AND DEVELOPMENT CO. LTD. (N.P.L.)
MERRITT, B. C.

ON WORK DONE
from JULY 1 to AUGUST 14, 1970

Department of

Mines and Petroleum Resources

ASSESSMENT REPORT

NO. 3143 MAP

3143

Report on a

Geophysical Survey

of

NIK Mineral Claims

at Nicola Lake, Merritt, B. C. 92 I /2E

to

George Cressy Jr.

and

CKN Exploration and Development Co. Ltd. (N.P.L.)

Merritt, B. C.

by

Sherwin F. Kelly, P. Eng.

Geophysicist and Geologist

July 12, 1971

Report to
George Cressy Jr. and
CKN Exploration and Development Co. Ltd.
on a Geophysical Survey of NIK Claims

TABLE OF CONTENTS

ILLUSTRATIONS

Report to
George Cressy Jr.
and
CKN Exploration & Development Co. Ltd.
on
Geophysical Surveys
of
Part of the NIK Claim Group

by

Sherwin F. Kelly, P. Eng.

INTRODUCTION

Geophysical surveys by magnetic and electromagnetic techniques were conducted in July and August of 1970, on eight of the claims of the NIK group, which belongs to George Cressy, Jr. The claim group, consisting of claims NIK #1 to #12, is in the process of being transferred to CKN Exploration and Development Co. Ltd. (N.P.L.) of Merritt, B. C. The claims surveyed were NIK #5 to #12. A base line, and a grid of lines running nearly east and west spaced 300 feet apart, had been cut and picketed in preparation for this survey.

The surveys were conducted by using a Scintrex flux-gate magnetometer and a Ronka VLF electromagnetic instrument. The geophysical observations were made with both instruments by George Cressy, Jr. The results were plotted by him and checked by me.

Mineral claims NIK #1 to #12 bear record numbers 45916 to 45927. Although the survey was made on NIK #5 to #12, the work was applied to the assessment requirements of the entire group, NIK #1 to #12.

MERRITT

BRITISH COLUMBIA

Scale 1:126,720 or 1 Inch to 2 Miles

Miles 1 0 2 4 6 8 10 Miles

N

Plate I

Location Map NIK Claims

LOCATION AND ACCESS

The NIK claims are located on the north shore of Nicola Lake near its southwesterly end, not far from the settlement of Nicola. The group lies about 9 miles northeast of Merritt, in the Nicola Mining Division. The longitude co-ordinates are:- 120° 37' west longitude and 50° 10' north latitude. Plate No. I shows the approximate outline and location of these claims, on the Merritt topographic sheet, 92 I/SE.

Access to the claims is from the Merritt-Kamloops highway at the settlement of Nicola. A gravel road turns off to the north near the eastern edge of Nicola. About 2 miles from the highway the road forks. The right hand fork crosses Clapperton Creek and continues up the slope of the nameless mountain forming the north shore of Nicola Lake. The road is suitable for a passenger car and one of its numerous branches leads directly to the claims.

GRID

The base line from which the grid was turned off runs N 15° W and follows the boundary line between two columns of NIK claims. On the west side of the base line the bounding claims are, from south to north, NIK #6, #5, #10 and #9. The bounding claims on the east side of the base line are, from south to north, NIK #8, #7, #12 and #11.

Grid lines were run east and west at right angles to the base line and spaced 300 feet apart. They were numbered in feet, from south to north, beginning with Line 0 at the south boundary of claims NIK #6 and #8 and ending with Line 6000 North at the north boundary of claims NIK #9 and #11.

The grid lines were blazed and picketed with stations marked at 100 foot intervals and numbered in feet east and west from the base line. The grid lines extended 1500 feet east and west of the base line, terminating at the east and west boundaries of the claim group. The claim boundaries and claim posts are shown on the map of the magnetic contours, Fig. 2.

The grid lines as above laid out, were utilized for a magnetic survey by flux-gate magnetometer and an electromagnetic survey by a VLF instrument, with readings taken at the 100 foot stations. Soil samples were also taken at the same 100 foot stations, but this survey is not reported on herein.

