GEOPHYSICAL - GEOCHEMICAL REPORT
on the
VECTOR GROUP of CLAIMS, OMINECA M.D.
55° 10' North - 124° 50' West 93N 2
by H. VEERMAN, P.Eng.
Owner of claims: David L. Moore.
Work done between July 15 and Sept. 25, 1967

1599

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GEOPHYSICAL - GEOCHEMICAL REPORT

on the

VECTOR GROUP of CLAIMS

LOCATED at the SOUTH SHORE of TCHENTLO LAKE

55° 10' North - 124° 50' West

in the

OMINECA MINING DIVISION

June 1968

H. VEERMAN, P.Eng.

TABLE OF CONTENTS

SUMMARY

From the 18th of May till the 25th of September a general exploration program was carried out on the Vector Group of the Nation Copper Property on the South shore of Tchentlo Lake in the Omineca M.D. Line cutting and diamond drilling were carried out during the first part of the summer.
Geophysical and geochemical surveys were completed in the late summer and early fall of 1967. The program was completed on September 25th.

INTRODUCTION

During July, August and September combined Ronka E.M. 16 and geochemical surveys were carried out on the Vector Group of claims on the Nation Copper Property.
The field work was done by H. Veerman and W.G. Botel, geologists, D. Woodsworth, instrument operator, and E. Weinhardt and I. Van Assum, field assistants.

The claims of the Vector Group cover a vertical range from 2850 feet at Tchentlo Lake to 4850 feet on the S.S.K. 3 claim, and stretches over a horizontal distance of about 4 miles.

Access is by helicopter from Fort St. James, a distance of about 70 air miles. Several landing sites have been prepared on the property :
On the S.K. 2 claim,
on the R.T. 22 claim,
on the R.T. 24 claim,
on th ISA 2 claim.
Access to the lower claims may be gained from Tchentlo Lake, which can be reached by float plane or by boat from the lower Nation River.

The claims are covered with immature pine and spruce at the lower elevations, and they are partly open above 4000 feet. The area was burnt over some 20-30 years ago.

Above 4000 feet rock outcrops may be found along the ridges. Below the 4000 feet contour rock outcrops are fewer, and are mainly found in the creekbeds and along a few ridges.

The area has not been mapped geologically on a scale large enough to show the local details.
The area is underlain by granodioritic rock in which younger feldspar porphyry dikes have intruded along regional zones of weakness.
Several faults or fault zones are known to occur on the property.

FIELD WORK

Control

A base line was cut starting at a point on the S.K. No 2 claim, and close to the boundary with the S.K. No 4 claim. (This point is on the main helicopter landing site, and about 300 feet to the S.E. of the camp.) From this point, designated OOW-OON, the base line runs in Northwesterly and Southeasterly directions with a bearing of North 40 degrees West. A Brunto compass and a 200 feet chain were used to put in the base line.

From the base line side lines were turned off at 90 degrees and at regular intervals of 500 feet. (For detailed work lines were turned off at 100 or 250 feet). The side lines were chained and the bearing was maintained with a Silva compass. The side lines were marked with plastic flagging tape at each station at 100 feet intervals from the base line. Little actual line cutting was done to mark these lines.

The length of the side lines varies from 1000 feet to 3000 feet according to the dictates of geological information as well as topography.

Geophysical Survey

The instrument used for this survey was the Ronka E.M. 16.
This is a lightweight one man electro-magnetic instrument that consists of a receiver only. It measures variations in a magnetic field set up by V.L.F. transmitters in different parts of the world.
In the presence of a conductor the primary field will induce a secondary field wich is the measured quantity in this survey.
The secondary field is expressed as a percentage of the primary field.
The transmitter station used in this survey was at Seattle, Washington, transmitting a signal at 18.6 kilocycles.

Readings were taken at the stations marked at regular intervals of 100 ft. along the side lines, and recorded in a field book.
The readings were plotted in the office directly from this field record, and a smooth curve was drawn through the points obtained in this way.

For the purpose of interpretation of the results only the in-phase component of the vertical field was used. The quadrature readings have not been taken into account as they are influenced by conductive overburden, and for that reason do not materially add to the total picture.

Geochemical Survey

Soil samples were taken at regular intervals of 100 feet along the side lines and at the same stations that were used for the geophysical survey.

Samples were taken from shallow holes dug with a short handle mattock, a short handle spade, or both.
The samples were taken from the "B" horizon where a proper soil profile could be identified, or,where this was impossible they were taken from material directly below the humus layer. Where the cover was very thin the material directly above bedrock was used for a sample.

The material was placed in a 3½ by 9½ inch brown paper waterproof envelope which was marked with a sample number on the outside. A numbered paper sample tag was placed inside the envelope at the same time for identification at the laboratory.

The samples were taken to the geochemical laboratory of Noranda Exploration Company Ltd. at 1050 Davie street in Vancouver, B.C. for assaying.

Assaying

Laboratory Determination Method.

The samples are first hung to be air dried for 3 or 4 days.
Then they are mechanically screened and sifted to obtain a -80 mesh fraction.

The determination procedure is as follows :
0.125 grams of -80 mesh material is fused with potassium bisulfate.
This is dissolved in 5 ml of hydrochloric acid.
A 2 ml aliquot is shaken with 10 ml acetate buffer and 1 ml biquinolin solution.
The samples are then compared with colorimetric standards.

Soil Survey Maps

The copper values obtained from the laboratory have been marked on a set of base maps identical to the ones used for the plotting of the geophysical survey, and covering largely the same area.
Values over 5 times background are considered to be anomalous, and are marked with a red circle. (Background is assumed to be 100 ppm copper for the whole group of claims, although variations occur due to local deep glacial overburden)

INTERPRETATION

Geophysical evidence indicates the existence of several major anomalies as well as a larger number of second class and lower order features that may prove to be of more significance after detailed work has been carried out.

The evaluation of these anomalies depends to a large extent on supporting geochemical evidence, and to a lesser extent on the small amount of geological information available at the present time.

The following discussion of the results obtained takes into consideration all available information rather than geophysical and geochemical data separately.
The results are evaluated for each map sheet separately. The number of each map sheet may be found in the extreme lower right hand corner.

North 1 Sheet

A very strong conductor is indicated right at the base line at OON and at 5+OON. Geochemical evidence supports the geophysics. A sulphide zone outcrops at these locations.

A conductor of medium strength is shown to run from 15+OON-15+OOE to 50+OON-1+OOE. Geochemical evidence indicates anomalous values near the North end as well as near the South end of this conductor.
Geological information indicates a narrow fault zone with an occasional sulphide content. Geochemistry supports this view.

