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## REPORT ON GEOPHYSICAL SURVEY

(INDUCED POLARIZATION)

Alma, Sunrise, Homestead OLALLA PROPERTY FOR 82E/5W

FRIDAY MINES LIMITED

BY R. A. BELL, PH.D. AND P. G. HALLOF, PH.D.

### NAME AND LOCATION OF PROPERTY:

OLALLA; 1/2 MILE W. OF OLLALA, 49°, 119° SW

DATE STARTED - OCTOBER 20, 1961 DATE COMPLETED - OCTOBER 31, 1961

## McPHAR GEOPHYSICS LIMITED

#### STATEMENT OF QUALIFICATION

for Robert A. Bell, Ph. D.

I, Robert G. Appleton, Chartered Accountant and Commissioner, and Secretary-Treasurer of McPhar Geophysics Limited hereby certify:

That I have known and worked with Dr. Bell for the past six years.

2. That Dr. Bell is a geologist/geophysicist with a business address at 139 Bond Avenue, Don Mills, Ontario.

3. That Dr. Bell holds a B. A. degree in geophysics from the University of Toronto and a Ph. D. degree in geology from the University of Wisconsin.

4. That Dr. Bell has been actively practising his profession for the past nine years.

McPHAR GEOPHYSICS LIMITED

Robert G. Appleton, C. A.

Dated at Toronto

This 26th day of March, 1962.

## MCPHAR GEOPHYSICS LIMITED

#### STATEMENT OF QUALIFICATION

for James M. Peaver

I, Ashten W, Mullan, P. Eng. and Vice-President of McPhar Geoghysics Limited, hereby certify :

 That I have known and worked with Mr. Peaver for the past eighteen menths.

2. That Mr. Peaver is a goophysical technician with a business address at 137 Bond Avenue, Den Mills, Ontario.

3. That Mr. Peaver is a graduate electronic communications technician from the Radio College of Canada.

4. That Mr. Peaver is classified as an engineering technician by the Professional Engineers of Ontario.

5. That Mr. Peaver has been actively employed as a geophysical technician for eighteen meaths.

MEPHAR GEOPHYSICS LIMITED

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A. W. Mullon, B. Sc. , P. Eng.

**Deted at Terente** 

This 10th day of July, 1961.

### TABLE OF CONTENTS

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Part A: Notes on theory and field procedure	6 pages
Dent D. Dennut	
Part B: Report	10 pages Page
1. Introduction	1
2. Presentation of Results	2
3. Discussion of Results	3
Line 51	4
Line 49	5
Line 31	5
Line 33	7
4. Summary & Recommendations	7
5. Assessment Details	9
6. Summary of Cost	10
Part C: Illustrations	10 pieces
Plan Map (in pockets)	Dwg. Misc. 3340 413-1
I. P. Data Plots	Dwgs. I. P. 2857-1 to -8
Profile Line 31	Figure #1

Department of Alinos and Petroleum Resources ASSESSMENT REPORT HO. 413 MAP

## McPHAR GEOPHYSICS LIMITED

## NOTES ON THE THEORY OF INDUCED POLARIZATION AND THE METHOD OF FIELD OPERATION

Induced Polarization as a geophysical measurement refers to the blocking action or polarization of metallic or electronic conductors in a medium of ionic solution conduction.

This electro-chemical phenomenon occurs wherever electrical current is passed through an area which contains metallic minerals such as base metal sulphides. Normally, when current is passed through the ground, as in resistivity measurements, all of the conduction takes place through ions present in the water content of the rock, or soil, i.e. by ionic conduction. This is because almost all minerals have a much higher specific resistivity than ground water. The group of minerals commonly described as "metallic", however, have specific resistivities much lower than ground waters. The induced polarization effect takes place at those interfaces where the mode of conduction changes from ionic in the solutions filling the interstices of the rock to electronic in the metallic minerals present in the rock.

The blocking action or induced polarization mentioned above, which depends upon the chemical energies necessary to allow the ions to give up or receive electrons from the metallic surface, increases with the time that a d.c. current is allowed to flow through the rock; i. e. as ions pile up against the metallic interface the resistance to current flow increases. Eventually, there is enough polarization in the form of excess ions at the interfaces to effectively stop all current flow through the metallic particle. This polarization takes place at each of the infinite number of solution-metal interfaces in a mineralized rock.

When the d.c. voltage used to create this d.c. current flow is cut off, the Coulomb forces between the charged ions forming the polarization cause them to return to their normal position. This movement of charge creates a small current flow which can be measured on the surface of the ground as a decaying potential difference.

