

GEOLOGICAL, GEOCHEMICAL, GEOPHYSICAL,

AND

PHYSICAL WORK REPORT

ON THE

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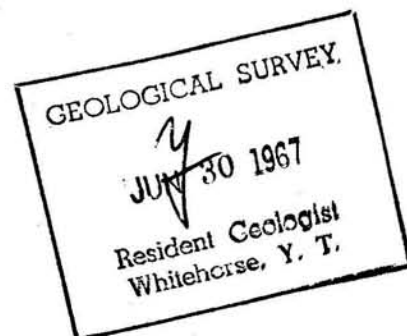
CLAIM GROUPS

BY

P. H. SEVENSMA, Ph.D., P. ENG.

AND

R. T. HEARD



Staking Sheet Nos. 105 - G6 & 11

Latitude: - 61° 29'

Longitude: - 131° 02'

Date Work Performed: July 12 to December 31, 1966

This report has been examined by  
the Geological Evaluation Unit.  
Approved as to technical worth by:

*D. G. Fordham*  
RESIDENT GEOLOGIST

Approved as to cost in the a. mount  
of \$ *36 00.00*

*R. T. Heard*  
DETERMINING ENGINEER

Accepted as representation work  
under Section 53(4) Yukon Quartz  
Mining Act

*[Signature]*  
COMMISSIONER OF YUKON

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SUMMARY

Riviera Mines Ltd. (N.P.L.) of 890 West Pender Street, Vancouver 1, B.C. acquired, by staking, 119 mineral claims in the Finlayson Lake area of the Watson Lake Mining Division, Yukon Territory.

MacDonald Consultants Limited were retained by Riviera Mines Ltd. to manage a geological, geochemical, geophysical and physical work program under the direction of Dr. P. H. Sevensma, P. Eng.

The exploration program was started by purchasing the results of an airborne combined magnetic-electromagnetic survey from Atlas Explorations Limited. Lockwood Survey Corporation Limited conducted the survey using helicopter-borne equipment under the supervision of John S. Brock. This purchase was negotiated by Dr. P. H. Sevensma.

From the results of the airborne geophysical survey, the claims were divided into two separate areas of interest. Each of these contained interesting electrically conducting zones. In all, six conductors are present on Riviera Mines' ground.

Both areas were gridded on 400' line spacings. The cut lines were surveyed, tied into local topographical features, and then plotted on to a 1000 scale base map that had been prepared by McElhanney Surveying and Engineering Limited. The claim boundary between Riviera Mines ground and Northlake Mines ground was also surveyed and plotted.

A geochemical survey was conducted over the grids as it was felt that a preliminary soil sampling program would give an indication as to possible mineralized zones and would define areas for closer follow-up work.

Geological mapping of the grid areas to 1000 scale plus a preliminary geological reconnaissance of the whole area was conducted. This information was used as an aid in the interpretation of the geochemical results.

Physical prospecting was also done over the area by both Riviera Mines' crews as directed by P. H. Sevensma and by MacDonald Consultants' crews.

One diamond drill hole was drilled to test an airborne and supporting ground geophysical anomaly.

PROPERTY

The property acquired by Riviera Mines consists of the following claim groups (figure 1):

<u>Claim Names &amp; Numbers</u>	<u>Grant Numbers</u>
A1 - A8	Y2943 - Y2950
B1 - B8	Y2951 - Y2958
C1 - C8	Y2959 - Y2966
D1 - D8	Y2967 - Y2974
E1 - E8	Y2975 - Y2982
F1 - F8	Y2983 - Y2990
G1 - G8	Y2991 - Y2998
H1 - H2	Y2999 - Y3000
H3 - H8	Y7001 - Y7006
I1 - I8	Y7007 - Y7014
J1 - J8	Y7015 - Y7022
K1 - K8	Y7023 - Y7030
L1 - L8	Y7031 - Y7038
M1 - M8	Y7039 - Y7046
AH 1 - AH8	Y7994 - Y8000
AH9 fraction - AH15 fraction	Y13203-Y13210

LOCATION

The claims are located in the Watson Lake Mining Division on N.T.S. 105-G, Finlayson Lake map sheet at 61 29' north latitude and 131 02' west longitude. They are centered on a two mile lake (Riviera) approximately 25 air miles south of the new Watson Lake - Ross River road and 60 miles east of the community of Ross River.

HISTORY

The area has in general been dormant until 1954 when the Vangorda Creek lead-zinc deposit was discovered. This was due mainly to the extensive overburden in the area and its relative inaccessibility before road construction.

The first discoveries were made in the early fifties in the Grass Lakes area, followed by the North Lake - Fyre Lake discoveries in the early sixties. Reports of these showings refer mostly to copper-zinc mineralization.

Reconnaissance mapping on a scale of 1" = 4 miles was carried out on the Finlayson Lake map sheet in 1958 and 1959 by the Geological Survey of Canada. This work was published as map 8, 1960.

In 1961, the Geological Survey of Canada had an airborne magnetic survey carried out over the Finlayson sheet, the results of which were published in 1963 as map 7006 G on a scale of 1" = 4 miles.

In April of 1966, several airborne geophysical anomalies were staked by Riviera Mines Limited. There has been considerable selective staking in the area by other companies, notably Northlake Mines, Atlas Explorations and Kerr Addison.

#### GENERAL GEOLOGY

The general geology of the area has been described by J. O. Wheeler, 1958, 1959; L. H. Green, and J. A. Roddick, 1959, map sheet 8, 1960.

The predominant rocks in the area are quartz biotite, quartz chlorite schist, micaceous quartzite, hornfels, minor phyllite, micaceous quartzose gneiss, granitoid gneiss, graphitic schist and a slightly argillaceous biotitic schist. There are also several large ultrabasic intrusives in the area.

#### I GEOLOGICAL SURVEY

##### A. Detailed Geology

The area is approximately 90% drift covered and in many instances mapping was done from observation of boulders, slide rock and felsenmeer. It is underlain by an assemblage of quartz micaschist and slate rocks as described on G.S.C. map 30, 1963. These have been correlated with the Anvil Range schists and the Klondike schists.

This assemblage of schists is thought to be of Mississippian age and is intruded by Cretaceous granites and in places by Tertiary basalts.

There are also zones of gneiss present which are believed to represent metamorphosed arkoses, grits and conglomerates.

The grade of metamorphism varies throughout the area with the distinction between gneiss and schist reflected by a difference in original lithology, rather than by a pronounced change in intensity of metamorphism.

The lithological characteristics throughout the Finlayson Lake - Anvil Range vary, quartzitic and arkosic members predominate in the Finlayson Lake belt which is also characterized by large

ultrabasic intrusives. In the Anvil Range, the original sediments of the schist formation represent deeper deposition and graphitic and sericitic schists are more abundant, while at the same time the ultrabasics diminish in importance.

#### B. Structure

The general trend of the formations is North West, but to the south west of Finlayson Lake, an east-west trend has developed and a regional anticline with this trend is indicated by G.S.C. reconnaissance mapping.

The true structure of the claim area proper is unknown as the detrital cover (Pleistocene) obscures most rock.

#### C. Mineralization

Prospecting and geological mapping found several small areas of mineralized float. These have been plotted on the accompanying maps. Mineralization was mainly pyrite, pyrrhotite, and one small piece of chalcopyrite was found.

In a diamond drill hole core on the west side of the property was found a nearly massive section of pyrite-pyrrhotite (4") with specks of chalcopyrite in the wallrock for a few feet on either side of the massive iron-sulphides.

### II GEOCHEMICAL SURVEY

#### A. Grid Detail:

Two grids were cut for a total of 34.5 line miles. These were identified as follows:

Riviera #1: 25.4 line miles. Two baselines were cut at right angles to one another.  
Cross lines were cut at 400' intervals.

Riviera #2: 9.1 line miles. Baseline with cross lines at 400' intervals.

#### B. Sampling:

A total of 700 soil samples were taken from both grid areas. All samples were taken at 200' intervals. All samples were tagged and bagged in polyethylene bags. They were then shipped to Bio Metals Corporation Ltd. (N.P.L.) in North Vancouver, B.C. to be analysed for lead, zinc, and copper.

C. Method of Analysis:

All samples were analysed at the Bio Metals Corporation Limited (N.P.L.) laboratory located at 204 - 1515 Pemberton Avenue, North Vancouver, B.C. Samples were shipped periodically from Whitehorse via C.P.A. air freight.

When the samples were received by the laboratory, each was dried and then screened to - 80 mesh. A 0.5 gram sample was weighed out and digested in hot aqua regia. They were then diluted, clarified for 20 hours and then tested for copper, lead, and zinc content on an atomic absorption spectrophotometer. The 'AA' unit used was an 'Evans' manufactured by Evans Co. of Essex, England. Accuracy of this instrument ideally is 1.5 ppm, 0.05 ppm & 0.15 ppm/% absorption for lead, zinc and copper respectively. Individual cathode lamps were used for each element and results were reported in parts per million (ppm).

D. Treatment of Data:

The results of geochemical tests were returned airmail to the field as soon as they were available. The values in ppm were plotted onto field maps and contoured to see whether any areas required follow-up sampling.

In contouring results a background was determined from the % frequency of occurrence of results in ppm. This information was used as a control for detailed mapping and prospecting.

E. Interpretation of Results:

All samples taken were analysed for lead, zinc and copper. Copper values (anomalous) were found to reflect areas of ultrabasics.

There is a weak copper anomaly on the east side of Riviera Lake. It is supported by a weak zinc anomaly.

There is also a medium weak zinc anomaly to the west of Monaco Lake.

Grid Riviera #2 also has a weak copper anomaly.

III GEOPHYSICAL SURVEY

A. Airborne Geophysics:

The airborne geophysical survey was conducted by Lockwood

Survey Corporation Limited under the supervision of John S. Brock, Assistant Exploration Manager, Atlas Explorations Ltd. Results of this survey were purchased from Atlas Explorations Ltd. by Dr. P. H. Sevensma on behalf of Riviera Mines Ltd.