From 20+OON to 50+OON and to the West of the base line, an erratic pattern of geophysical and geochemical anomalies is apparent.
A higher than average magnetite content in the intrusive is thought to be responsible for the E.M. pattern. A fairly persistent trace content of copper in the same rock may have caused the high copper values in the soil.

North 2 Sheet

A strong conductor is indicated from 70+OON-OOE to 90+OON-2+OOE.
Geochemical results show a strong anomaly in the area from 85+OON to 95+OON and directly East of the base line.
Geological information confirms the existence of a conductor through the fact that several outcrops with sulphides have been found in the area. Some downhill displacement of the geochemical anomaly in relation to the outcrops is evident.

Interpretation (cont).

North 2 Sheet (cont).

Note: The erratic pattern of readings mentioned for the North 1 Sheet is continued on the North 2 Sheet between 50+00N and 70+00N to the West of the base line.
The same explanation given earlier applies to this area as well.

North 3 Sheet

An irregular pattern of cross overs and reverse cross overs is assumed to be caused by conductors in the form of clay lenses in a glacial deposit of unconsolidated material.
The overburden in this area is thought to be over 50 feet , and perhaps over 100 feet in depth.
The geochemical pattern shows values well below background for the rest of the claim group, supporting the view that the overburden is deep.

South 1 Sheet

A conductor of medium strength starts at 10+00S-10+00E and runs in (grid!) Southerly direction through a point at 50+00S-10+00E and on to the next mapsheet to the South.
The soil survey does not show a significant anomaly in this area, although a few erratic highs are present.
The air photographs show a strong fault coinciding with the indicated conductor.
Geological field evidence turned up only minor amounts of mineralization in association with this fault.

South 2 Sheet

The continuation of the fault-conductor mentioned for the South 1 Sheet is apparent on this sheet. (50+00S-10+00E to 60+00S-9+00E)
Occasional higher copper values in the soil are the results of narrow stringers of sulphides observed in a few places.
There is little to indicate that the fault itself carries appreciable a amounts of sulphide mineralization.

CONCLUSIONS

1. A combination of geophysical and geochemical surveys constitute a suitable approach in the prospecting for copper bearing minerals in the area under consideration.

2. Considering all available information, the most promising area's and/or anomalies in the surveyedparts of the Vector Group are :

North 1 Sheet	:	00N to 5+00N at the base line.
		15+00N-15+00E to 50+00N-1+00E.
North 2 Sheet	:	70+00N-00E to 90+00N-2+00E.

3. Additional work such as bulldozer stripping and/or diamond drilling is necessary to ascertain beyond doubt the cause of these anomalies.

June 1968.

Heinz Veerman, P. Eng.

APPENDIX I

GEONICS LIMITED

GEO-X SURVEYS Ltd.
627 HORNBY ST., VANCOUVER 1, B.C.

DEEP-PENETRATING ELECTROMAGNETIC DETECTOR

RONKA EM16

The EM16 is a new basic electromagnetic tool using homogeneous horizontal primary fields (15-25 kc).

The real- and quadrature-vertical fields are measured.

Fairly high frequency is also good for weaker conductors.

Horizontal primary field is not influenced by flat horizontal overburden.

One man can now survey faster and deeper than a large crew of men with older equipment.

Field experience has proven the EM16 to be very fast, rugged, and practical.

The equipment is designed by Vaino Ronka and built by Geonics Limited.

EM16 offers you the best in easy interpretation; faster, more effective coverage; and simplicity and ruggedness of instrumentation.

Designers and Manufacturers of Geophysical Instruments
2 Thorncliffe Park Drive, Toronto 17, Ontario. (416) 425-1821

GEONICS LIMITED

TYPE EM16

SPECIFICATIONS

Primary field:	Horizontal from any selected VLF-transmitting station.
Frequency range:	15-25 kc.
Station selection:	By plug-in units. + a switch for 2 stations
Measured fields:	Vertical field, in-phase and quadrature components.
Accuracy of readings:	±1%.
Range of measurements:	In-phase ±150% or ±90°, quadrature ±~~20%~~. 40%
Output readout:	Null-detection by an earphone, real and quadrature components from mechanical dials.
Batteries:	6, size AA penlight cells. Life about 200 hours.
Size:	16 x 5.5 x 3.5 in. (42 x 14 x 12 cm).
Weight:	2.4 lbs. (1.1 kg).
Accessories:	1 earphone and cord. 1 carrying bag. 1 set of batteries. 1 Manual of Operation. 3 plug-in units for station selection —additional optional units available.
Price:	$2220.00 F.o.b. Toronto. Fed. sales tax in price. Extra plug-in units, $60.00 each.

Specifications and price subject to change without notice.

Designers and Manufacturers of Geophysical Instruments
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OPERATING INSTRUCTIONS

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°. 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 $\pi/2$-signal from the horizontal coil is a measure of the quadrature vertical signal.

2. Selection of the Station

The selection of the proper transmitting station is done by a plug-in unit inside the receiver. The equipment takes two selector-units simultaneously. A switch is provided for quick switching between these two selected stations.

The magnetic field lines from the station are always at right angles to the direction to the station. Always select a station which gives the field approximately at right angles to the main strike of the ore bodies or geological structure of the area you are presently working on. To select the stations, open first the cover on top of the instrument and pull out the plug-in unit on the side of the instrument frame and insert the proper plugs. Then close the cover again.

Here is the list and locations of some of the stations useful in Canada and United States.

Station	NAA:	Location,	Cutler, Maine.	Freq.	17.8 kc.
"	NSS:	"	Annapolis, Maryland.	"	21.4 kc.
"	NPG:	"	Seattle, Washington.	"	18.6 kc.
"	WWVL:	"	Fort Collins, Colorado.	"	20 kc.
For European use	GBR:		Rugby, England.	"	16 kc.

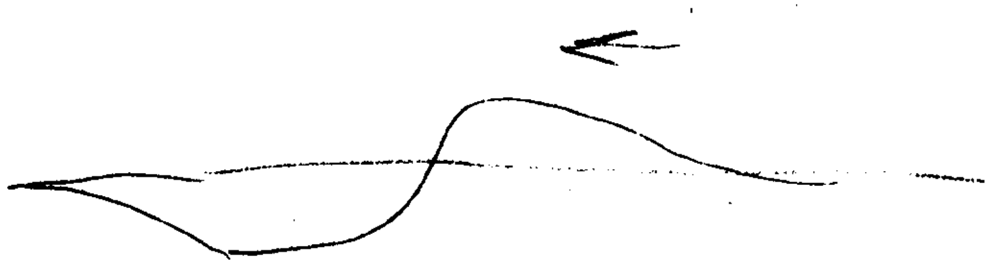
The direction of the survey lines should be selected approximately along the lines of the primary magnetic field; at right angles to the direction to the station being used. Before starting the survey, the instrument can be used to orient oneself in that respect. By turning the instrument sideways, the signal is minimum when the instrument is pointing towards the station thus indicating that the magnetic field is at right angles to the receiving coil inside the handle.