From an alternate viewpoint it can be seen that if the direction of the current through the system is reversed repeatedly before the polarization occurs, the effective resistivity of the system as a whole will change as the frequency of the switching is changed. This is a consequence of the fact that the amount of current flowing through each metallic interface depends upon the length of time that current has been passing through it in one direction.

The values of the "metal factor" or "M.F." are a measure of the amount of polarization present in the rock mass being surveyed. This parameter has been found to be very successful in mapping areas of sulphide mineralization, even those in which all other geophysical methods have been unsuccessful. The induced polarization measurement is more sensitive to sulphide content than other electrical measurements

- 2 -

because it is much more dependent upon the sulphide content. As the sulphide content of a rock is increased, the "metal factor" of the rock increases much more rapidly than the resistivity decreases.

Because of this increased sensitivity, it is possible to locate and outline zones of less than 10% sulphides that can't be located by E. M. Methods. The method has been successful in locating the disseminated "porphyry copper" type mineralization in the Southwestern United States.

Measurements and experiments also indicate that it should be possible to locate most massive sulphide bodies at a greater depth with induced polarization than with E.M.

Since there is no I. P. effect from any conductor unless it is metallic, the method is useful in checking E. M. anomalies that are suspected of being due to water filled shear zones or other ionic conductors. There is also no effect from conductive overburden, which frequently confuses E. M. results. It would appear from scale model experiments and calculations that the apparent metal factors measured over a mineralized zone are larger if the material overlying the zone is of low resistivity.

Apropos of this, it should be stated that the induced polarization measurements indicate the total amount of metallic constituents in the rock. Thus all of the metallic minerals in the rock, such as pyrite, as well as the ore minerals chalcopyrite, chalcocite, galena, etc. are responsible for the induced polarization effect. Some

- 3 -

oxides such as magnetite, pyrolusite, chromite, and some forms of hematite also conduct by electrons and are metallic. All of the metallic minerals in the rock will contribute to the induced polarization effect measured on the surface.

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the ground to be separated from the effects of vertical changes in the properties. Current is applied to the ground at two points a distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current electrodes. The distance between the nearest current and potential electrodes is an integer number (N) times the basic distance (X).

The measurements are made along a surveyed line, with a constant distance (NX) between the nearest current and potential electrodes. In most surveys, several traverses are made with various values of (N); i. e. (N) = 1, 2, 3, 4, etc. The kind of survey required (detailed or reconnaissance) decides the number of values of (N) used.

In plotting the results, the values of the apparent resistivity and the apparent metal factor measured for each set of electrode positions are plotted at the intersection of grid lines, one from the center point of the current electrodes and the other from the center point of the potential electrodes. The resistivity values are plotted above the line and the metal factor values below. The lateral displacement of a given value is determined by the location along the survey

4 -

line of the center point between the current and potential electrodes. The distance of the value from the line is determined by the distance (NX) between the current and potential electrodes when the measurement was made.

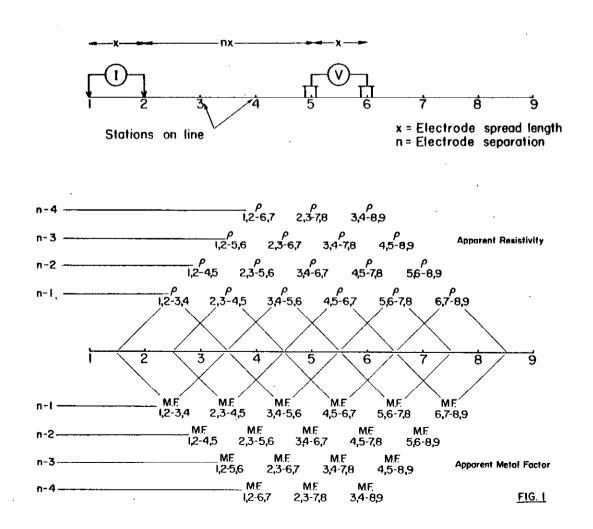
The separation between sender and receiver electrodes is only one factor which determines the depth to which the ground is being sampled in any particular measurement. These plots then, when contoured, are not section maps of the electrical properties of the ground under the survey line. The interpretation of the results from any given survey must be carried out using the combined experience gained from field, model and theoretical investigations. The position of the electrodes when anomalous values are measured must be used in the interpretation,

In the field procedure, the interval over which the potential differences are measured is the same as the interval over which the electrodes are moved after a series of potential readings has been made. One of the advantages of the induced polarization method is that the same equipment can be used for both detailed and reconnaissance surveys merely by changing the distance (X) over which the electrodes are moved each time. In the past, intervals have been used ranging from 100 feet to 1000 feet for (X). In each case, the decision as to the distance (X) and the values of (N) is largely determined by the expected size of the mineral deposit being sought, the size of the expected anomaly and the speed with which it is desired to progress.