1. Lockwood Airborne Method

The Lockwood method uses a single frequency of 4000 cps to generate a primary electromagnetic field. The transmitter loop is carried in a fiberglass bird and is oriented with the loop axis parallel to the direction of flight. A receiving loop is located 30' away in the other end of the bird; the loops are coaxial.

The bird is suspended at the end of a 70' cable and is towed by a helicopter at an elevation of 100' above the ground.

A magnetometer of the Gulf Mark III type, also located in the bird, measures the total intensity of the magnetic field.

Recorders and a positioning camera are carried on the helicopter and are handled by an operator who indicates to the pilot the planned course plotted on 1" = 1320' airphotographs and who marks fiducial points on the recorder's strips.

In general, the flight lines are laid out at right angles to the strike of the formations and at distances varying from 600' to 1500' apart.

If a conductive body in the ground is crossed by the helicopter carrying this equipment, the primary electromagnetic field creates eddy currents in this conductor which cause the generation of a secondary electromagnetic field. This secondary field is generally of the same frequency as the primary field but out-of-phase with it; it is detected by the receiver loop in the bird.

As a variation in the distance between the transmitter and the receiver coils will create a strong in-phase response, both coils are in a fixed position in the relatively rigid bird. This will eliminate false responses. Increasing out-of-phase responses will be obtained over bodies of low to medium conductivity; as the conductivity increases beyond the medium range, this out-of-phase response falls off again.

In-phase responses are increasingly stronger as the conductivity

rises from poor to very high.

The strength of the response is measured in parts per million. For the above cited reasons, the ratio of the in-phase to the out-of-phase responses is less than one for bodies of poor to medium conductivity and increases rapidly as the conductivity varies from medium to high.

The response is also a function of the size of the conducting body and of the distance from the bird to it.

The maximum distance at which a highly conductive body of large size will give a response appears to be about 300' between the bird and the top of the conducting body.

Various geological bodies are electrical conductors and geological conductors are manifold and of greatly varying size, shape and conductivity, the latter often being a function of the internal texture of the conductor.

The reliability of the method is principally a function of the elevation above ground that can be maintained. Correlation of responses on adjacent lines flown at different elevations, due to weather or topographical conditions, may not be satisfactory. This happens if the survey is flown with too light a helicopter.

Providing the bird is flown at a steady elevation above the aground, interpretation of airborne data is largely a function of the geological conditions.

Different geological environments will lead to different appraisals of quantitatively very similar airborne geophysical responses.

In general, experience has shown that long conductors (several thousand feet or several miles) with relatively low ratios of 1 or less are likely to be of a formational nature, like graphitic schists. Smaller conductors of better than 1, or preferably 2, ratios may represent near-surface sulphide occurrences.

In certain areas, coincidence of magnetic and electromagnetic highs is critical because of an association of sulphides and magnetite. Most magnetic highs are however a reflection of increased magnetite content of the underlying rock formations, and high magnetic readings may have no more than a very indirect relationship to unusual sulphide concentrations in any given area.

Other geological factors complicating a qualitative interpretation are, for example, the frequent association of graphite and sulphide bodies or the presence of sulphide deposits the mass of which is buried beyond the range of the electromagnetic field but that do have a small near-surface expression.

An airborne geophysical survey should therefore be considered as a mapping tool enabling the exploration effort to be directed towards limited portions of the area flown and further ground work in restricted areas should use methods like geological mapping, geochemical reconnaissance, ground EM and gravity to assess conductors or magnetic highs detected by airborne methods.

## 2. Airborne Survey Results

Magnetic results are comparable to the G.S.C. aeromagnetic survey, but show greater detail as the line spacing is 1/4 mile instead of the 1 mile spacing used by the G.S.C., and as the mean terrain clearance is about 150' instead of 1000' in the fixed wing G.S.C. method.

The high magnetics clearly reflect the presence of an ultrabasic body, partly under medium cover of perhaps several hundred feet of rock and overburden and partly under shallow overburden cover of perhaps a few tens of feet.

The electromagnetic results show a conductive formation which is essentially wrapped around the highly magnetic ultrabasic body.

Very high ratios with high in-phase readings to the NW of Monaco Lake reflect a body with high conductivity much as a near surface pyrrhotite body or a highly graphitic slate formation.

The strong conductor on the West shore of Riviera Lake is about coincident with a magnetic high and could be related to a pyrrhotite occurrence.

A more detailed interpretation using all data obtained during the 1966 field program is presented in the last section of this report.

## B. Ground Geophysics

### 1. Summary

Huntec Limited of Toronto was contracted to carry out a Turan Inductive Loop E.M. survey over part of Riviera #1 grid to double check a weak Horizontal Loop E.M. survey picked up by MacDonald Consultants crew using a Ronka Mark III unit.

The method of conducting the Turam survey is explained in a separate report contained herein as written by Norman R. Patterson, Ph.D., P. Eng., of Huntec Limited.

The Ronka survey was conducted under the direction of MacDonald Consultants Limited. A map of this survey is included in this report.

United Geophysical were contracted and a small gravity survey was also run over parts of grid #1. Results of this survey were inconclusive due to the size of the area covered. A more detailed and larger survey would have to be conducted before a true interpretation could be made.

### 2. Results

The Ronka Survey over the SW part of the property provided an excellent analysis of the conductivity of the underlying formations, showing three zones of strong conductivity separated by material of lesser conductivity.

Drilling of one core-hole proved a 4" thick layer of massive pyrite-pyrrhotite with only traces of base metal to lie along the contact of a highly conductive graphitic slate with a moderately conductive chloritic schist.

Over the SE part of the property overburden was too deep for the Ronka instrument, but a Turam Survey located strong conductors, with maximum current concentrations at depths of from 140' to 200', suggesting an overburden thickness of the order of 100' at least.

Characteristics of four of these conductors have led to the recommendation by the geophysical contractor to drill a total of four locations.

These results will be discussed in more detail in the final conclusions.

The gravity survey showed a strong gradient climbing in a Northerly direction, i.e. a slope of 2.6 milligal in 1800' along a topographical drop of only 125'.

To the North of these various surveys lies an area of from 50 - 100 ppm Cu with some values of 104 - 116 ppm Cu.

### 3. Conclusions and Recommendations

The total sum of these data indicates that gravity and EM surveying with a deep penetration instrument should be expanded, as the deep overburden precludes any other geological-geophysical approach short of drilling.

The most promising target area is the one covered by the geochemical anomaly, North of the previous geophysical surveys.

An expanded gravity survey on lines 800' apart is required to determine whether or not the gradient is related to deeper lying serpentine or whether it develops a maximum in the geochemically active area, thereby suggesting a chance for a massive base-metal bearing sulphide occurrence.

Electromagnetic work should be extended over the geochemically active area to the North.

## IV PHYSICAL WORK

### A. Diamond Drilling:

One diamond drill hole was drilled to a depth of 382.4 feet to test a combined airborne and Ronka geophysical survey. This hole was not completed due to severe cold weather conditions. Location of this hole is on line 28W at 700'S, drilled at -90°.

The detailed log by P. H. Sevensma is as follows:

0 - 32	Overburden
32 - 207	Laminated and thin bedded argillite, no lime
207 - 219'6"	6' of broken core only. Limey, irregularly thin bedded to laminated argillite
219'6" - 222'6"	Intensely altered and silicified rock with minor chalcopyrite
222'6" - 239'6"	All core lost and ground
239'6" - 242'	Well laminated quartz-graphite schists
242 - 242'6"	Same schist with minor chalcopyrite
242'6" - 244'6"	Massive dark argillaceous section with 4" of about 80% bedded fine grained pyrrhotite and minor pyrite in the centre.
244'6" - 248'	Well laminated quartz-graphite schist with minor chalcopyrite.
248 - 382'6"	Well laminated quartz-graphite schist.
382'6" -	End of hole.

Dips of the bedding measured in relation to the axis of the core are as follows: 32' - 76': 40, 76' - 106': 50, 106' - 210': 65, 239.5' - 248': 75 - 80, 248' - 382.5': 70 ; this indicates a progressive flattening of the bedding as the depth increases.

Assays completed by T.S.L. on the 4" of massive sulphides gave the following values:

Au: trace, Ag: trace, Cu: 0.02%, Pb: trace, Zn: 0.05%, Ni: trace.  
Geochemical assays by atomic absorption on the rejects showed:  
Cu: 175 ppm, Zn: 25 ppm, Pb: 10 ppm.

#### B. CONCLUSION

In conclusion, the drilling showed a narrow bed of strata-bound sulphides near the chloritic argillite-graphitic slate contact with minor chalcopyrite in both walls. Measured in ppm, the base metal values are well below those of soil samples obtained over the same formations on nearby ground.

The presence of strata-bound sulphides is significant and further exploration of this occurrence is warranted.

#### CONCLUSIONS AND RECOMMENDATIONS

See Dr. P. H. Sevensma's report which is attached hereto.

REPORT ON  
A TURAM ELECTROMAGNETIC SURVEY  
ROSS RIVER, YUKON TERRITORY

FOR

RIVIERA MINES LIMITED

BY

HUNTEC LIMITED  
TORONTO, ONTARIO  
JANUARY, 1967

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Turam E. M. Survey with Interpretation	1" = 200'

INTRODUCTION

Between September 12th and 15th, 1966, a Turam electromagnetic survey was carried out by Huntec Limited for Riviera Mines Limited over an area near Grass Lake, approximately 50 miles south of Ross River, Yukon Territory.

The party chief for the survey was Mr. A. Dyck, with supervision from Toronto by Messrs. A.R. Dodds and N.R. Paterson. Final drafting of results, interpretation and report writing were done at the Toronto office of Huntec Limited.

The survey consists of reconnaissance readings at 100 foot intervals on lines 400 feet apart, using the Turam induction loop electromagnetic method with a frequency of 660 cps. Some detailing was done using a lower (220 cps) frequency.

The data are presented in the form of profiles of reduced amplitude ratio and phase difference between the two receiver coils, at a scale of 1 inch to 200 feet.

## SURVEY SPECIFICATIONS

The basic principle of any electromagnetic survey is that when an electrical conductor is subjected to a primary alternating field, a secondary current is induced in the conductor. This in turn produces a secondary alternating field which, together with the primary field, causes a resultant field of different amplitude and phase from the primary field. Thus, a conductor would be indicated by such distortions of the primary field.