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 traveling to the next location you can, if you wish, keep the instrument in operating position. If abrupt changes in the position occurs while traveling, 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° 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.

Theoretically, for <u>spherical</u> conductor the depth

$$h = \Delta x$$

where Δx is the horizontal distance between the max. points of the vertical field H_z.

The radius $a = 1.3\, h \sqrt[3]{H_z\,(max.)}$

For <u>cylindrical</u> body

$$h = 0.86\, \Delta x$$

The radius $a = 1.22\, h \sqrt{H_z\,(max.)}$

In these equations $H_z = 1$ means 100% on the equpment dial.

The instrument is calibrated also in degrees. H_z equals the tangent of the angle.

The determination of depth is generally more reliable than the estimation of the actual dimension, a. The real component of H_z which we should use, decreases proportionally for a poorer conductor.

The Δx, however, is fairly well a constant for given ideal shape of the ore so that the depth can be estimated with fair accuracy.

One can also draw some conclusions about the depth and shape of the upper edge of the conductor by observing the actual smaller details of the profile.

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.

Horizontal sheet should give a single polarity tilt-angle on the edge of it, and again the opposite way on the other edge.

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.

As with any EM, the largest and best conductors give the highest ratio of in-phase to quadrature components.

However, in practice most of the ore bodies are composed of different individual sections, and therefore one cannot use the in-phase/quadrature ratio as the sole indicator of the conductivity-size factor.

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.

6. Servicing

Changing the batteries is done by removing the cover and changing the penlight batteries one by one. Please notice the polarities marked for each individual cell. To test the condition of the batteries, turn the instrument on, press the push-button on the front panel. There should be a whistling sound in the headphone if the batteries are in usable condition. If the sound is not heard, the battery voltage may be low.

It may be occasionally necessary to clean the contacts of the plug-in unit. For this, use a clean rag that is very slightly moistened with oil.

If any repairs are necessary we recommend that the instrument be shipped to Geonics Limited for a thorough checkup and testing with proper measuring instruments.

ADDENDUM
to
GEOPHYSICAL - GEOCHEMICAL REPORT
on the
VECTOR GROUP of CLAIMS
located at the South end of Tchentlo Lake in the Omineca Mining Division.

STATEMENT of QUALIFICATIONS of the Geophysical Operator D. Woodsworth.

While going to the University of British Columbia Mr. Woodsworth worked as a Geophysical Operator for three successive summers, 1965, 1966 and 1967.

Summer 1965 : Geophysical Operator, Noranda Exploration Co. Ltd.
Instrument operated : Crone Junior E.M. (J.E.M.)

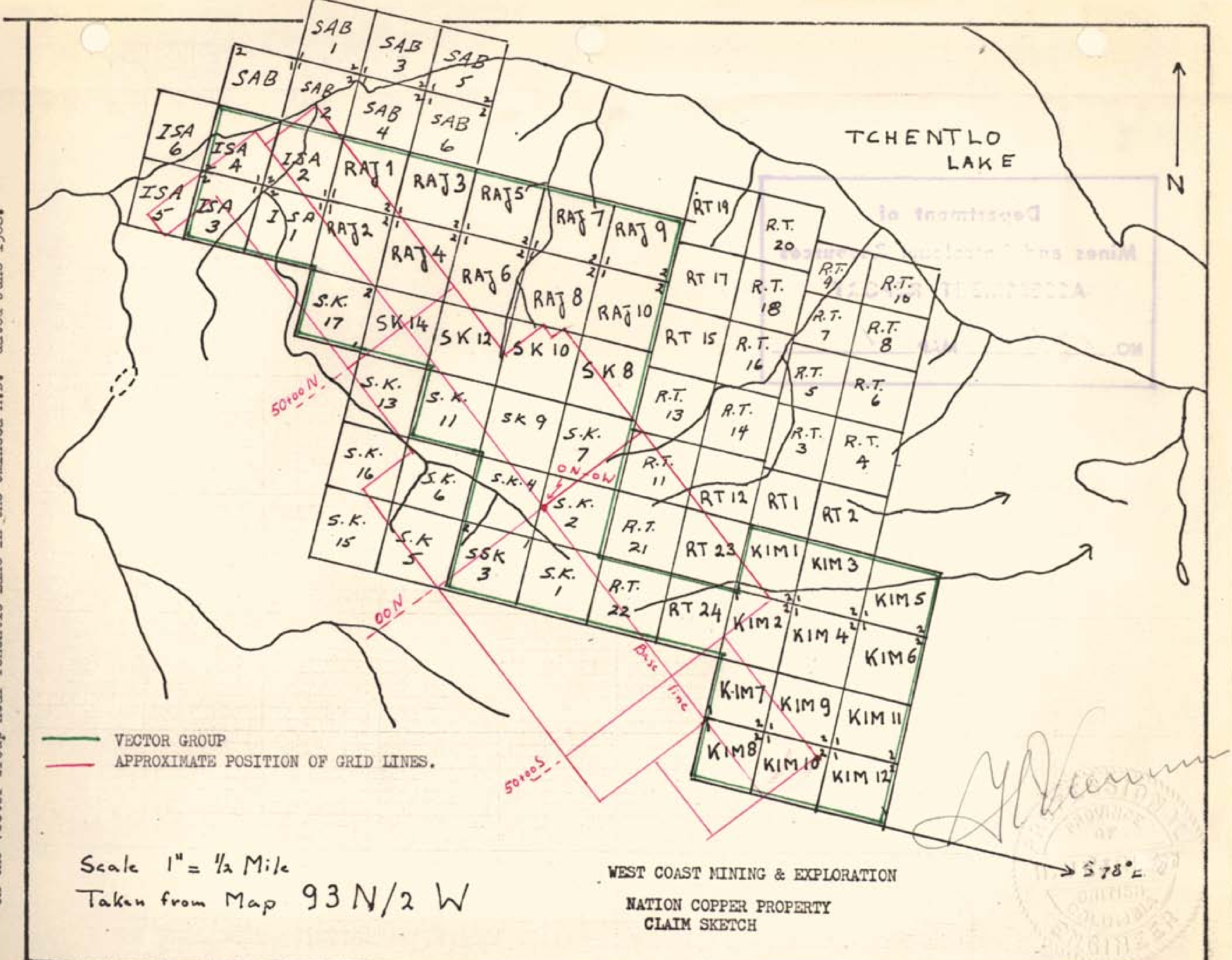
Summer 1966 : Geophysical Operator, Noranda Exploration Co. Ltd.
Instrument operated : Crone Junior E.M.