- 5 -

The diagram in Figure 1 below demonstrates the method used in plotting the results. Each value of the apparent resistivity and the apparent "Metal factor" is plotted and identified by the position of the four electrodes when the measurement was made. It can be seen that the values measured for the larger values of (n) are plotted farther from the line indicating that the thickness of the layer of the earth that is being tested is greater than for the smaller values of (n); i. e. the depth of the measurement is increased.

> METHOD USED IN PLOTTING DIPOLE-DIPOLE INDUCED POLARIZATION AND RESISTIVITY RESULTS



- 6 -

## McPHAR GEOPHYSICS LIMITED REPORT ON GEOPHYSICAL SURVEY (INDUCED POLARIZATION) ON THE OLALLA PROPERTY FOR FRIDAY MINES LIMITED

#### 1. INTRODUCTION

At the request of Mr. E. P. Chapman, Jr. of Chapman, Wood and Griswold Limited, geological consultants for Friday Mines Limited, we have carried out a test L.P. survey of a portion of the company's Olalla Property. The claim group is located near the village of Olalla, about three miles north of Keremeos in southern British Columbia.

Several narrow gold-quartz veins occur on the property and recent drilling has disclosed a wide gold-sulphide breccia zone. The purpose of this investigation was to ascertain if the induced polarization method could be used to locate and delimit the two types of mineral deposits. Field work was performed during the latter part of October of this year using the standard McPhar multiple frequency Induced Polarization system.

We wish to acknowledge the co-operation and assistance provided by Mr. Neil McDiarmid, president of Friday Mines Limited, and Messrs. E. P. Chapman and John Wood, geological consultants for the company.

#### 2. PRESENTATION OF RESULTS

The induced polarization and resistivity results are shown on the following data plots in the manner described in the notes preceding this report.

Line 51	50 foot spreads	Dwg. I. P. 2857-1
Line 51	100 foot spreads	Dwg. I. P. 2857-2
Line 51	200 foot spreads	Dwg. I. P. 2857-3
Line 49	200 foot spreads	Dwg. I. P. 2857-4
Line 31	50 foot spreads	Dwg. I. P. 2857-5
Line 31	200 foot spreads	Dwg. I. P. 2857-6
Line 33	50 foot spreads	Dwg. I. P. 2857-7
Line 33	200 foot spreads	Dwg. I. P. 2857-8

Enclosed with this report is Dwg. Misc. 3340, a plan map showing the location of the IP lines with respect to the survey grid. The definite and possible induced polarization anomalies are indicated by solid and broken bars respectively on this plan map as well as the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the induced polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no

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anomaly can be located with more accuracy than the spread length; i. e. when using 200' spreads the position of a narrow sulphide body can only be determined to lie between two stations 200' apart. In order to locate sources at some depth, larger spreads must be used, with a corresponding increase in the uncertainties of location. Therefore, while the center of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

#### 3. DISCUSSION OF RESULTS

The Olalla area is underlain by a thick sequence of Mesozoic clastic sediments intruded by an irregularly shaped pyroxenite plug, in turn intruded by syenite, according to G.S.C. maps #341A, Keremeos Sheet, and #628A, Olalla Sheet. Pyroxenite and syenite are the dominant rock types in the area of immediate interest.

Several narrow but highly persistent quartz veins are known to occur on the property, some of them carrying economically important quantities of gold. These veins tend to be better developed and more highly mineralized in the syenite than in the pyroxenite, probably due to the greater competency of the syenite. Both the veins and adjacent wall rocks contain only minor amounts of sulphides across widths of a few feet so that at best only very weak IP effects were anticipated.

Drilling in the eastern part of the property (near 15,000 E; 10.300N) recently disclosed the presence of a breccia zone about 30 feet

- 3 -

wide containing 20-30% pyrite and significant gold values at a depth of a few hundred feet. Lines 51 and 49 were surveyed with 200-foot spreads in an attempt to trace this occurrence.

In addition to the gold deposits there are small but interesting copper showings in the pyroxenite between stations 7N and 10N on Line 31. Test lines were also run in this vicinity with interesting results. Since there is approximately 15% magnetite throughout the pyroxenite, the lines were extended to the north in order to assess its effect.

#### Line 51

This line was surveyed using three different spreads in order to separate the effects of the shallow, narrow veins from the deeper, wider breccia zone.