The electromagnetic survey was carried out using an ABEM Type 1182 Turam electromagnetic prospecting unit. The primary field was set up by closed inductive loops laid out on the ground. Two receiver staffs, effectively horizontal search coils, connected by a lightweight shielded cable to a compensating amplifier are used to measure the distortions in the electromagnetic field. The quantities measured are:

- (a) the ratio of the field strengths at each coil; and
- (b) the phase difference in the fields at the two coils.

The effect of variations in the primary field on the former measurement is removed by dividing the field value by the theoretical ratio of primary field strength at each coil location, giving the reduced amplitude ratio.

To carry out this survey, two primary cable loops were laid.  
The distance between the receiver staffs was 100 feet.

INTERPRETATION

The most prominent feature of this survey is a northeasterly striking anomalous zone which extends over a large part of the area surveyed. Outside this zone there are no significantly anomalous readings, while within its boundaries, as shown on the accompanying map, background values are the exception and some of the anomalous readings are very strong. The limits of the zone are well defined on the southeast on Lines 20+00E to 36+00E and on the northwest on Lines 8+00E to 16+00E, with a definite weakening of values on Line 3+00E, possibly indicating the western closure. East of Line 20+00E the readings at the north end of all lines are unreliable, probably as a result of the shielding effect of the conductors within the zone, so that the northern limit of the zone may be south of the end of these lines rather than further north as would be indicated by these readings.

The various conductors making up this zone appear to be of very limited strike length and in close proximity to each other, making a quantitative interpretation virtually impossible. Some of them are certainly strongly conductive, but the location, depth and attitude are difficult to define accurately. It is also possible that the presence of magnetic material is further complicating the geophysical picture.

The interpreted conductors and conductivity strengths are shown on each survey line, together with estimates of depth to the main conductor axes. The conductivity strength is less a function of the amplitude of the anomaly, which is also dependent on both strike length and depth, but rather a function of the relative amplitudes of the ratio and phase components and the relative amplitudes of measurements at two frequencies, where a second frequency is used. The broken lines joining these conductor centres indicate what are considered to be the most probable trends of conductors between the survey lines. In a complex situation such as this there are several possible trend directions which are all the harder to resolve because of the uncertain characteristics of the conductors. These trends are therefore given with less than usual confidence.

The depths given are, in all cases, the interpreted maximum depths to the main conductor axes, which are located near the tops of the conductors. The question marks indicate the relative reliability of these depth estimates. Where an anomalous peak results from the combined effects of two conductors the depth given will be greater than the depth to the shallow conductor. The same restriction applies where the conductor does not lie directly beneath the survey line.

SUMMARY AND RECOMMENDATIONS


A group of conductors of varying strength has been located by the Turam survey. Several exhibit strong conductivity and are recommended for further investigation by diamond drilling. Four locations are given at this time, as follows:

1. To intersect 12+40N, Line 24+00E at 160' below ground.
2. To intersect 21+50N, Line 36+00E at 140' below ground.
3. To intersect 16+50N, Line 32+00E at 200' below ground.
4. To intersect 6+60N, Line 16+00E at 150' below ground.

Angle holes are recommended, preferably from North to South, at inclinations of  $45^{\circ}$  -  $60^{\circ}$ .

Respectfully submitted,

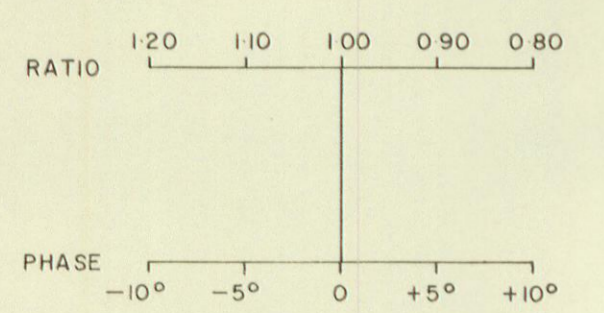
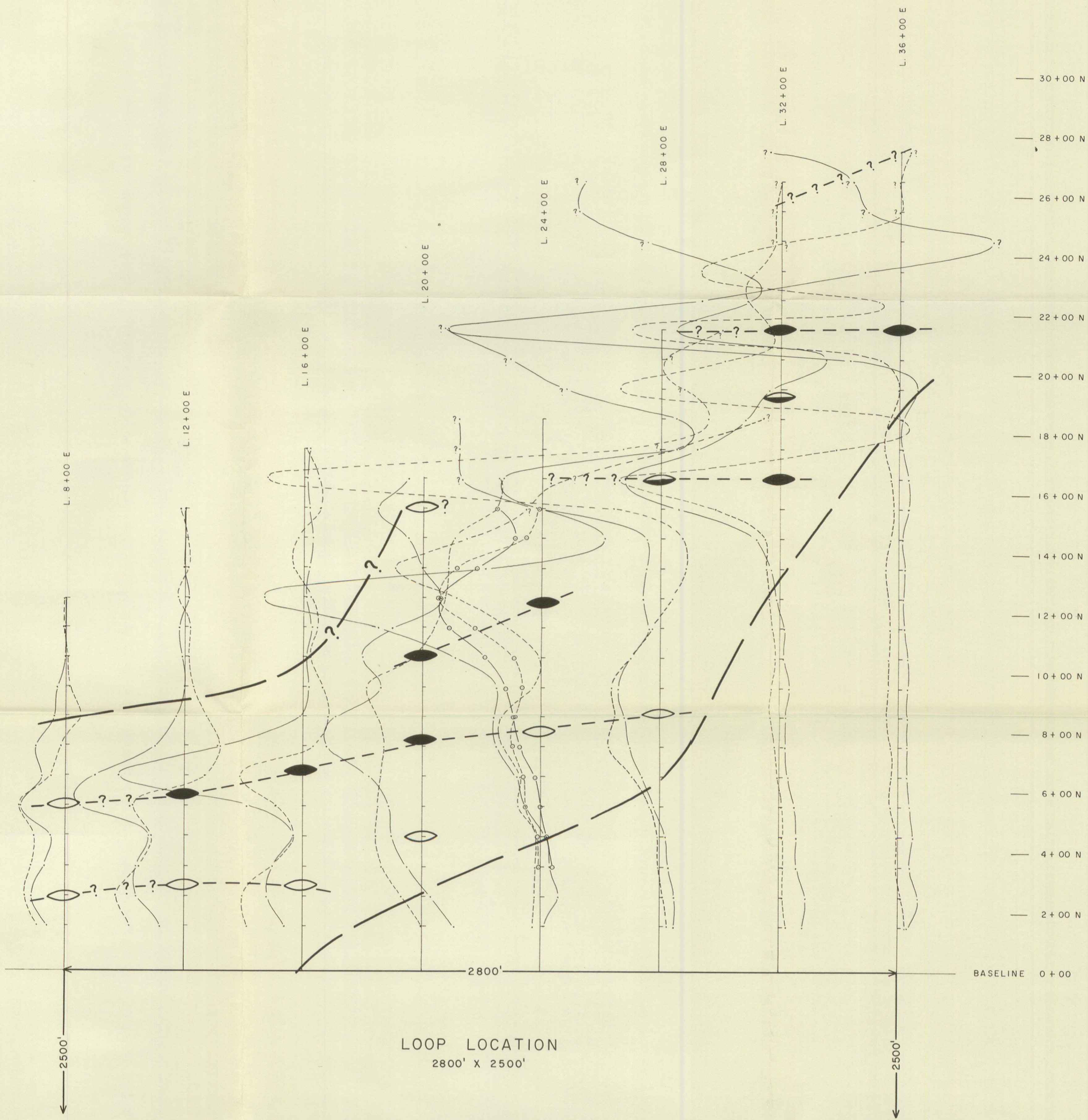
HUNTEC LIMITED



Andrew R. Dodds, B. Sc.,  
Geophysicist.



Norman R. Paterson,  
Ph. D., P. Eng.,  
Geophysicist.



SCALES :-  
 DISTANCE 1 inch = 200 feet  
 PHASE 1 inch = 10 0°  
 RATIO 1 inch = 0.20

--- PHASE Frequency 660 c.p.s.  
 --- RATIO Frequency 660 c.p.s.  
 --- PHASE Frequency 220 c.p.s.  
 --- RATIO Frequency 220 c.p.s.

Coil Separation 100 feet

INTERPRETATION LEGEND

- Limits of anomalous zone
- Strong conductor
- Medium strength conductor
- Weak conductor
- Interpreted conductor axis

RIVIERA MINES LIMITED  
 TURAM ELECTROMAGNETIC SURVEY  
 ROSS RIVER, YUKON TERRITORY

E.M. PROFILES WITH INTERPRETATION

To accompany report by *Norman Paterson*

N.R. Paterson, Ph.D., P. Eng., Geophysicist

HUNTEC LIMITED, Toronto, Canada - Jan., 1967

RIVIERA MINES LIMITED

SUMMARY REPORT & RECOMMENDATIONS

RIVIERA LAKE CLAIM GROUP  
105-G-6, 11. 61°30'N, 131°3'W.  
WATSON LAKE M.D., Y.T.

May 1st TO October 31st, 1966

by

P.H. SEVENSMA, Ph.D., P. Eng.

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## ILLUSTRATIONS

Figure 1	Geology and location, 1" = 4 miles
Figure 2	Inferred subsurface geology, 1" = 1 mile
Figure 3	Topography and HEM anomalies, 1" = 1 mile
Figure 4	HEM survey, South half, 1" = 1000'
Figure 5	Geophysical ground surveys, 1" = 1000'
Figure 6	Geochemical survey, 1" = 1000'

## I. INTRODUCTION

This report summarizes the results of the work on the A to M and AH claim groups, a total of 119 claims held by Riviera Mines Ltd. The details of the program are described in a separate report by the writer and by T. Heard of MacDonald Consultants Ltd.