Summer 1967 : Geophysical Operator, West Coast Mining & Exploration.
Instruments operated : Sabre Mark II Magnetometer,
Ronka E.M. 16.

While Executing the survey on the Vector Group Mr. Woodsworth was under close day by day supervision from Mr. W.G. Botel, P. Eng. and Mr. H. Veerman, P.Eng.

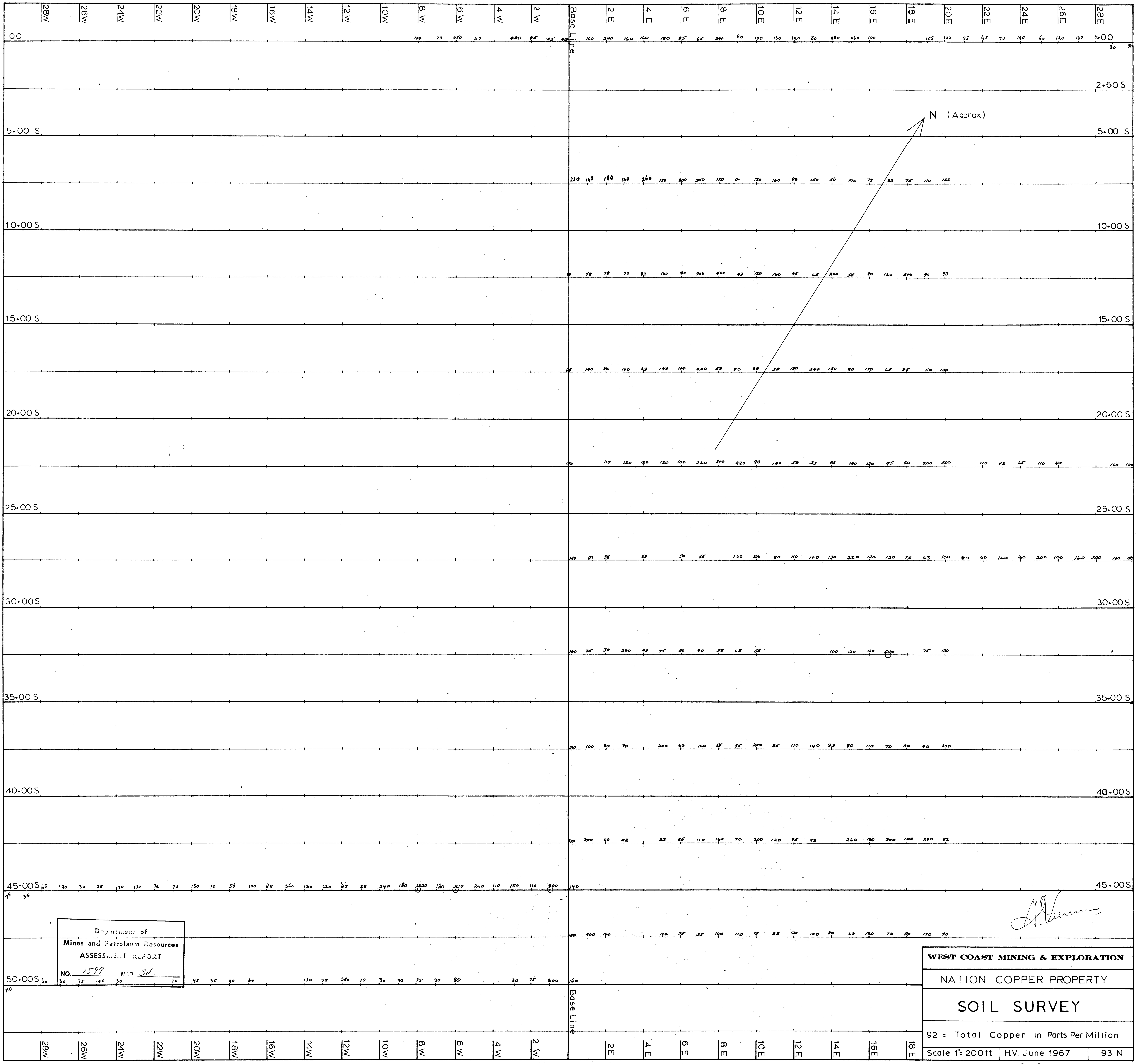
H. Veerman, P. Eng.

To accompany Geophysical-Geochemical Report by H. Veerman, P.Eng.
on the Vector Group near Tchentlo Lake in the Omineca M.D. dated June 1968.