MAGNETIC SURVEY

Instrument

The magnetometer used in the magnetic survey was a Scintrex MF-1 flux-gate magnetometer, serial number 81137, manufactured by Scintrex Ltd. of Concord, Ontario. It measures the vertical component of the earth's magnetic field.

Procedure

The sensitivity chosen was the most sensitive range, reading 1,000 gammas for full scale deflection. The resulting sensitivity is 20 gammas per scale division. The instrument was read to the nearest half division, so the readings were accurate to the nearest 10 gammas. The only variation from this procedure occured in the south-eastern portion of the survey area, where high values were encountered. These required the next range of sensitivity, in which the full scale deflection represents 3,000 gammas and the sensitivity becomes 50 gammas per scale division.

A base station was established on Line 5100 North at station 1200 west. The instrument was set at 0 on this station. Checks were made on this base station at the commencement of work in the morning, around noon and again at the end of the day's observation. The survey was carried out by George Cressy, Jr., who reported unusually quiet magnetic days, as the observations at the base station never varied more than 10 to 20 gammas. Diurnal corrections were therefor not made. The observations were taken in the period of July 30th to August 14th, 1970.

The readings were plotted in the form of profiles along the grid lines to which they referred. To begin with, they were plotted as positive or negative readings with reference to the above-mentioned base station as 0. My inspection of the profiles indicated that a good "zero," or datum for this area, could be established at the level of minus 250 gammas. The profiles on the accompanying Fig. 1, were plotted in accordance with this concept.

The instrument reading observed at any station shown on the maps, can be deduced from the profile value recorded at that point, by adding the figure -250 gammas to the value read off the profile. That is, all positive readings would be reduced by 250 gammas, but negative readings would be increased by that amount.

Results

With one noticeable exception, the magnetic relief recorded in this area is not pronounced, nor does it show an evident trend. With the exception of a group of anomalous readings in the southeast, the values lie between about -300 gammas and +450 gammas. In general, the magnetic relief is stronger at the south end of the survey area than it is at the north end; and it is stronger east of the base line than it is west thereof. The south-east quadrant is therefore the area exhibiting the maximum magnetic relief and is furthermore the site of the one strong anomaly with a definite trend.

In the southeast portion of the grid area, the magnetic high is centered on Line 300 N at Station 1200 E, where a maximum value of slightly over 2,800 gammas is shown. The values remain nearly that high due south of the latter station, on Line 0. To the north, however, they drop to about 1400 gammas on the next line, at Station 1250 E. On Line 900 N, the peak is shifted 100 ft. W to Station 1150 E, where the value is just over 1200 gammas. From here to the north, the peak gradually fades out and is last apparent on Line 1800 N at Station 1100 E, with a value close to 350 gammas.

Aside from the marked high just described, the general range of most of the readings in the rest of the area, varies between -200 gammas and +300 gammas. The contours outlining these areas of weak reaction generally have a north-south extension, except on Line 2700N, where there is an east-west elongation on the west side of the base line. See Fig. 2.

On Lines 2700 N to 3600 N, there is a slight indication of rising magnetic values at their eastern extremities. The generally northerly trend is also evident here.

Interpretation

The area of this survey lies on the southern end of the Central Nicola Batholith. This batholith belongs to the series of Coast Intrusives of Jurassic Age, which are generally granitic to dioritic in composition. Their magnetic reactions do not generally show great magnetic relief and what relief is shown, is likely to be irregular in shape and distribution. It is the irregular and random distribution of magnetic minerals, essentially magnetite through the body of the intrusive, which gives rise to the random variations in magnetic intensity, characteristic of these intrusives.

The magnetic high in the south-east corner of this survey area probably does not arise, however, from a local concentration of magnetite in the body of the intrusive. It could have its origin in a dike of more basic rock which was subsequently intruded into the solidified batholithic mass.

An alternative hypothesis would ascribe this zone of magnetic reaction to an engulfed, "Roof Pendant" of the intruded Nicola volcanics, which was caught up and entrapped in the molten magma of the intrusion. The resultant metamorphism of the entrapped material could well have resulted in an increased magnetite content of that rock.