## II. SUMMARY OF WORK PROGRAM

1. In April 1966, Riviera Mines Ltd. acquired by staking 104 claims in an area where float of massive coarse-grained pyrrhotite with minor chalcopyrite had been found some 10 or 12 years earlier (figure 1). Subsequently, 15 claims and fractions were staked to round out these holdings.

2. The claims are located in an area where chloritic and graphitic schists, believed to be the equivalent of the Vangorda Creek area, are in contact with ultrabasic bodies indicated by the 1961 G.S.C. aeromagnetic survey and by a few minor outcrops. (figure 2).

3. While staking was in progress, a combined Lockwood airborne magnetic and electromagnetic survey was flown by another organization. The results of this survey were acquired by Riviera Mines. Figure 3 shows the outline of the electrically conductive formations located by this survey, plotted on a topographical base-map prepared by McElhanney Surveying and Engineering.

The magnetic results of the Lockwood Survey are essentially a refinement of the aeromagnetics of figure 2.

4. Some detailed work was carried out on the NW corner of the property where a grid was cut and a soil-sampling program of 200 samples completed over what initial interpretation had shown to be an airborne conductor. This location was subsequently found to be in error and the geochemical survey provided mostly background values, with a definite copper anomaly (13 samples from 51 to 136 ppm)

5. A more extensive program was carried out over the South half of the property where strongly conductive zones had been found, wrapped around the nose of the ultrabasics. (figure 4).

6. Electromagnetic ground work consisting of a Ronka survey followed by a Turam survey outlined and detailed the conducting zone in the field and suggested relatively shallow overburden along the West edge of the property and depths of overburden possibly up to some 100' - 150' around the two lakes in this area. (figure 5).

7. A gravity survey of restricted portions of the ground where interesting conductors had been located, revealed a strong gradient of about 2.5 milligals over 1800' in the Easterly area, rising downhill towards the lake.

The Westerly gravity survey showed an anomalous pattern with a gradient of about 0.5 milligal over 800' rising uphill, towards an area with a significant copper soil anomaly beyond the boundary of the Riviera claims. (figure 5).

Due to their limited extent, the results of these gravity surveys are considered inconclusive.

8. A soil sampling program with a sample interval of 200' revealed an area of copper values significantly above the usual 0-25 ppm background East of Riviera Lake, partly confirmed by zinc values over 100 ppm. (figure 6).

Scattered lead values over 25 ppm were found, three of which overlie the area where massive pyrrhotite float with minor chalcopyrite had previously been found (lines 12 and 16 North), about 1500' N of the South shore of Riviera Lake.

In this area there is also a conducting zone about coincident with a magnetic high and the only coincident zone of this type found on Riviera ground.

9. One drill hole (figure 5) showed clearly the presence of a narrow bed of bedded fine grained iron sulphides near the contact of mildly conductive chloritic argillites and a limy member with highly conductive graphitic slates in an area where these formations have dips of from 15° - 45°, very likely to the NE.

### III. CONCLUSIONS

Near Riviera Lake, the existence has been proven of a folded belt of alternating chloritic and graphitic slates with a limy member, wrapped around an ultrabasic mass affected by faulting of unknown intensity.

Within these conductive formations, one drill hole has intersected a narrow zone of bedded iron sulphides.

Both on the property and elsewhere in the area, geochemical copper anomalies of various intensities have been found in the soils overlying the contact between the chloritic and the graphitic schists; the intensity of these anomalies is a function both of the depth of overburden and of the copper contact of the underlying formations.

Some of the copper anomalies are very likely to reflect the presence of copper-bearing iron sulphide bodies along the favorable chloritic-graphitic contact, especially where bedded iron sulphides are known in the vicinity.

In view of the similarity of this terrain to other portions of the Anvil Range-Finlayson Lake schist belt, where both small and large base-metal bearing bedded iron sulphides are known, some of which are of economical size and grade, intensive exploration of this belt in the Riviera Lake area is fully warranted.

### IV. RECOMMENDATIONS

Staking along the NE extension of the favorable belt has been recommended previously and has been completed in March 1967 following the zone indicated by the copper soil anomaly on the SE portion of the Riviera claims (CC 1-56 claims).

It is also recommended to record three years assessment work on the existing claims, to conduct at an early stage a general reconnaissance program over the newly acquired claims and to the North of Riviera Lake, and to continue drilling the initial target at a later stage when more information on this particular zone will be available.

As a bulldozer is expected to be available in the very near future for a limited time near Riviera Lake, the following work is recommended before breakup, snow conditions permitting:

1. Cut a tote-road along the West side of Riviera Lake, and North of the Lake to the North boundary of the property, approximately a claim-length West of the ultrabasic contact.
2. Cut a similar tote-road East of Riviera Lake to the NE boundary of the ground, about a claim-length SE of the ultrabasic contact.
3. Cut lines at right angles to these tote-roads about every mile, where the terrain is favorable or where targets are present (area 2).
4. Take a soil sample every two hundred feet behind the bulldozer at a picketed and flagged location.
5. Trench by bulldozer the coincident electromagnetic-magnetic anomaly in the float area West of the Lake and trench two lines across the geochemical copper highs on lines 16 and 32 East, East of Riviera Lake.

The following work is recommended for the 1967 summer season:

1. Run reconnaissance ground EM lines with a Ronka EM-16 one-man survey instrument along lines at right angles to the tote-roads to locate the favorable contact zone of the chloritic and graphitic schists.
2. Map the property accurately on a scale of 1" = 1000' after the snow is gone.
3. Follow-up by detailed soil sampling any significant geochemical anomaly discovered during the initial reconnaissance.
4. Take silt samples in any creeks which are in suitable locations.

The results of this work should provide a good appraisal of the entire property and the tote-roads will allow easy movement of equipment to any location where detailed follow-up by drilling is justified.

V. COST OF PROPOSED PROGRAM

1. Before breakup

Tote-roads and lines, 50 bulldozer hours @ \$28.00	\$ 1,400.00	
Trenching, 30 bulldozer hours @ \$28.00	840.00	
Supervision	600.00	
Soil Sampling, reconnaissance, 300 @ \$5.00	1,500.00	
Camp costs	500.00	
Transportation	<u>600.00</u>	
	5,440.00	
Contingency, 10%	<u>560.00</u>	
Total		\$ 6,000.00

2. After breakup

16 line miles EM @ \$75.00 per line mile	\$ 1,200.00	
Geological mapping, 2 man months	3,000.00	
Soil Sampling, 400 samples @ \$5.00	2,000.00	
Transportation	800.00	
Camp costs	<u>600.00</u>	
	7,600.00	
Contingency, 20%	<u>1,400.00</u>	
Total		\$ <u>9,000.00</u>
Total for both programs		\$15,000.00

3. Contingent upon other surveys

Gravity survey, 10 line miles @ \$350.00	\$ <u>3,500.00</u>	
Total Cost Estimate		\$ <u><u>18,500.00</u></u>

Cost savings will result from using equipment when available on nearby properties for parts of this program.

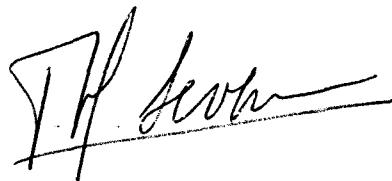
4. It is recommended that the drilling program started in 1966 be continued after the assessment both of the newly acquired claims and of the favorable contact zone lying along and North of Riviera Lake. This assessment may result in the location of other drill targets which would materially affect the overall cost of drilling.

5. Tote-roads are being built into the area and work being done by a neighbouring company is expected to materially assist the assessment of the known sulphide zone on the Riviera Mines ground, which even now constitutes a worthwhile drilling target.

6. The drilling recommended by Hunttec Limited on the Turam conductors SE of Riviera Lake should be postponed until a more detailed geological assessment of this area is available.

No reliable estimate of the timing, the cost or the amount of anticipated future drilling can therefore be made at present. An approximate estimate, taking into account the presence of tote-roads, is 4000' of core drilling at \$16.00 per foot overall plus a 10% contingency, for a total of \$70,000.00.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'P.H. Sevensma', written over a horizontal line.

P.H. Sevensma, Ph.D., P. Eng.

PHS/lz

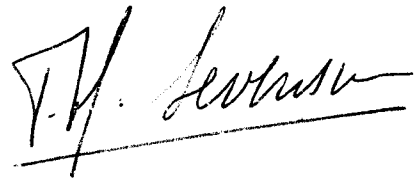
April 7, 1967

CERTIFICATE

I, PETER H. SEVENSMA, of Vancouver, B.C., do hereby certify that:

1. I am a graduate of the University of Geneva, Switzerland (Physics and Chemistry, 1937; Geology and Mineralogy, 1937) where I obtained my Ph.D. in Geological and Mineralogical Sciences in 1941.
2. I am a Consulting Geological Engineer and a registered member in good standing of the Association of Professional Engineers of British Columbia and of the Association of Professional Engineers of Yukon Territory.
3. From February 1948 until December 1965 I have been engaged continuously in mining and exploration geology in the employ of Cominco Ltd. AS a Senior Exploration Geologist, I have worked extensively both in Eastern and Western Canada.
4. I have personally examined on several occasions the claims which are the subject of this report, and have personally inspected the drilling results while drilling was in progress while acting as Consulting Engineer for Riviera Mines Ltd.
5. I have not received, nor do I expect to receive or acquire, directly or indirectly, any interest in any of the properties or securities of Riviera Mines Ltd.