Results using 50-foot spreads (Dwg. #I. P. 2857-1) show several anomalies. There is a shallow weak anomaly at 6 - 6+50N indicating a narrow source dipping to the south. This correlates with the syenite-pyroxenite contact and may be worth testing by means of a short drill hole. A second and somewhat stronger anomaly occurs at 9N or between stations 9N and 9+50N; this probably represents the Sweetner Vein. A weak questionable anomaly occurs at 13 - 13+50N but does not correlate with any known veins. In addition there are some weakly anomalous values between 7N and 8N on the wide separations which may reflect the breccia zone.

The 100-foot data show a weak, shallow anomaly near station

- 4

9N which is probably caused by the Sweetner Vein. No effects were noted from the other narrow features located using 50-foot spreads, but there is a slight increase in the IP effect for the wide separations over the breccia zone. At the north end of the line there is an increase in the observed Metal Factor possibly due to the magnetic pyroxenite.

Using 200-foot spreads, there is a weak but well-defined anomaly at depth near station 8N, correlating reasonably well with the position of the breccia zone. A second deep source occurs near 16N but it is not clear whether this represents a higher than average magnetite content in the pyroxenite or a smaller, more concentrated, sulphide zone. This anomaly should be re-evaluated on completion of the current drilling program with a view to making more specific recommendations.

#### Line 49

Line 49 was surveyed with 200-foot spreads only in an attempt to trace the breccia zone to the west. The results show a weak deep anomaly near station 9N which may represent the breccia zone. The results are not as conclusive as on Line 51 owing to a somewhat higher background effect. However, since the elevation is nearly 100 feet greater on Line 49, the breccia zone may be deeper and hence give a smaller effect.

#### Line 31

Lines 31 and 33 were surveyed with 50-foot and 200-foot spreads to test the interesting copper showings between stations 7N and

- 5 -

10N and to check the possibility of larger concentrations occurring at depth.

The 50-foot data on Line 31 show a weak, deep anomaly at 4N that is not related to any known veins. A second anomaly at intermediate depth is centered near 6+50N; this is the strongest anomaly found during the test survey. It is located on strike to the west of a narrow vein at 6N, Line 33. The feature warrants a drill test and a hole is presently being drilled from 7+50N, Line 31 at -55° to the south in an attempt to determine the cause.

In addition to these two features there is a slight increase in the apparent Metal Factor at about 7+50N, corresponding with a known vein, and anomalous effects were noted on the wide separations at 8N to 9N. Neither of these features is definite enough to warrant a drill test.

The 200-foot data show a complex anomaly at intermediate depth between 6N and 10N probably representing two sources, one between 6N and 8N and a deeper feature at 8 - 10N. The southern zone corresponds with the strong anomaly on the 50 foot spreads while the northern one correlates with the known copper occurrences.

On the north part of this line there is a generally higher background effect which undoubtedly reflects the magnetite. Superimposed on this is a deep anomaly at 14N - 16N, which may represent either a higher magnetite content or a more concentrated sulphide zone. Additional surveying might resolve this problem.

6

Line 33

The 50-foot spreads show weak definite anomalies at 7+50Nand 9 - 9+50N, correlating with the known veins, and possibly a third source near 11N; the line would have to be extended to check this latter possibility. The line did not go far enough south to check fully the zone at 6+50N, Line 31, but the last data taken show a small increase in the IP effect.

The 200-foot data show a weak anomaly near 6N which probably correlates with the one on Line 31. Higher background effects were also noted on the north part of the line with a possible anomaly at 16 - 18N.

### 4. SUMMARY AND RECOMMENDATIONS

Weak anomalies were obtained over most of the known veins using 50-foot spreads and are probably caused by small amounts of sulphides both in the veins and wallrocks. Therefore, it would be possible to trace known veins through areas of light overburden to guide drilling or to prospect for other veins of this type. A few similar anomalies were located in areas where there are no known veins, as at 4N, Line 31 and 6 - 6+50N, Line 51. Consideration should be given to extending the IP survey to trace these zones in order to locate sites for a drill test.

On Line 51, and to a lesser extent on Line 49, there is a weak but definite anomaly over the breccia zone using 200-foot spreads. Additional IP work is warranted to trace out this zone, but might be more definitive using 300-foot spreads because of the depth.

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The strongest anomaly from the test survey occurs at 6+50N, Line 31. While this could simply represent a greater concentration of pyrite than occurs in the known veins, its proximity to known copper and gold occurrences dictates a drill test. Currently a hole is being drilled south at -55° from 7+50N, Line 31 in order to determine the source of this feature.

Several other anomalies were found on the north sections of the lines in areas underlain by pyroxenite. Since this rock generally contains 15% magnetite these effects may simply be due to wide zones of greater-than-average concentration rather than small concentrated sulphide deposits. If sufficient encouragement is obtained from the current drill test, consideration should be given to testing one or more of these anomalies, although it would be preferable to obtain more IP data before attempting to select drilling locations.