Such a situation, of an engulfed roof pendant is, furthermore, a favorable one for the deposition of metallic minerals. This is especially true where the engulfed material is a favorable host rock for such deposition, as is the case for the Nicola series. The area of this magnetic anomaly is, then, one deserving further investigation.

The vague, north-south linearity of the otherwise weak magnetic relief, may be due to poorly defined flow-structures in the intrusive. This could develop while it was still a molten, plastic mass, as a result of the drag of the intruding magma against the solid wall rock.

A point to be noted is, that the strike I observed on the copper-bearing veins, is about N 25° E (they dip SE between 30° and 60°). This is at an angle of nearly 45° to the vague linearity of the weak magnetic relief, which is actually slightly west of north. Also, the known showings of copper exhibit no consistent relationship to either magnetic highs or lows. These copper-quartz-calcite veins were therefor presumably not formed as the outer part of the magma cooled, but are a product of a late phase in the solidification of the batholithic magma. The cooled and solid periphery of the mass may have been subjected to straining and fracturing by movements in its still liquid core. Such fractures may then have been penetrated by metallic mineral-bearing, siliceous solutions arising from the molten core, from which the veins were deposited. The wall rocks of the veins may also have been permeated by the mineralizing solutions. In such a case, disseminated mineralization could occur through the adjacent body of the intrusive. This possibility should be investigated.

ELECTROMAGNETIC SURVEY

Instrument Used

The electromagnetic survey was made with a Ronka EM-16, serial no. 78, manufactured by Geonics Ltd. of Leaside, Ontario. Electromagnetic instruments of this type utilize the low frequency (VLF) broadcast waves emitted by shore-to-ship radio stations of the U. S. Navy.

The Ronka EM instruments are designed to tune in on one or more of such radio stations of the U. S. Navy, which are set up to communicate in particular with submarines. The antennae of these stations are vertical and consequently radiate an electromagnetic field in a horizontal plane. This field suffers distortion wherever it encounters conductive formations in the ground, such as metallic sulphide bodies and some other types of geological structures, such as wet shear zones, faults and formational contacts. The EM-16 instruments measure the distortion produced by such conductive bodies, for both the in-phase and out-of-phase, or quadrature, components of the electromagnetic field.

The readings are made by orienting the instrument with respect to the transmitting station and then observing the tilt required to produce a minimum, or null audio signal.

Procedure

For surveys in the southern interior of British Columbia, it is usually convenient to tune in on the Jim Creek radio station near Seattle, Washington. It is designated station NPG and operates with 250 Kw of power at a frequency of 18.60 kHz. This station is particularly useful in areas where the prevailing formational strikes are nearly north and south, as is the case in the general area of Merritt. Conductive formations with such a north-south strike give the best coupling with the waves emitted from Jim Creek. For veins with an east-west strike, a station on the east coast provides a better coupling.

Observations are made by orienting the instrument with respect to the transmitting station and then tilting the instrument forward or back in a plane at right angles to the direction to the emitting station, to detect the position of minimum, or null audio signal in the headphones. The tilt is indicated on a dial which reads in percentage, ie. percent slope, which is closely equivalent to the tangent of the angle of tilt. The tilt angle is designated as positive when the downward-protruding stem of the instrument is pointed forward and away from the operator. It is negative if the stem is pointed backwards towards the operator. A strong positive tilt indicates a conductor ahead of the operator, and a negative one indicates it is behind him. Consequently, it is necessary to know the direction in which the operator faced when he took the reading. All readings in the course of the present survey were taken with the operator facing west.

Readings were taken on both in-phase and out-of-phase components of the electromagnetic field. The tilt angles of the in-phase component, are the angles of inclination of the ellipses of polarization of the electromagnetic field; the tilt gives a directional indication of the location of the causative conductive body. For the quadrature, or out-of-phase component, the instrument is used to determine the ratio, in per-cent, of quadrature component of the vertical, secondary field, to the horizontal, primary field. This ratio provides an approximate indication of relative conductivity of the subjacent formations. For maximum information, both components are observed and recorded, in order to obtain the greatest possible benefit from the data available.