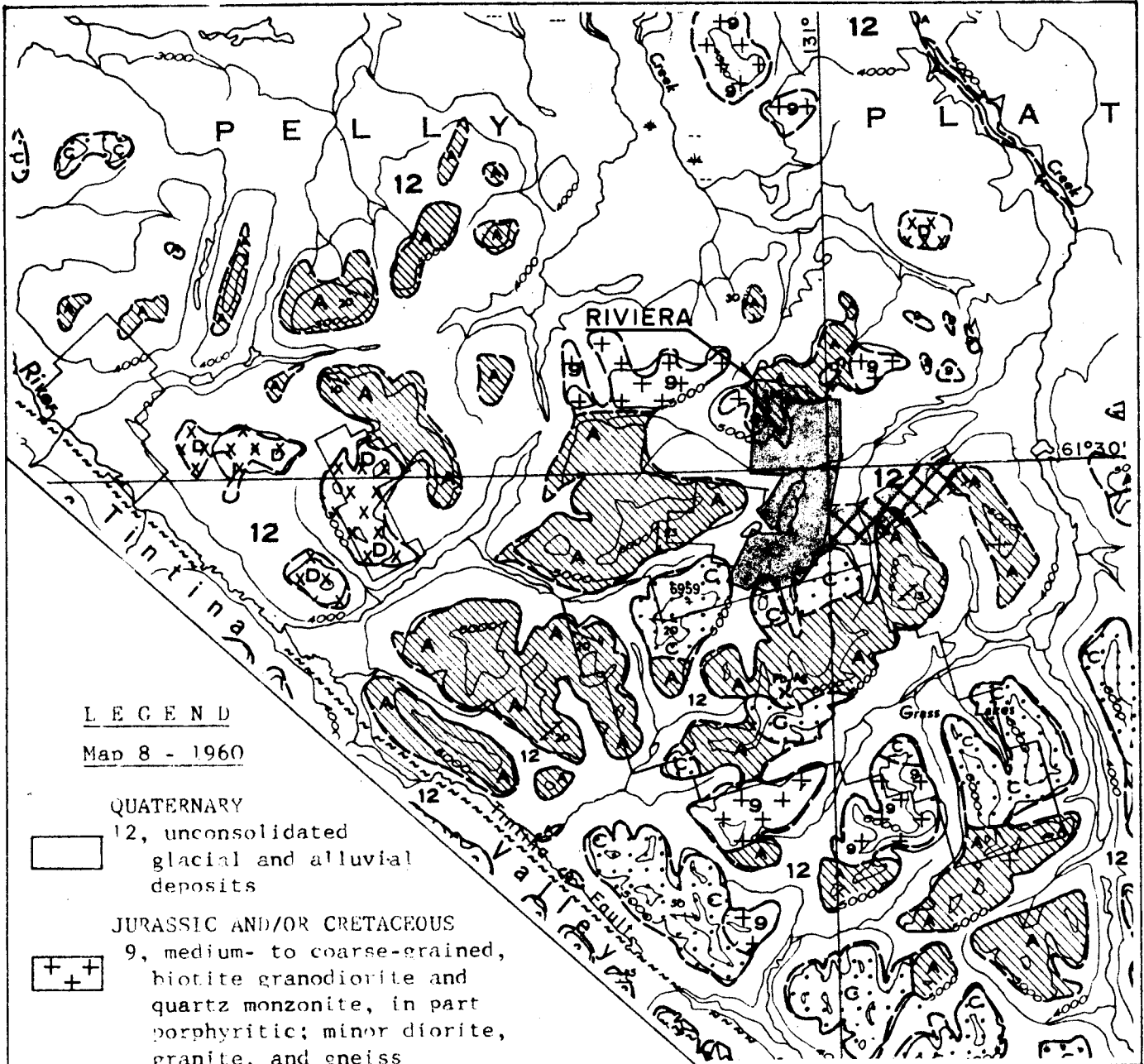
Respectfully submitted,



P.H. Sevensma, Ph.D., P. Eng.

PHS/lz

April 7, 1967



**LEGEND**

Map 8 - 1960

**QUATERNARY**

12, unconsolidated glacial and alluvial deposits

**JURASSIC AND/OR CRETACEOUS**

9, medium- to coarse-grained, biotite granodiorite and quartz monzonite, in part porphyritic; minor diorite, granite, and gneiss

A, Quartz-biotite and quartz-chlorite schist, micaceous quartzite, hornfels; minor phyllite and limestone

C, Micaceous, quartzose gneiss, granitoid gneiss; minor quartz-biotite schist

D, Dunite; minor peridotite, pyroxenite, and serpentinized equivalents; gabbro and diorite

Original 1966 claims

C.C. 1-56 claims, staked and recorded in March 1967

*P.H. Sevensma*

<b>RIVIERA MINES LTD.</b>	
<b>GEOLOGY AND LOCATION PLAN</b>	
Watson Lake M.D.	105 G-6/11
P.H. Sevensma Consultants Ltd. - Vancouver, B.C.	
DEC. 1966	

FIG. 1

# RIVIERA MINES LTD.

INFERRED SUBSURFACE GEOLOGY

Watson Lake M.D. 105 G-6/11

P.H. Sevensma Consultants Ltd.

Vancouver, B.C. SCALE: 0 1/2  
Dec. 1966 (miles)

— LEGEND —

CHLORITE - QUARTZ SCHIST

AEROMAGNETIC CONTOURS

SULPHIDE OCCURENCES

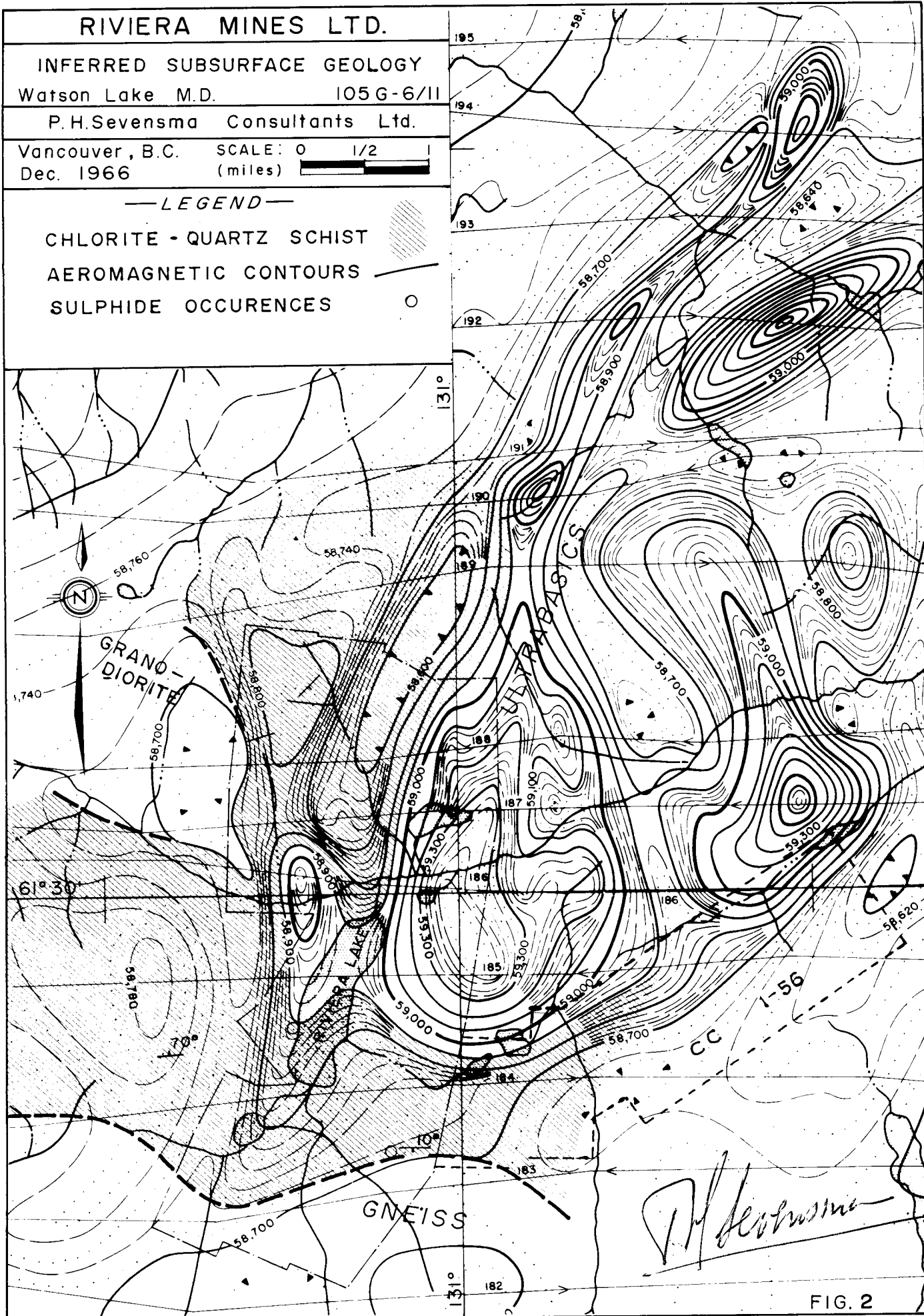
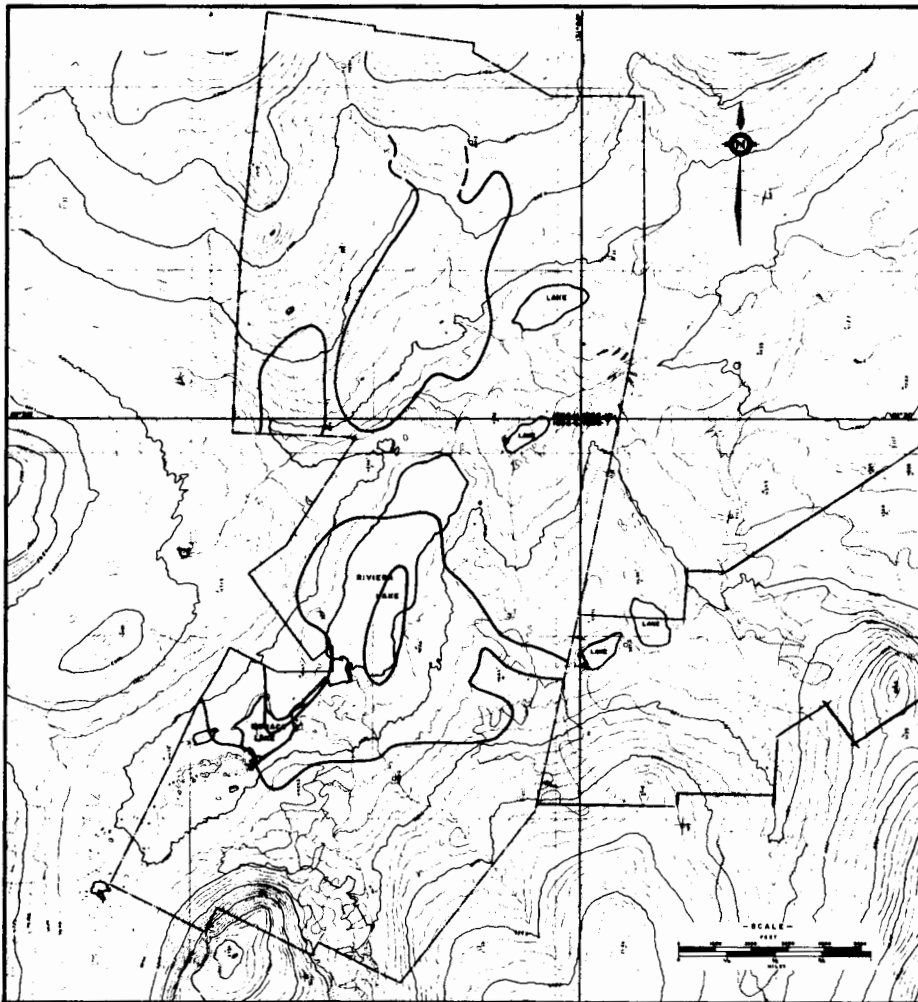