#### McPHAR GEOPHYSICS LIMITED

7

Rahur R. Bell

Robert A. Bell, Geologist/Geophysicist.

Philip G. Hallof, Geophysicist.

Dated : November 15, 1961.

- 8 -

#### ASSESSMENT DETAILS

PROPERTY: Olalla Properties	MINING DIVISION: Osoyoos			
SPONSOR: Friday Mines Limited		PROVINCE: British Columbia		
TYPE OF SURVEY: Induced Polarization				
OPERATING MAN DAYS:	32	DATE STARTED: October 20/61		
EQUIVALENT 8 HR. MAN DAYS:	48	DATE FINISHED: October 31/61		
CONSULTING MAN DAYS:	5,5	NUMBER OF STATIONS OCCUPIED: 103		
DRAUGHTING MAN DAYS:	4	NUMBER OF READINGS TAKEN: 778		
TOTAL MAN DAYS:	57.5	MILES OF LINE SURVEYED: 2.4		
CONSULTANTS:		. (		

R. A. Bell, 12 Cottonwood Drive, Don Mills, Ontario P. G. Hallof, 5 Minorca Place, Don Mills, Ontario

FIELD TECHNICIANS:

J. Peaver, Bancroft, Ontario R. Fernholme, 467 Vaughan Road, Toronto, Ontario Helper Helper

#### DRAUGHTSMEN:

F. R. Peer, 38 Torrens Avenue, Toronto 6, Ontario R. MacKenzie, 55 Shannon Drive, Scarborough, Ontario.

McPHAR GEOPHYSICS LIMITED

Robert & Bell.

Robert A. Bell, Geologist/Geophysicist.

Dated : November 15, 1961.

- 9 -

#### SUMMARY OF COSTS

## Consulting Geologist/Geophysicist R. A. Bell

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3-1/2 days Consulting l day Travel	@ \$90.00/day @ \$60.00/day	\$315.00 <u>60.00</u>	\$ 375.00
Expenses			
Airfare - Toronto-Vanco	uver-Toronto	\$296.00	
Taxis		13.25	
Meals and Accommodatio	n	109.50	
Telephone and Telegraph		1.40	
Miscellaneous		2,00	422.15
Field Crew - 2 men			
Time			
8 days Operating	@ \$170.00/day	\$1,360.00	
1-1/2 days Bad Weather) 1 day Travel )	@ \$ 60.00/day	90.00	1,450.00
Expenses			
Car Rental Prorated		\$134.42	
Meals and Accommodatio	n	143.45	
Freight Charges - Prora	ted	·· 43.00	
Telephone and Telegraph		23, 50	
Supplies		32,69	377.06
			\$2,624.21