Strong, metallic conductors produce a pronounced tilt of the instrument and a sharp reversal of tilt on crossing the causative body. The ratio of the quadrature component of the vertical secondary field to the primary horizontal field, as measured by the VLF instrument, also reverses sign when crossing a body of very good conductivity, but with signs opposite to those just mentioned. A "cross-over" results in the plotted profiles of the readings, with the in-phase component sloping down from positive to negative (going from west to east) while the quadrature slopes sharply up (going from negative to positive), when the operator faces west in this area. Other conductive features, such as wet formational contacts, shear zones, etc., produce similar results, but with less pronounced slopes. Conductive overburden will also distort the readings, as will pronounced topographic variations (a hill acts as a conductive mass, a valley as a resistant one). A poor conductor in non-conducting rock, produces cross-overs similar to those described above, but in this case both components have the <u>same</u> sign.

The readings are plotted along the grid lines to which they refer, one curve for the in-phase and another for the out-of-phase component. The percentage slope angle of the instrument tilt at each station, and the percent ratio of the quadrature component of the vertical secondary field to the horizontal primary field, can be read directly off the profiles.

Results

As in the case of the magnetic observations, the eastern portion of the survey grid shows more electromagnetic "relief" than the western, and reactions are more pronounced in the southern than in the northern portion. The in-phase curves show more variation than those of the quadrature component. This results in numerous "cross-overs", but they are largely, although not exclusively due to the ups and downs of the in-phase curves crossing over the flatter quadrature ones.

Some examples of good cross-overs with slopes of opposite sign, are evident at the east ends of Lines 600N, 900N, 2100N, 2400N, 4800N and about the middle of the east portion of Line 5100N. Cross-overs of the same type also occur just west of the baseline on Line 1500N, near the west end of Line 4800N and also close to 1000 W on Line 1200N.

There are other, near approaches to crossovers. There are also actual crossovers, but with the quadrature curve flat, or even sloping up from zero or a low positive value, rather than from a negative one, as at 1000 E on Line 1200N and near 1200 E on Line 1500N. These may be of interest, however.

In the southwest quadrant there are some strong peaks on the in-phase curves, sometimes but not always parelleled by the quadrature curves.

Interpretation

Some of the pronounced peaks on the in-phase curves, with somewhat similar reactions in the quadrature component, in the southwest grid quadrant, are probably due to topographic or overburden effects.

An exception to the above is found between 200 and 300 feet west of the base line, on Line 1500N, where the two curves cross with opposite inclinations. This is only 7° off-strike (westerly) from the copper showings in the trench between Lines 900N and 1200N. Also nearly on strike, there is a cross-over close to the base line on the next line north, Line 1800 N. In this case, however, the quadrature component remains positive, probably indicating only moderate conductivity for the causative structure. It might therefore be a shear or a fault, or even a vein with disseminated mineralization. Another cross-over of the latter type occurs between 900 and 1000 feet west of the base line on Line 1200 N. It is close to the copper-bearing trenches between that line and Line 1500 N. This cross-over is on strike with the showings in those trenches. There are no other clear cross-overs, however, on the strike of these veins.

Just to the north of the above-described trenches, close to Line 1500 N and between it and Line 1800 N, there is an outcrop of copper-bearing rock with which a questionable cross-over lines up, at 600 W on Line 1800 N. No others are in evidence, however, on this strike.

Other copper showings west of the base line, near Lines 0, 300 N and 1800 N, do not appear to be associated, close-by or on strike, with cross-overs of the typesunder consideration. This should not be considered a strong negative factor, however, because of the nature of the method. Essentially, it responds well to a good conductivity of subsurface formations. A massive vein of metallically conductive sulphides produces a strong response. The response is weak with poor to moderate conductivity, which may be offered by wet shears, faults, contacts, etc, but also by disseminated sulphides.