FIG. 2

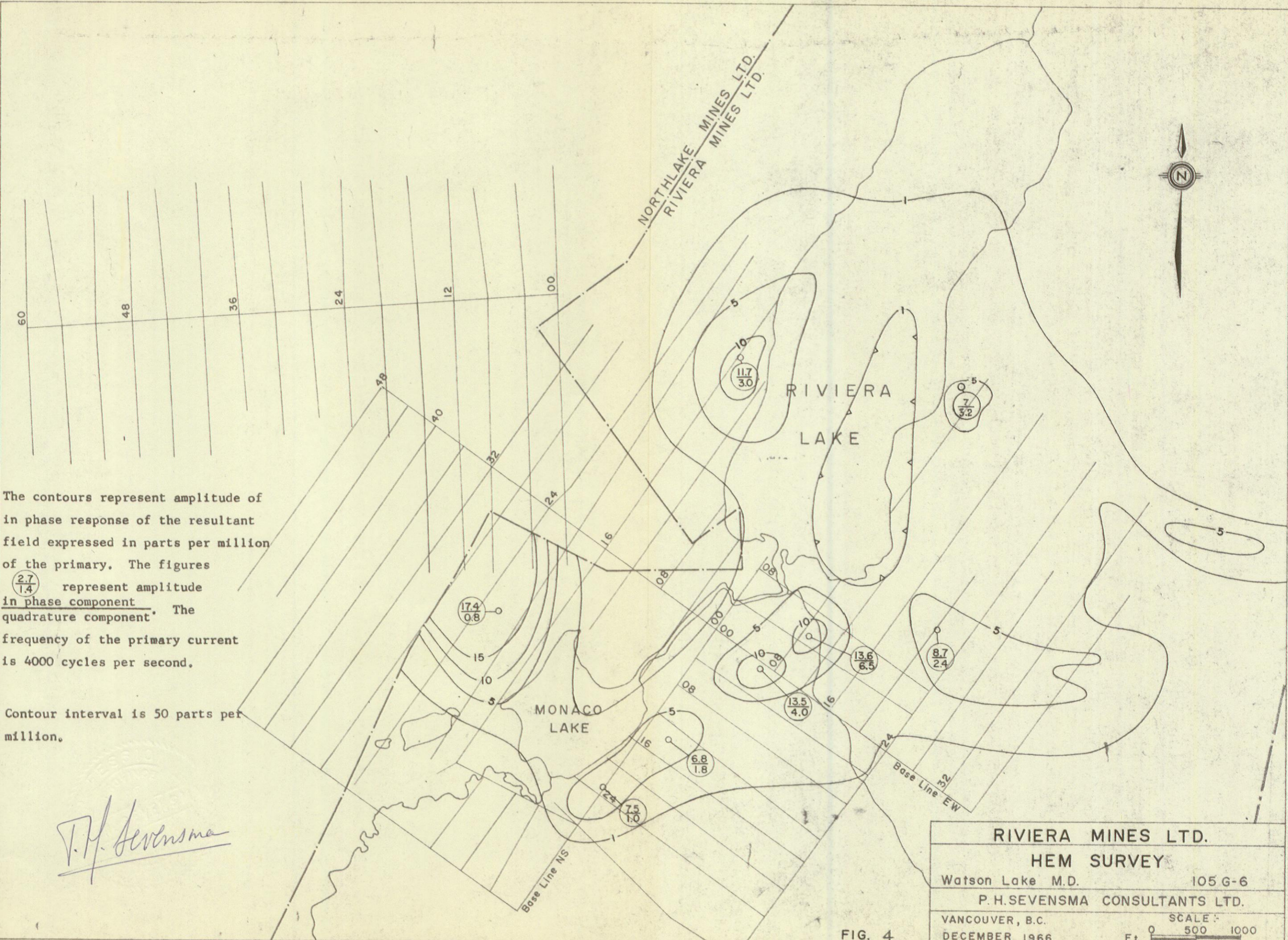


CC. 1-56

<b>RIVIERA MINES LTD.</b>	
<b>TOPOGRAPHIC AND CLAIM LOCATION MAP</b>	
<b>Watson Lake M.D.</b>	<b>105 G-6/11</b>
<b>P.H. SEVENSMA CONSULTANTS LTD.</b>	
<b>715-850 W. Hastings, Vancouver B.C. Dec. 1966</b>	

FIG. 3

*T.H. Sevensma*



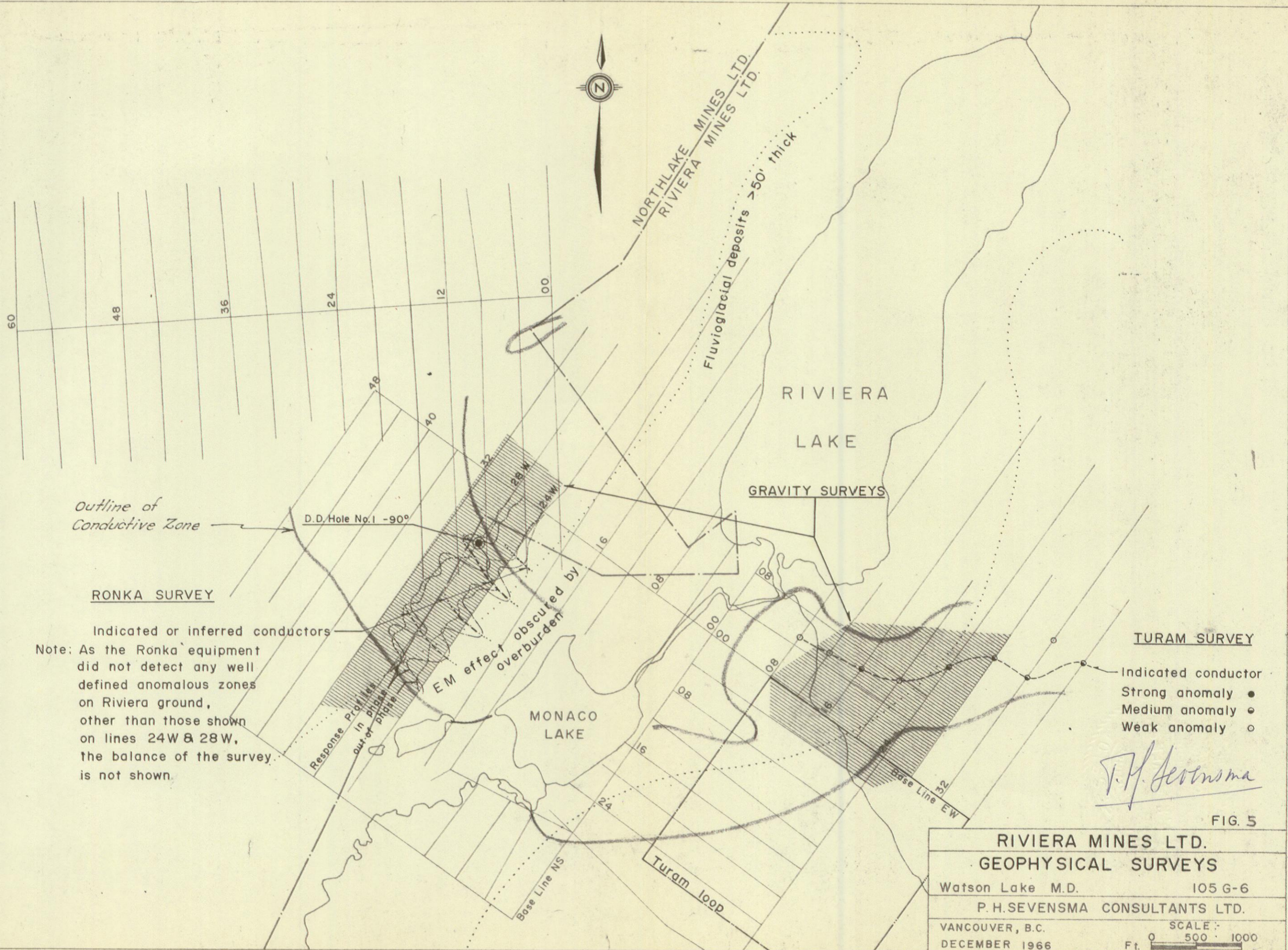
The contours represent amplitude of in phase response of the resultant field expressed in parts per million of the primary. The figures  $\frac{2.7}{1.4}$  represent amplitude in phase component quadrature component. The frequency of the primary current is 4000 cycles per second.

Contour interval is 50 parts per million.

*T.H. Sevensma*

RIVIERA MINES LTD.	
HEM SURVEY	
Watson Lake M.D.	105 G-6
P.H. SEVENSMA CONSULTANTS LTD.	
VANCOUVER, B.C.	SCALE:
DECEMBER 1966	Ft. 0 500 1000

FIG. 4



**RONKA SURVEY**

Indicated or inferred conductors

Note: As the Ronka equipment did not detect any well defined anomalous zones on Riviera ground, other than those shown on lines 24W & 28W, the balance of the survey is not shown.