WEST COAST MINING & EXPLORATION

NATION COPPER PROPERTY
CLAIM SKETCH



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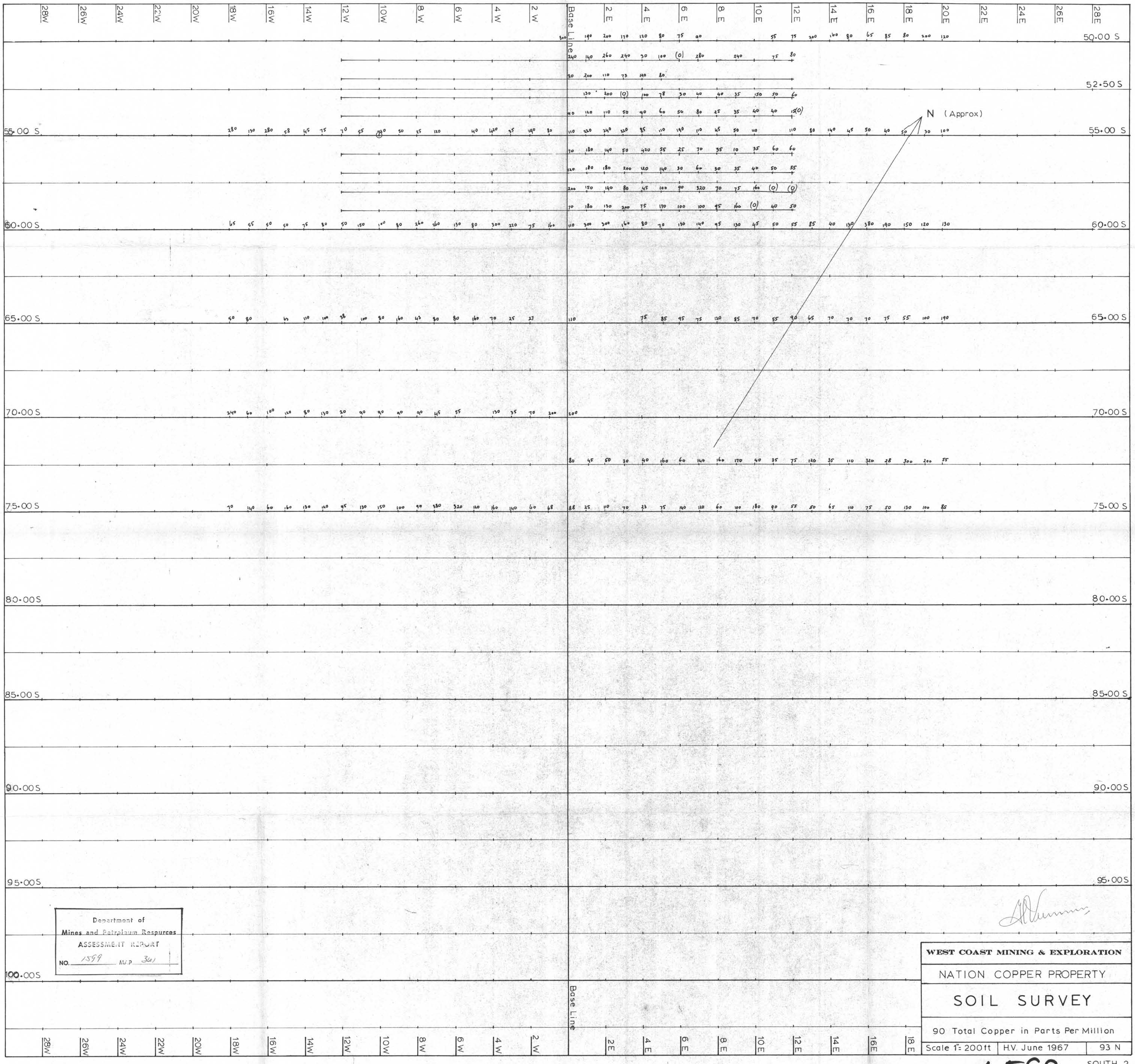

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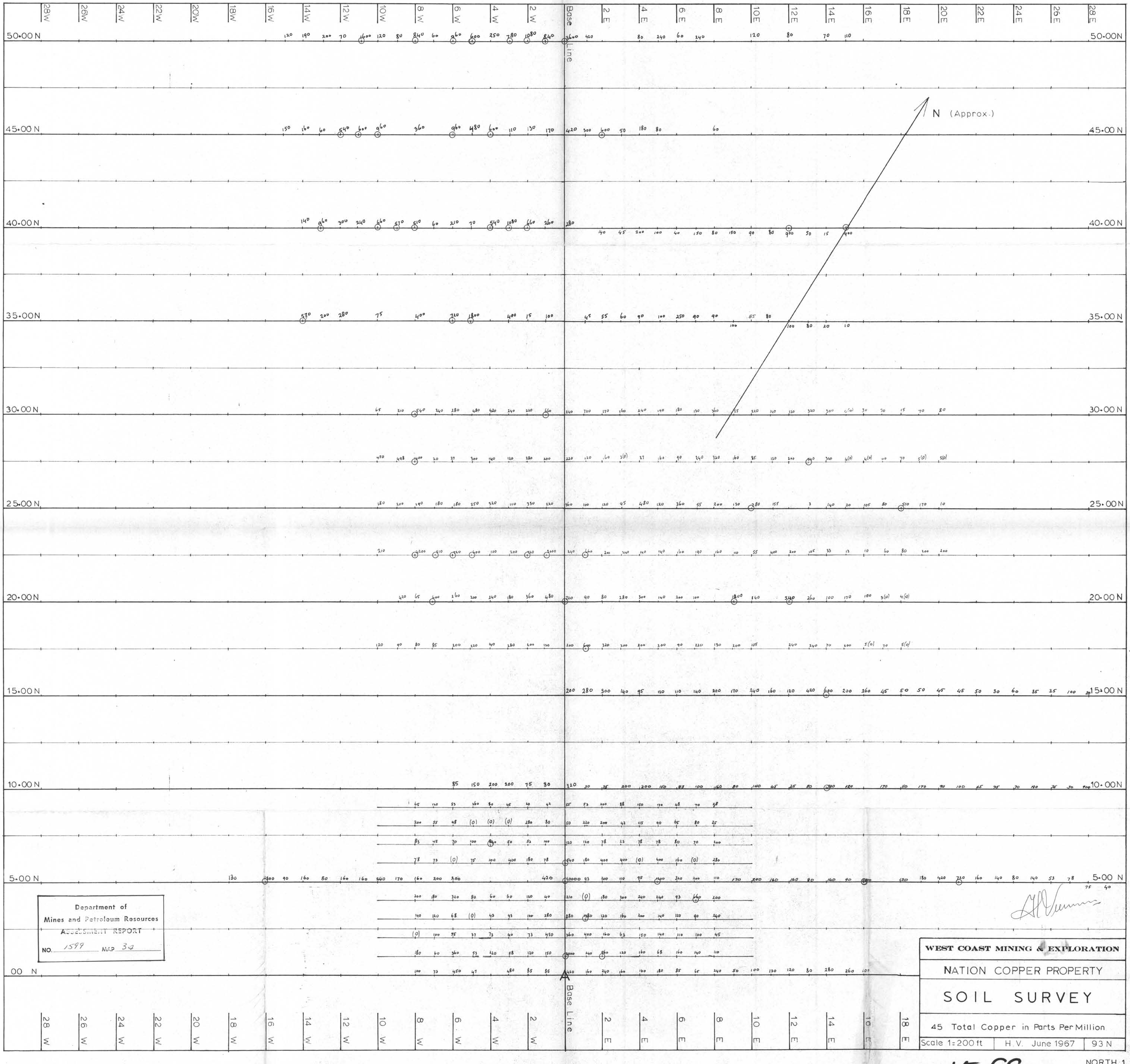