Since veins of the type thus far encountered here, can vary widely in sulphide content, it is adviseable to check at those points giving good cross-overs. Where veins are encountered, continue spot checks along strike, even in the absence of cross-overs, as disseminated sulphides could still occur, too weak to produce much reaction, yet still of possible interest.

In the southeastern quadrant of the survey area, a number of good cross-overs occur, especially at the eastern ends of Lines 600N, 900N, 1200N, 1500N, 2100N and 3000N. These electrical indications bear an interesting relation to the strong magnetic peaks observed in the same area. The cross-overs close to 1000E on lines 600N, 900N and 1200N are on the west flank of the strong magnetic high. The one close to 1200E on line 1500N, is on the east flank of the weakening nose of this magnetically anomalous area. There is also a good cross-over at the same location on line 2100N, in the area where the magnetic high is fading out but where there seems to be some tendency for the magnetic values to rise towards the east. A weak cross-over appears under similar circumstances close to 1300E on Line 2400N.

There are other weak and possibly questionable cross-overs continuing to the north at 1400E on line 3600N and 1200E on line 4800N. Immediately to the west and north there are some cross-overs and reactions which may have been influenced by the presence of conducting material in the creek bed.

When evaluating those VLF reactions which are closely associated with magnetic highs, some possible alternatives must be kept in mind. The magnetic highs probably indicate the presence of a different type of formation from the igneous rocks composing the batholith. There is therefore a possibility that the VLF reactions are caused by a formational contact. Such a formational contact might be rendered relatively conductive by a concentration of magnetite, or of sulphides near the contact, resulting from metamorphic action.

There is also the possibility, as described above, that the magnetic high corresponds to an engulfed roof pendant. Such a formation might present a favourable host rock for the deposition of metallic sulphides. The VLF reactions could then be due to the presence of metallic sulphides in the underlying bedrock. The appearance of some of the profiles, such as on lines 600N, 900N, 1200N and 1500N is consistent with the possible presence of a wide band of disseminated mineralisation. This area presents a prime target for further exploration work.

RECOMMENDATIONS

On some nonmetallic formations, the VLF method will yield results which may be almost indistinguishable from those yielded by metallic ones. It is therefore adviseable to use this method in conjunction with other geophysical and geochemical ones, in an effort to establish converging lines of evidence. Therefor, before proceeding with expensive drilling and trenching, it would be adviseable to await the results of the soil sampling survey. This should produce evidence which will be of assistance in screening the VLF and magnetic results and in choosing the most promising targets for surface exploration and diamond drilling. It may also be found adviseable to utilise the induced polarization technique, over this and the remaining area of the claim group, as it will pick up disseminated sulphides which the VLF method might not detect. The magnetic survey should be extended, especially to follow the strong magnetic anomaly southwards. The VLF technique should be continued, for the data it can yield on stronger concentrations and veins of sulphide minerals. The work should therefore be extended over the remaining claims to the south, keeping in mind the considerations outlined above.

Respectfully submitted,

Sherwin F. Kelly, P. Eng.
Geologist and Geophysicist

Merritt Mining Mart
Merritt, B. C.
July 12, 1971

I, Sherwin F. Kelly, P. Eng., residing at the Adelphi Hotel and maintaining a place of business at the Merritt Mining Mart in Merritt, B. C., certify that:-

(1) I am a registered Professional Engineer in the Province of British Columbia.

(2) I received the degree of B. Sc. in Mining Engineering from the University of Kansas in 1917.

(3) I pursued graduate work in geology and mineralogy at the Sorbonne, Ecole des Mines and Museum d'Histoire Naturelle in Paris and at the University of Kansas and the University of Toronto. I also taught those two subjects at the two latter universities. I received my training in geophysics from Prof. Conrad Schlumberger of the Ecole des Mines, in Paris.

(4) I have practised as a geologist and geophysicist in Europe, North Africa, United States, Canada, Mexico, Central America, South America and the Caribbean, since 1920. Since 1936, my work has been principally as a consultant.

(5) This report of a geophysical survey on a portion of the NIK group of mineral claims is based on my personal knowledge of the ground and the showings and on the geophysical data drawn up by George Cressy, Jr. and submitted to me for review and interpretation.