**TURAM SURVEY**

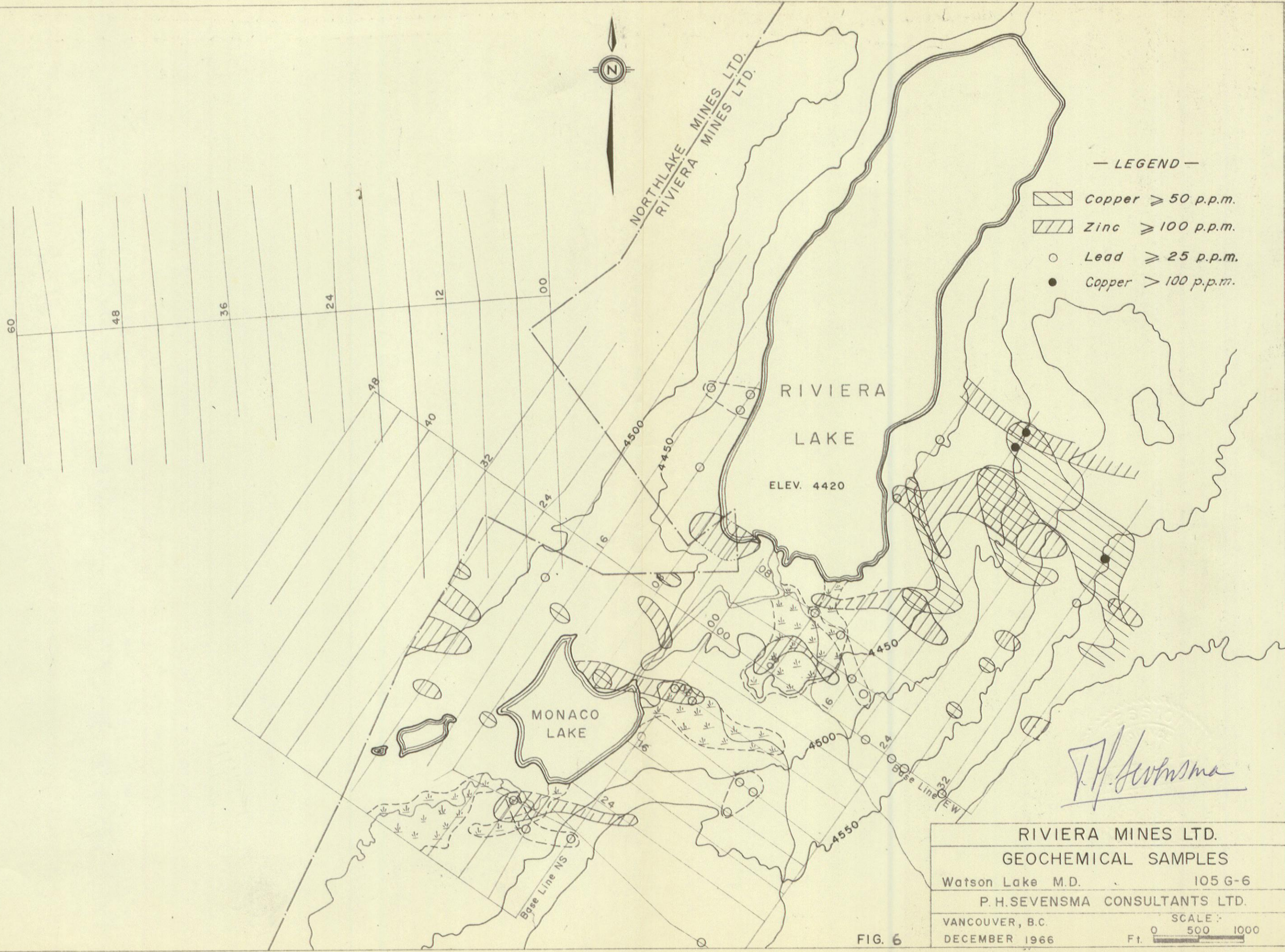
Indicated conductor

- Strong anomaly ●
- Medium anomaly ○
- Weak anomaly ○





*T. P. Sevensma*

FIG. 5

<b>RIVIERA MINES LTD.</b>	
<b>GEOPHYSICAL SURVEYS</b>	
Watson Lake M.D.	105 G-6
P.H. SEVENSMA CONSULTANTS LTD.	
VANCOUVER, B.C.	SCALE:
DECEMBER 1966	Ft. 0 500 1000



— LEGEND —

-  Copper  $\geq 50$  p.p.m.
-  Zinc  $\geq 100$  p.p.m.
-  Lead  $\geq 25$  p.p.m.
-  Copper  $> 100$  p.p.m.

*P.H. Sevensma*

RIVIERA MINES LTD.	
GEOCHEMICAL SAMPLES	
Watson Lake M.D.	105 G-6
P.H. SEVENSMA CONSULTANTS LTD.	
VANCOUVER, B.C.	
SCALE:	
0 500 1000	
Ft.	

FIG. 6

DECEMBER 1966

APPENDIX

# Young, Peers, Milner & Co.

BRANCH OFFICE: STE. 103-815 PARK ROAD  
TELEPHONE 278-6204 RICHMOND, B.C.

## CHARTERED ACCOUNTANTS

R.D. YOUNG, CA    R.D. PEERS, CA    R.S. MILNER, B.COM., CA.  
F. GINGELL, CA                      W.J. BURIAN, CA.

LICENSED TRUSTEE - R.D. YOUNG, CA.

1292 WEST GEORGIA STREET    VANCOUVER 5, B.C.  
TELEPHONE 684-6351

April 13, 1967

The Mining Recorder,  
Watson Lake, Yukon

Dear Sir:

Re: Rivera Mines Ltd., N.P.L.

At the request of the above named company, we have summarized on the attached sheet their expenditures on their property in the Finlayson Lake area, Watson Lake Mining, for the period July 12, 1966 to December 31, 1966.

Yours very truly,

YOUNG, PEERS, MILNER & CO.

Per: DMJ

APPENDIX

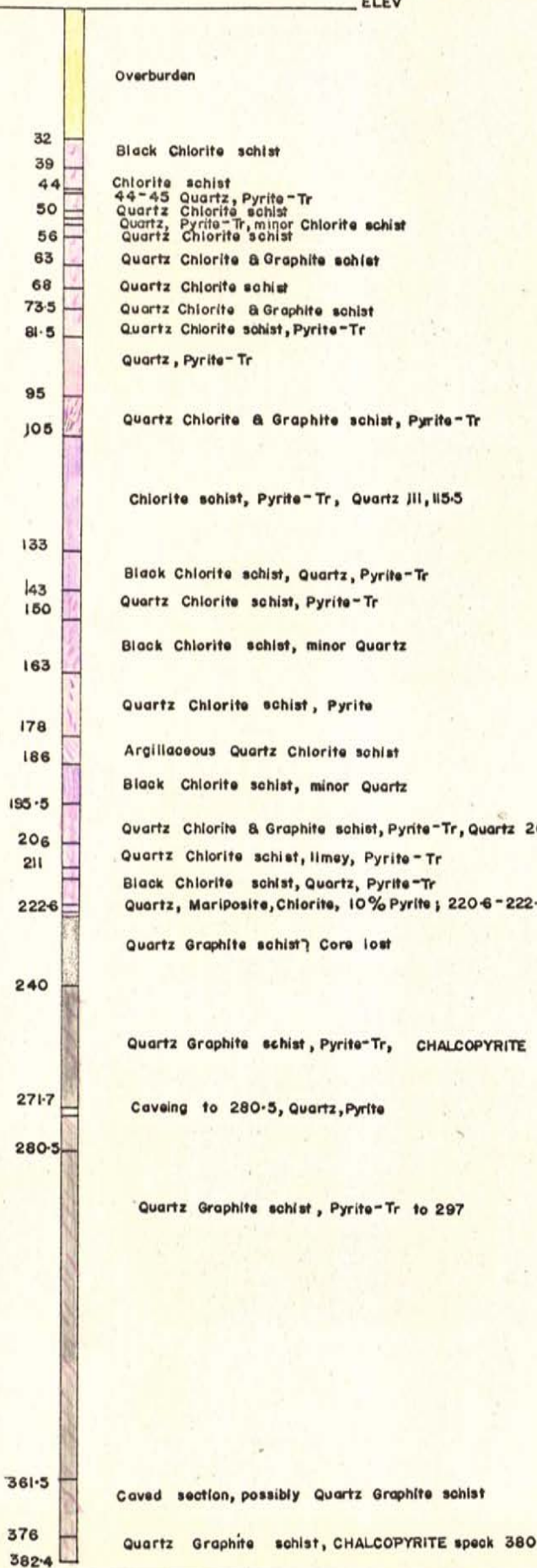
Summary of 1966 Assessment Work and Costs

The following is a summary of expenditures made by P. H. Sevensma and by MacDonald Consultants Limited on behalf of Riviera Mines Limited (N.P.L.) for the period from July 12, 1966 to December 31, 1966.

Management fees & expenses	\$ 2,360.00
Consultants fees & expenses	6,637.98
Miscellaneous expenses	47.42
Head office expense	310.52
Communications	214.75
Base camp	3,126.02
Fly camp	87.01
Line Cutting	3,105.00
Geochemical	1,999.34
Prospecting	2,215.93
Geophysical	4,151.47
Engineering & Geological	260.68
Surveying	1,838.47
Aircraft charter (C.P.A. & G.N.A.)	705.40
Helicopter charter	16,094.72
Diamond Drilling	6,372.85
Equipment rental (truck, jeep, etc.)	855.15
Assaying	<u>11.25</u>
	\$ <u>50,393.96</u>



ELEV



DDH R 1

Oct. 5-29, 1966

Recovery 68.5%

Location line 28 W  
7+00 S

Vertical

MacDonald Consultants Ltd.

RIVIERA MINES Ltd.