### MCPHAR GEOPHYSICS LIMITED

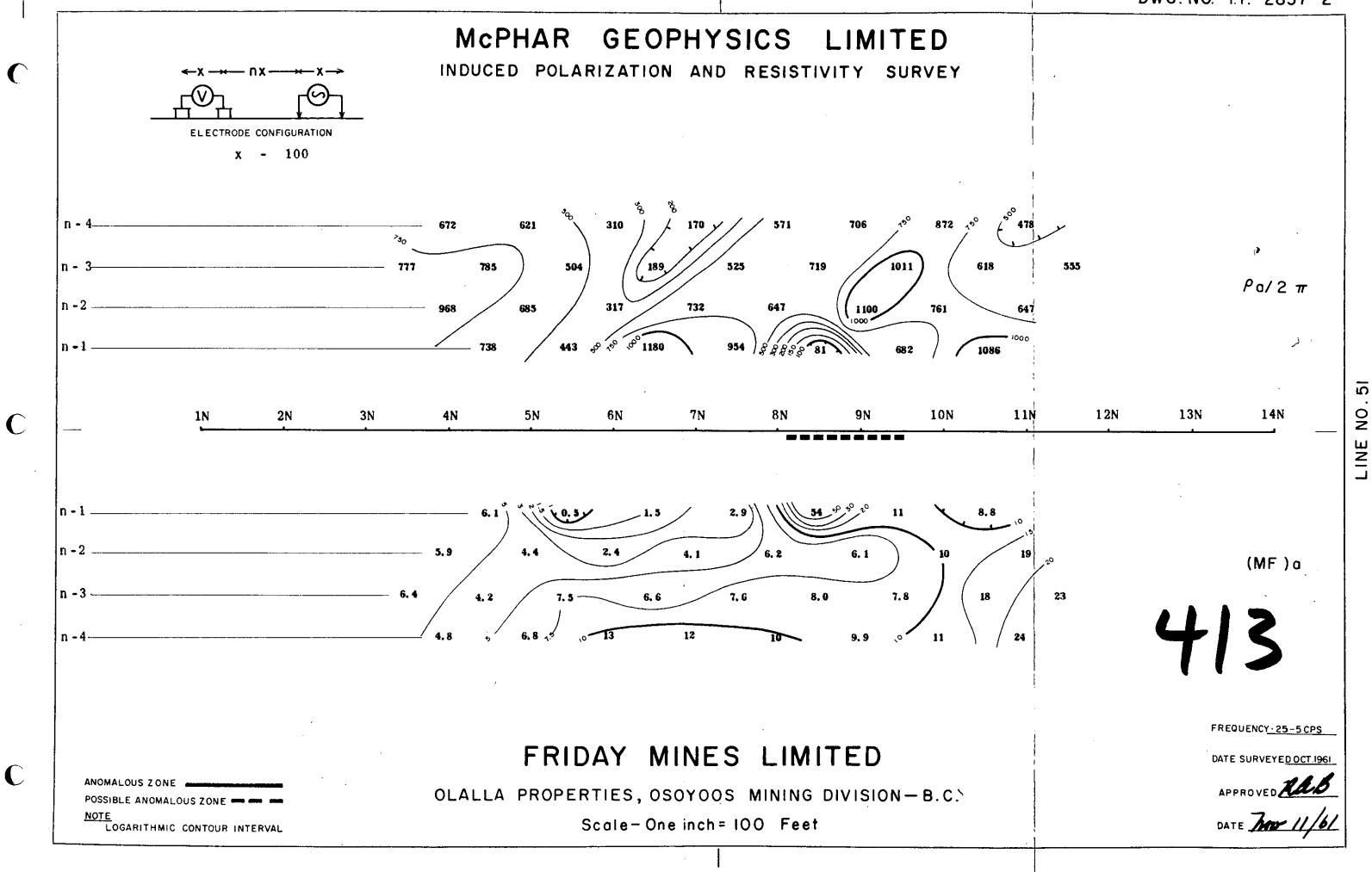
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Robert A. Bell, Geologist/Geophysicist.