Respectfully submitted

Sherwin F. Kelly, P. Eng.,
Geophysicist and Geologist

Merritt Mining Mart
Merritt, B. C.
July 12, 1971

Declaration of Expenditures
for
Line-Cutting and Geophysical Surveys,
NIK Claim Group.
July-August, 1970

Line-cutting, July 1 - July 25, 1970, George Cressy Jr, Contractor

By contract, 13 miles of line cut,
blazed, ribboned and picketed, @ $100 per mile...............$1,300.00

Electromagnetic Survey, July 30 to August 14, 1970. George Cressy Jr. Operator.

By contract, 13 miles of readings @ $50 per mile............. 650.00

Magnetic Survey, July 30 to August 14, 1970. George Cressy Jr., Operator

By contract, 13 miles of readings @ $50 per mile............. 650.00

To preparation of geophysical report........................... 500.00
$3,100.00

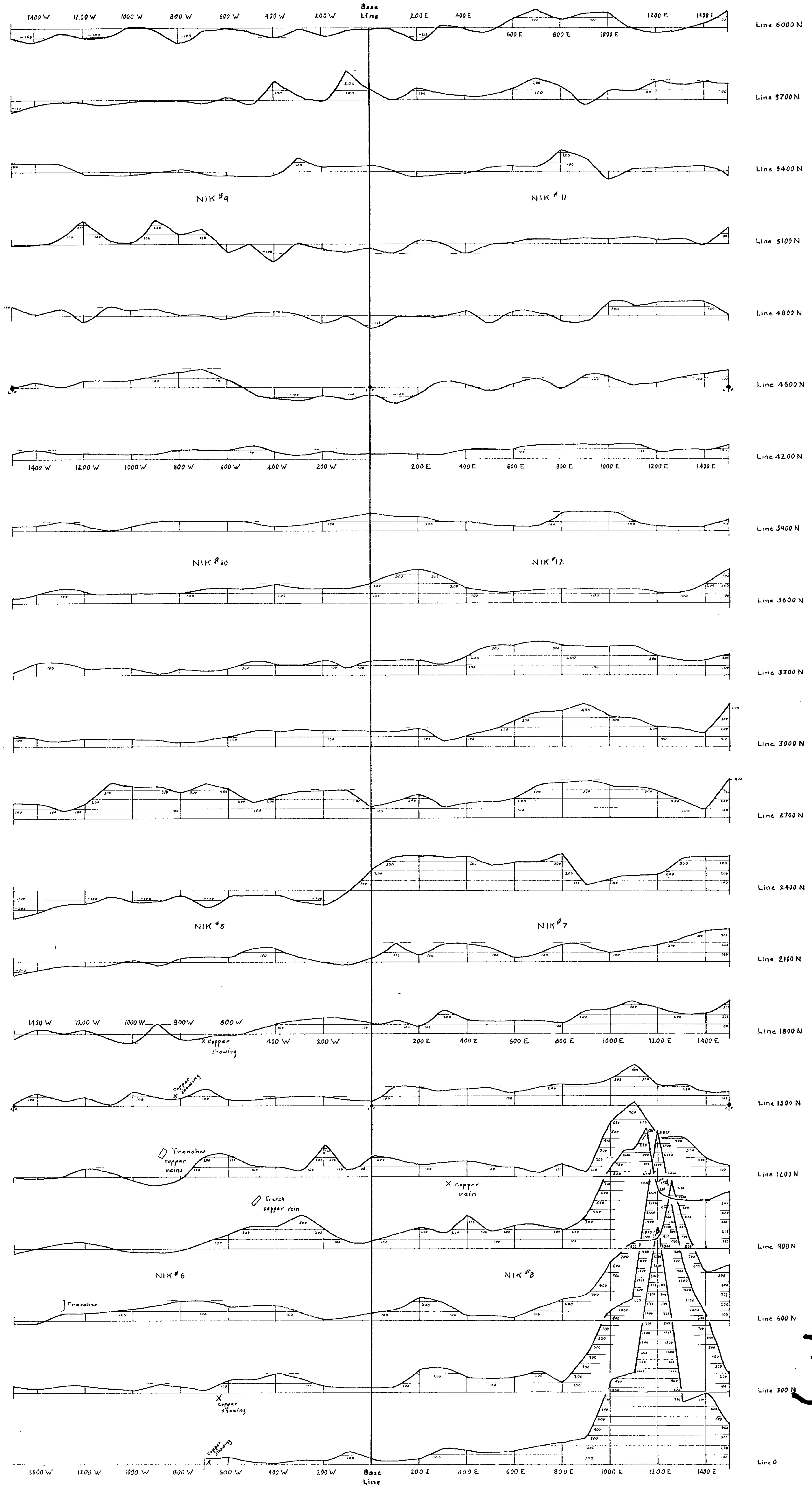
Magnetic observations made with Scintrex model
MF-1 Fluxgate magnetometer, serial no. 811377