SCALE 1" = 40'

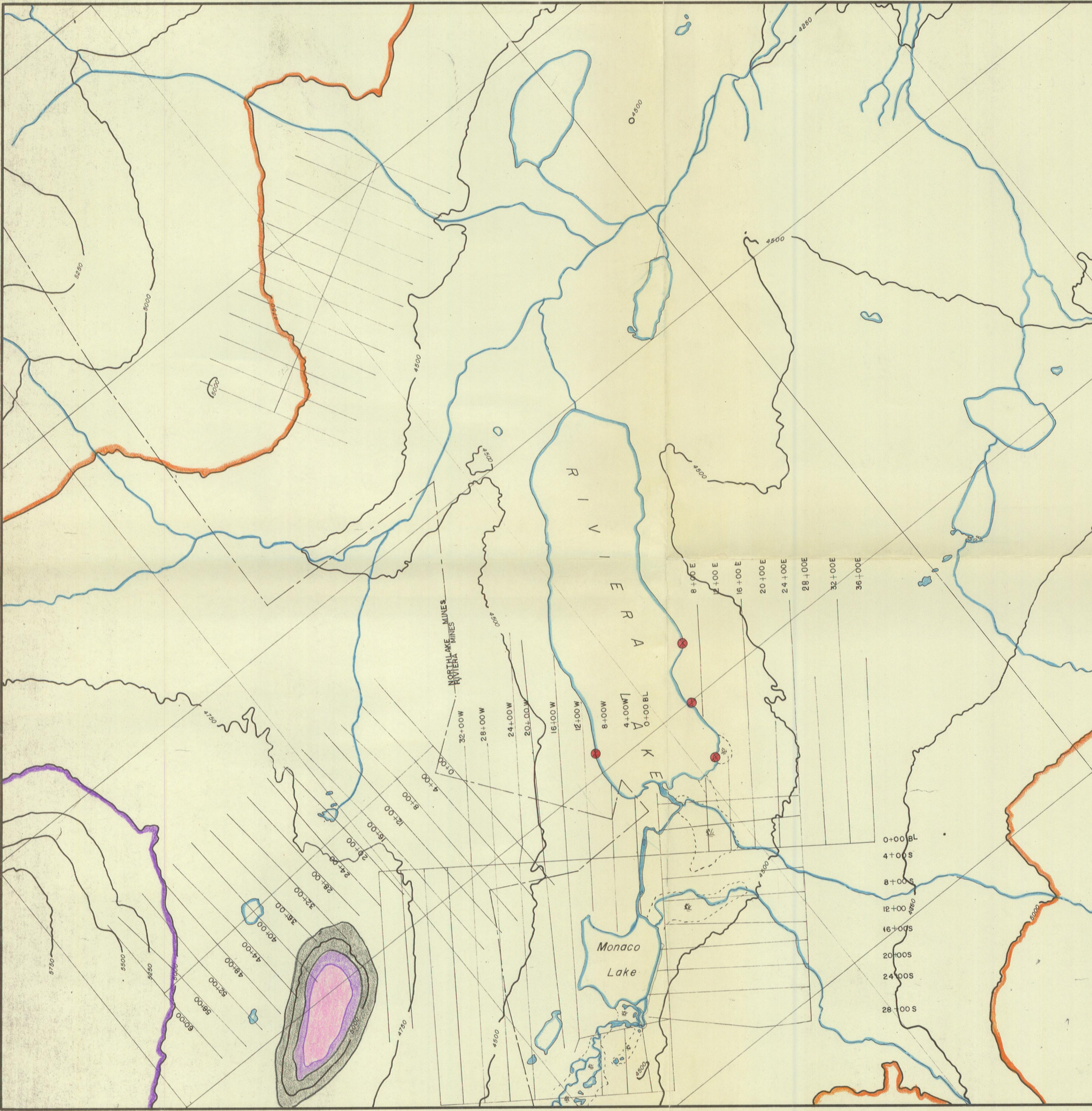
DRAWN CVD



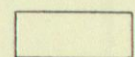
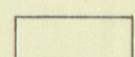
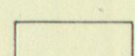
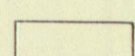
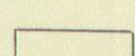
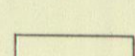
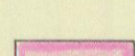

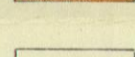
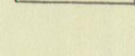
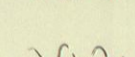
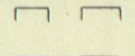


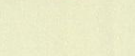
DATE March 67

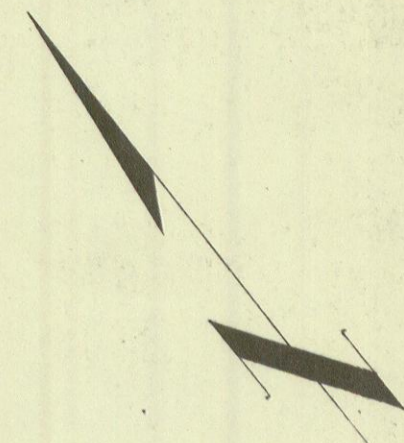
NO.

SECTION

DDH R 1



-  Graphite Schist
-  Chlorite Schist
-  Biotite Schist
-  Dolomitic Schist
-  Micaceous Schist
-  Limonitic Schist
-  Quartzite Schist
-  Dolomite
-  Quartzite
-  Granite Gneiss
-  Ultrabasic
-  Geological Contact (observed)
-  Geological Contact (assumed)
-  Fault (observed)
-  Fault (assumed)
-  Bedding
-  Mineralization (observed)



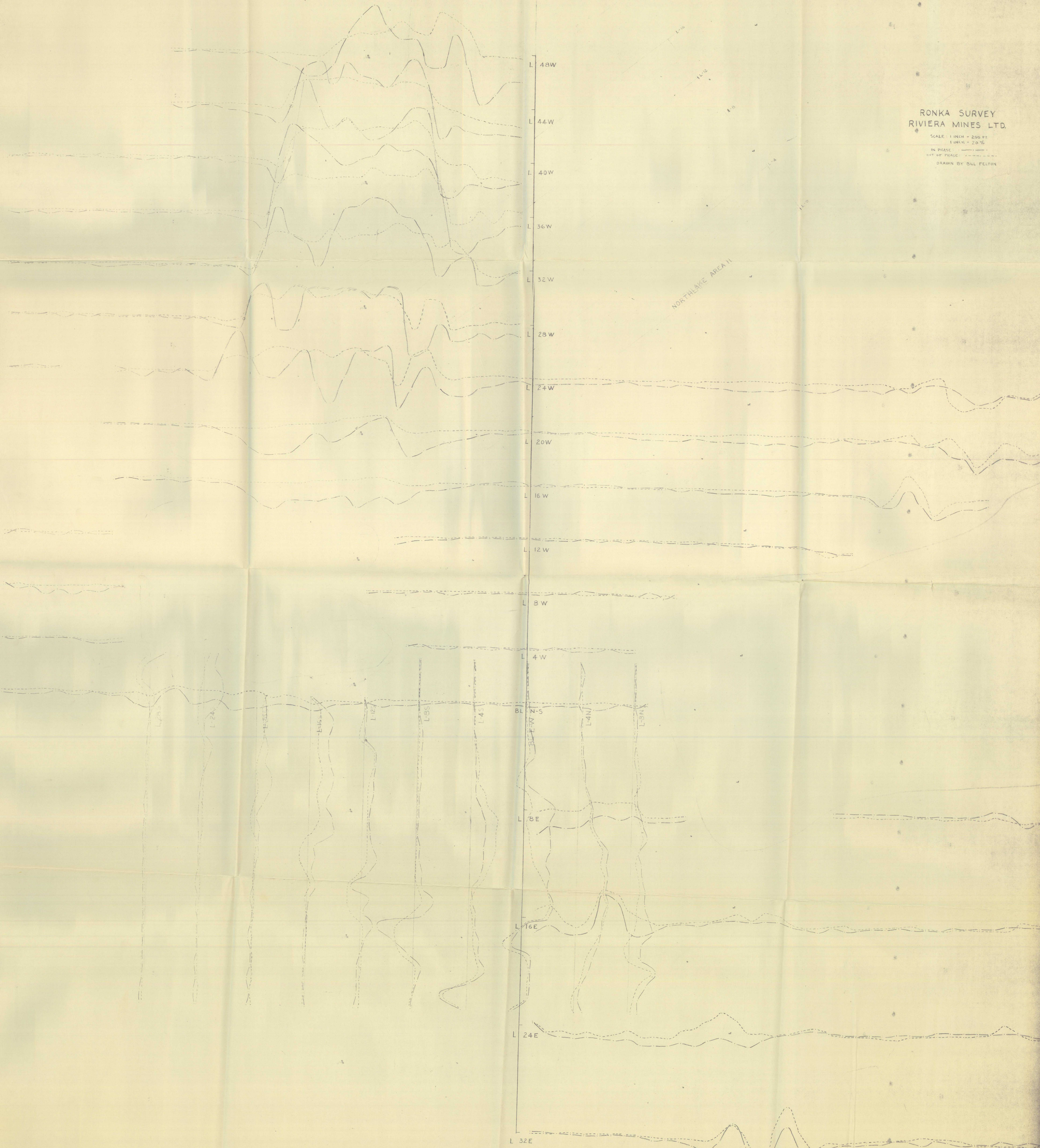
**RIVIERA MINES LTD.**  
 MacDonald Consultants Ltd.  
 11-425 Howe St., Vancouver 1, B.C.

<b>GEOLOGICAL MAP</b>		
Scale -	1" = 1000'	PROJECT NO.  <b>214</b>
Drawn -		
Date -		

RONKA SURVEY  
RIVIERA MINES LTD.

SCALE: 1 INCH = 200 FT  
1 INCH = 20 %  
IN PHASE: ————  
OUT OF PHASE: - - - -  
DRAWN BY BILL FELTON

NORTHLAKE AREA II



RIVIERA  
RONKA

3800N 3600N 3400N 3200N 3000N 2800N 2600N 2400N 2200N 2000N 1800N 1600N 1400N 1200N 1000N 800N 600N 400N 200N BL E-W 200N 400N 600N 800N 1000N 1200N 1400N 1600N 1800N 2000N 2200N 2400N 2600N 2800N 3000N 3200N 3400N 3600N 3800N