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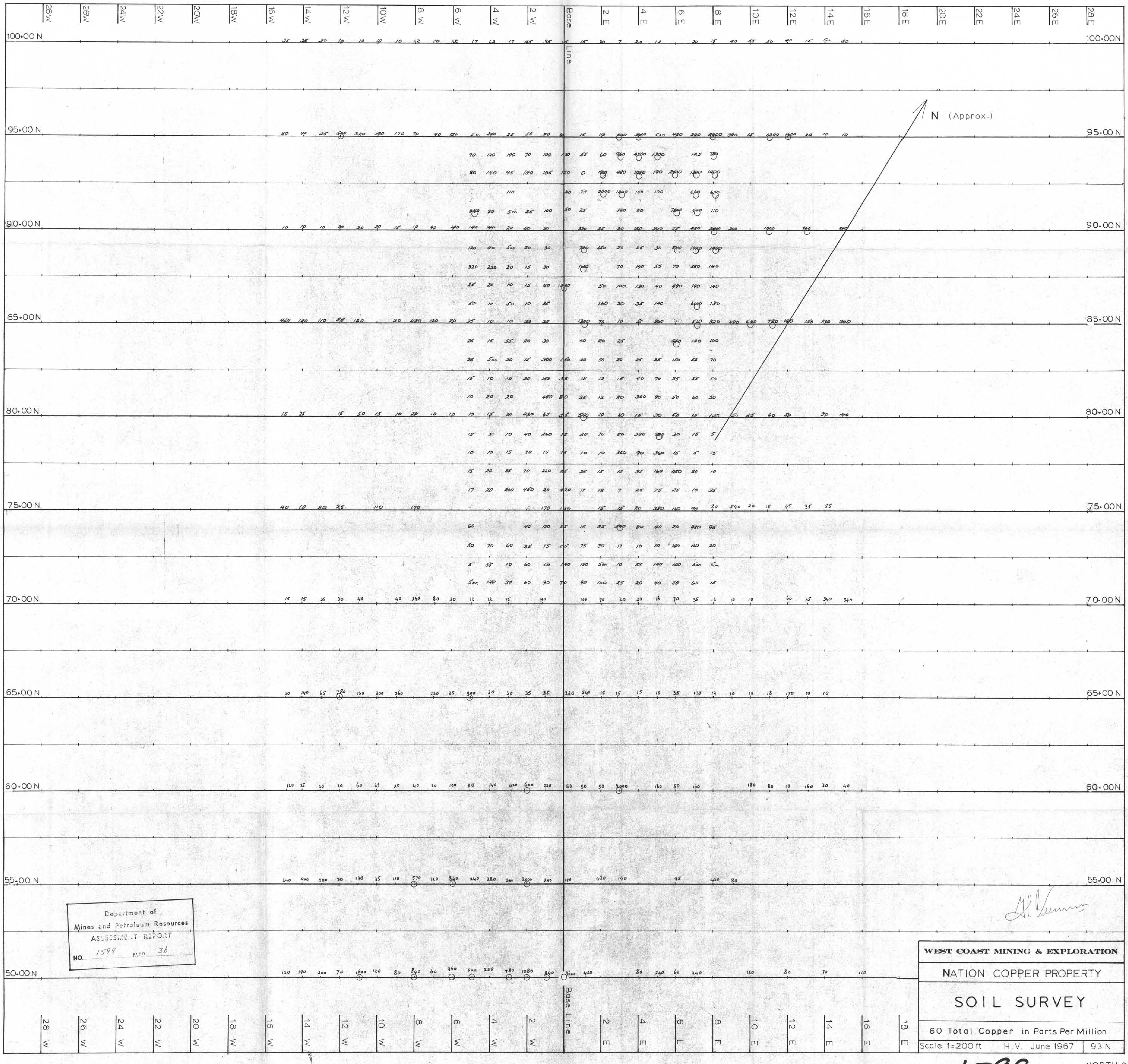

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NORTH 2

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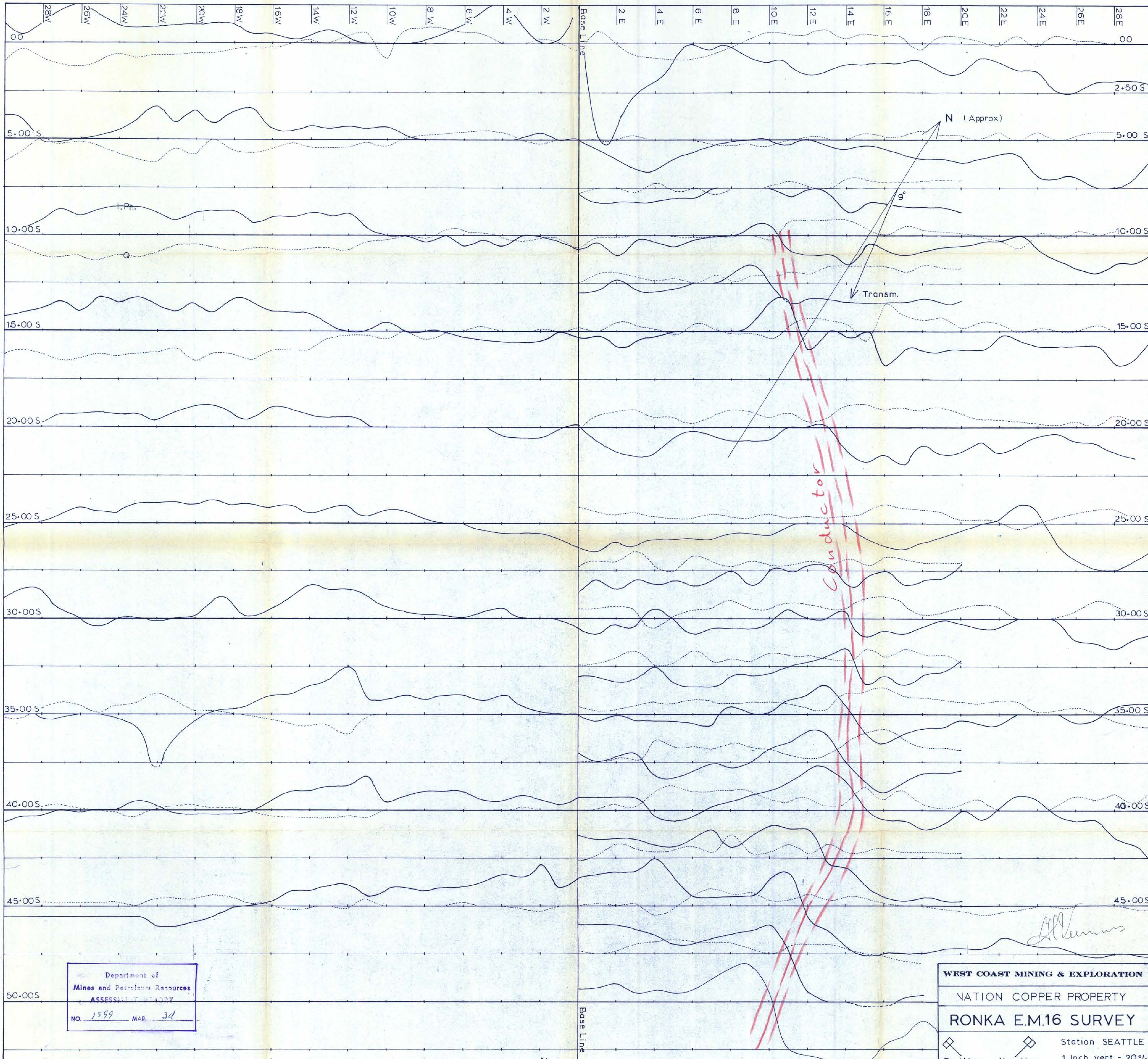