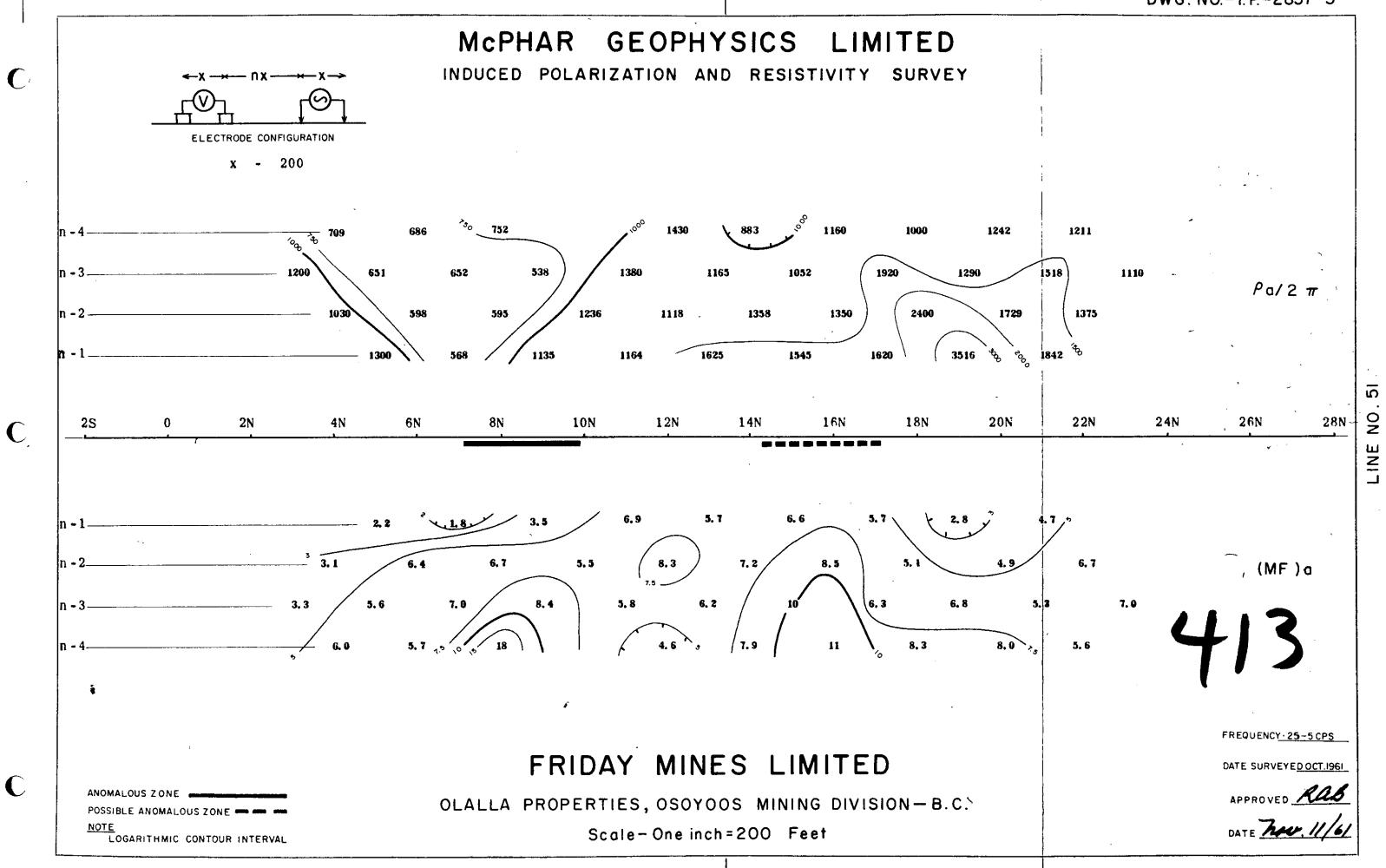
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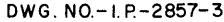
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