Electromagnetic observations made with Ronka
EM-16 VLF instrument, serial no. 78

The geophysical work was conducted on claims NIK #5 to #12, but was applied to the entire group, NIK #1 to #12. The amount claimed was $2,400.00, to apply two years' work on each of the 12 claims.

I hereby certify that the above expenditures were duly and properly incurred for the survey work performed.

George F Cressy Jr.



George Cressy, Jr., and
C K N Exploration and
Development Co. Ltd. (N.P.L.)

NIK
Claim Group
Merritt, B.C.

Fig. 1
Magnetic Profiles

Scale
1 in. = 200 ft.
0 100 200 ft
500 γ (gammas)
300
200
0
1 in. = 500 gammas (γ)

Grid lines numbered in feet N of Line 0.

Stations numbered in feet E and W of the Base Line.

Claims NIK #5 to NIK #12.

Claim posts.

Survey by Scintrex Flux-gate Magnetometer.

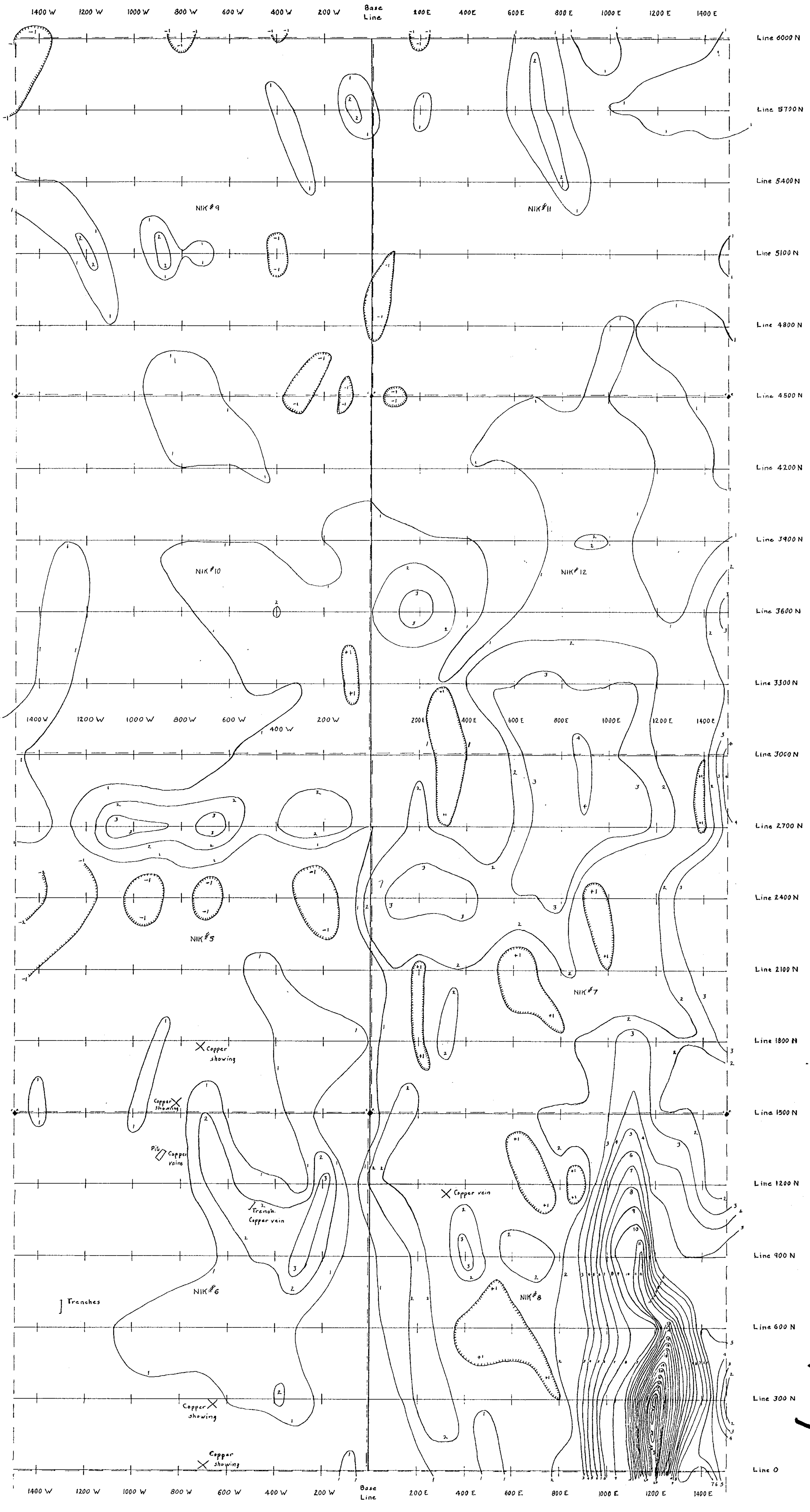
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 3143 MAP #2