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1599 MAP 3d

WEST COAST MINING & EXPLORATION

NATION COPPER PROPERTY

RONKA E.M.16 SURVEY

Station SEATTLE

1 Inch vert. = 20%

Scale 1" = 200ft | H.V. June 1967 | 93 N

SOUTH 1

To accompany Geophysical-Geochemical Report by H. Veerman, P. Eng. on the Vector Group near Tchentlo Lake in the OMineca M.D. dated June 1968

H. Veerman

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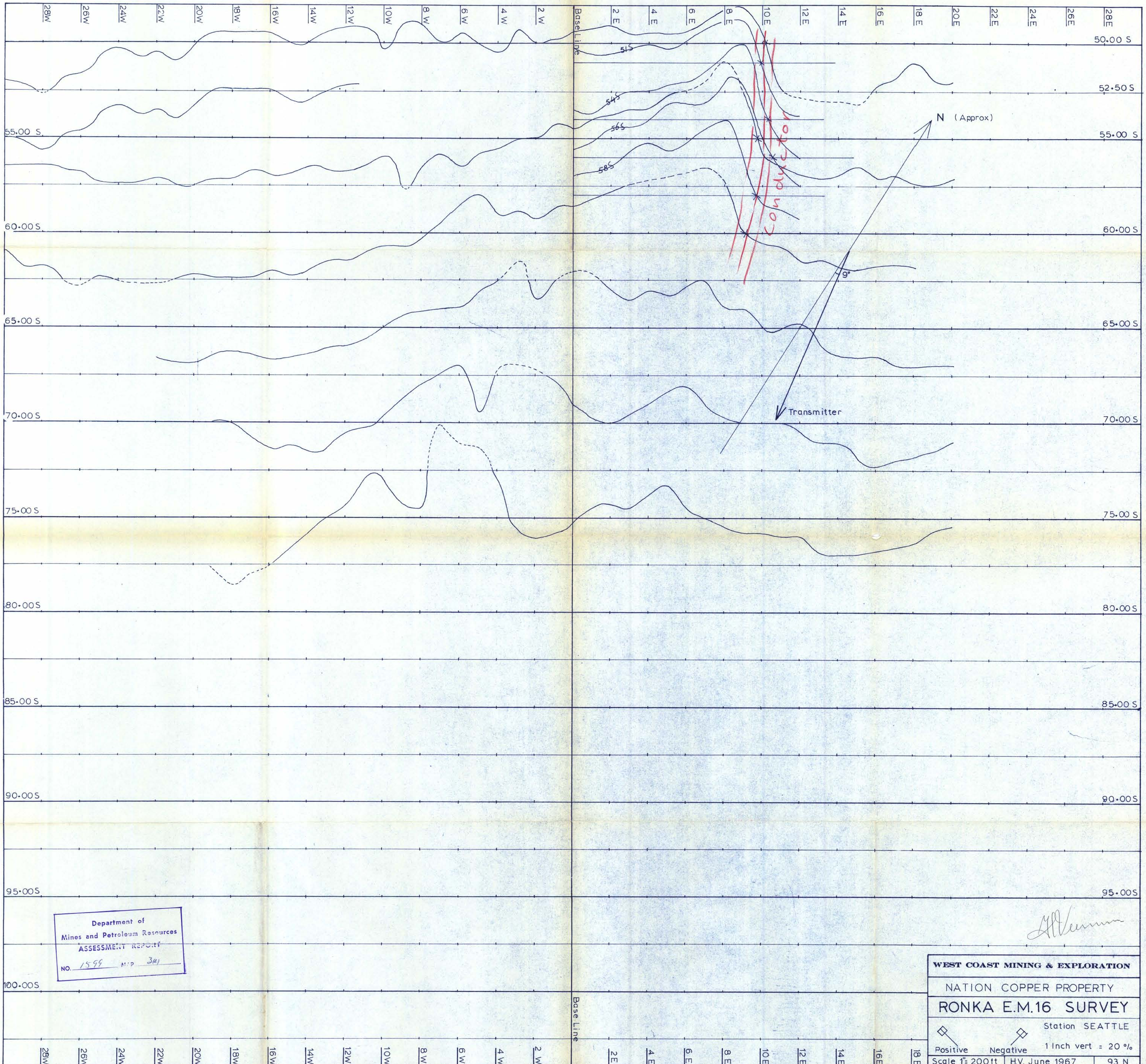