To accompany geophysical report by Sherwin F. Kelly, P. Eng. geophysicist and geologist, on the Nik group of mineral claims, Nicola Lake, Nicola Mining Division, B.C., dated July 12, 1971

Sherwin F. Kelly, P. Eng.

3143

M-2



N (astr.)

George Cressy, Jr. and
C K N Exploration and
Development Co. Ltd. (N.P.L.)

NIK
Claim Group
Merritt, B.C.

Fig. 2
Magnetic Contours

Scale
1 in. = 200 ft.
0 100 ft. 200 ft.

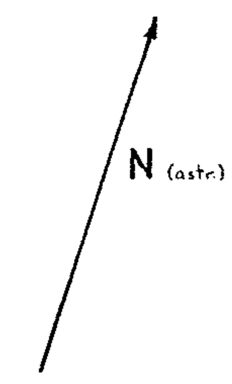
Grid lines numbered in feet N of line 0.
Stations numbered in feet E and W of the Base Line.
Contours numbered in hundreds of gammas.
Contour interval = 100 gammas.
Claims = NiK #5 to NiK #12.
Claim posts
Claim boundaries.

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 3143 MAP #3

To accompany geophysical report by Sherwin F. Kelly, P. Eng., geophysicist and geologist, on the NiK group of mineral claims, Nicola Lake, Nicola Mining Division, B.C. dated July 12, 1971.

Sherwin F. Kelly, P. Eng.

3143
M-3



George Cressy, Jr., and
C K N Exploration and
Development Co. Ltd. (N.P.L.)

NIK
Claim Group
Merritt, B.C.

Fig. 3
VLF-EM Profiles

Scale
1 in = 200 ft.
0 100 200 ft.

20%
10% 1 in. = 20%
0

Grid lines numbered in ft. N of Line 0
Stations numbered in feet E and W of the Base Line.
Claims NIK #5 to NIK #12
"◆" Claim posts.
Survey by Geonics VLF-EM instrument

To accompany geophysical report by Sherwin F. Kelly, P.Eng. geophysicist and geologist, on the NIK group of mineral claims, Nicola Lake, Nicola Mining Division, B.C., dated July 12, 1971.

Sherwin F. Kelly P.Eng.

3143
M-4