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SOUTH 2

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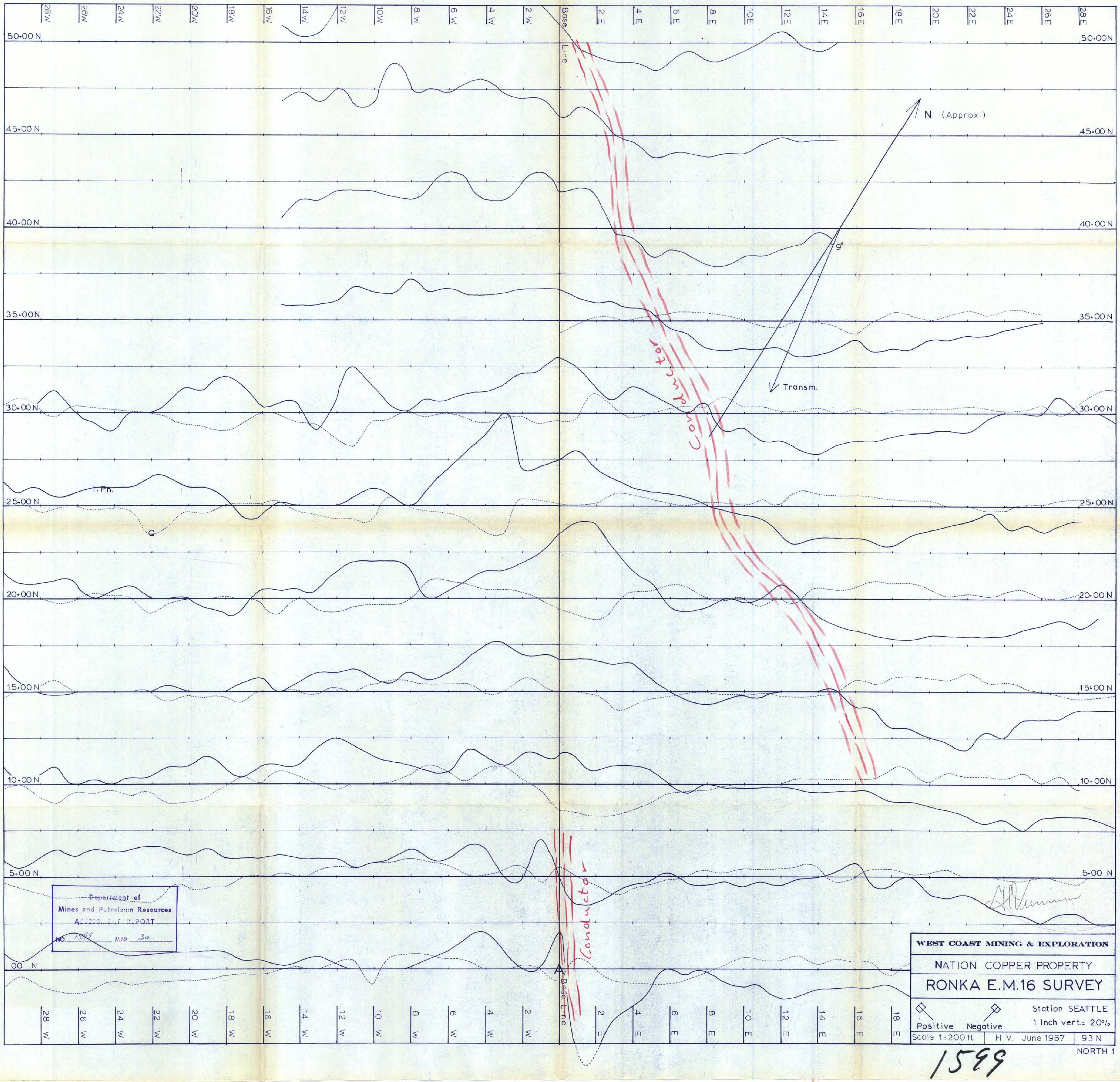

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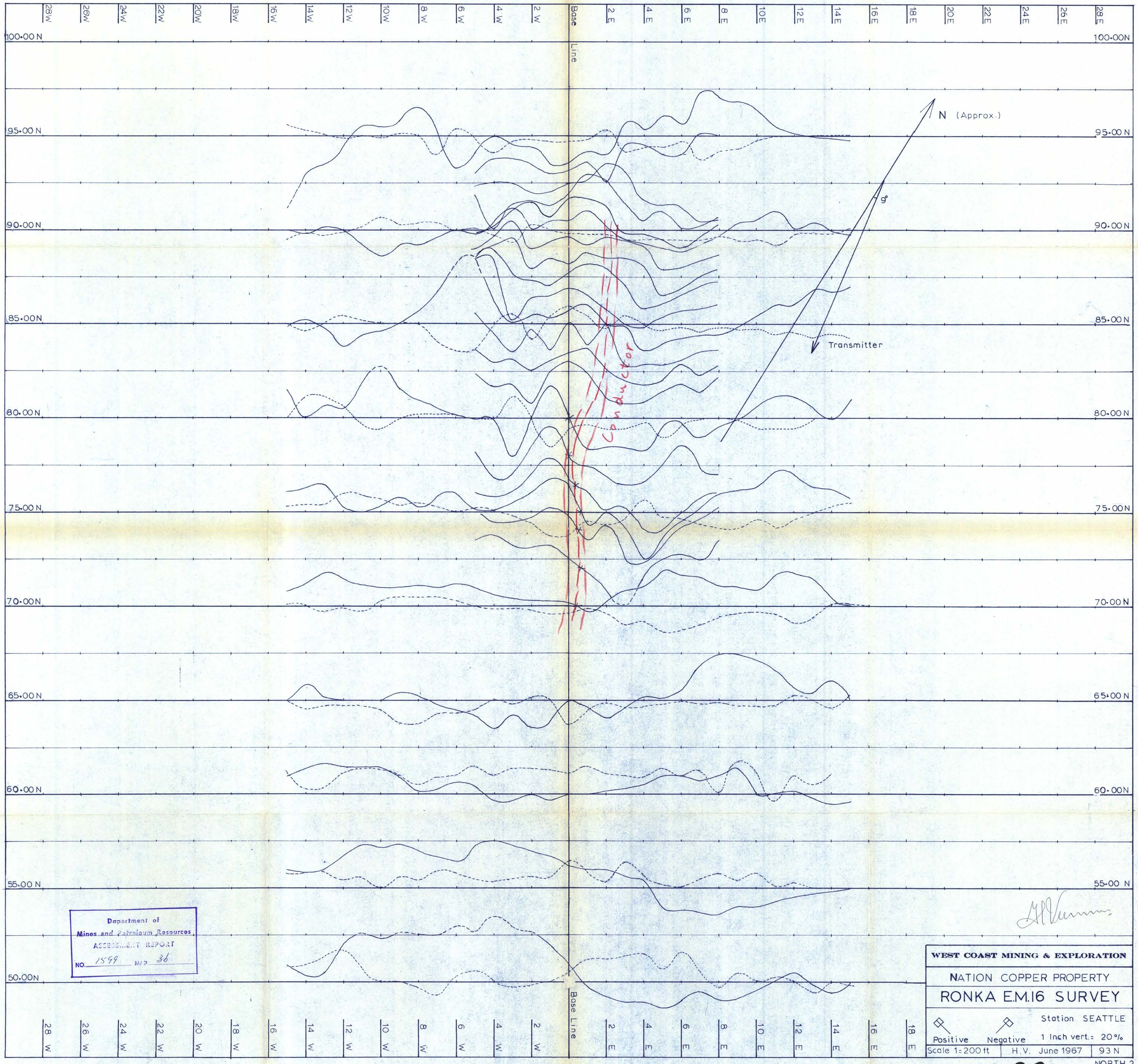
NORTH 3

To accompany Geophysical-Geochemical Report by H. Veerman, P.Eng. on the Vector Group near Tchentlo Lake in the Omineca M.D. dated June 1968



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1599