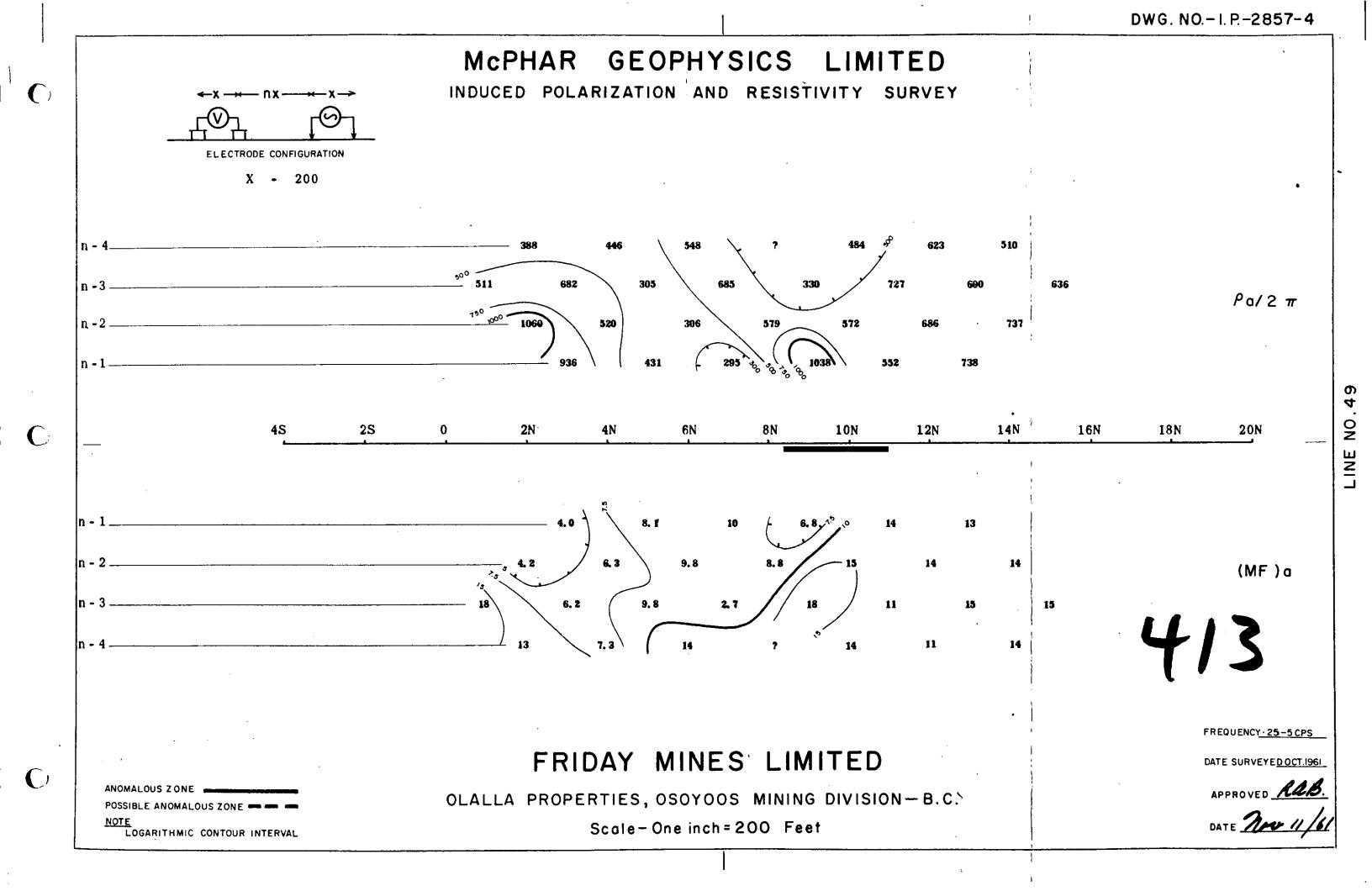
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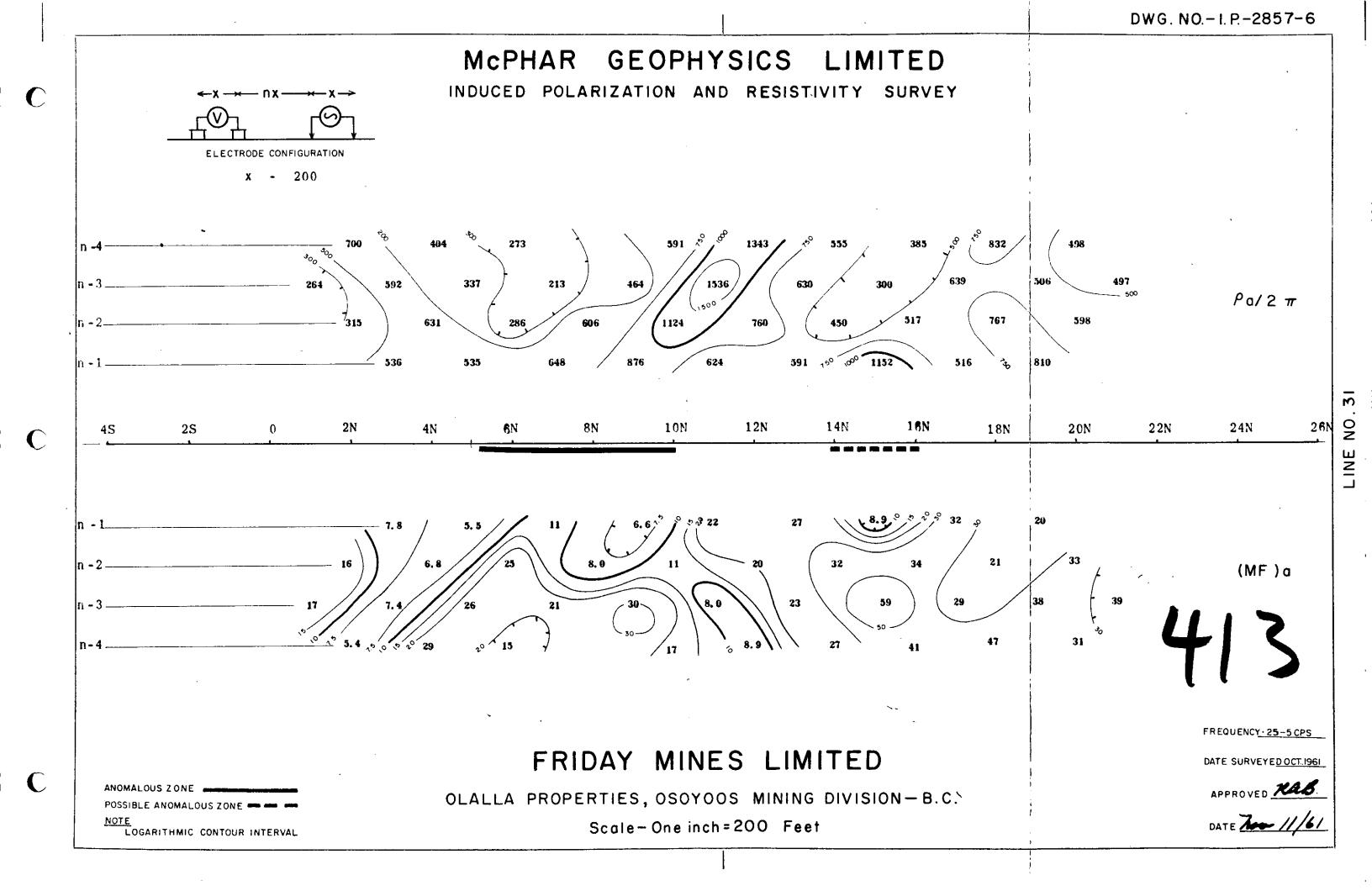


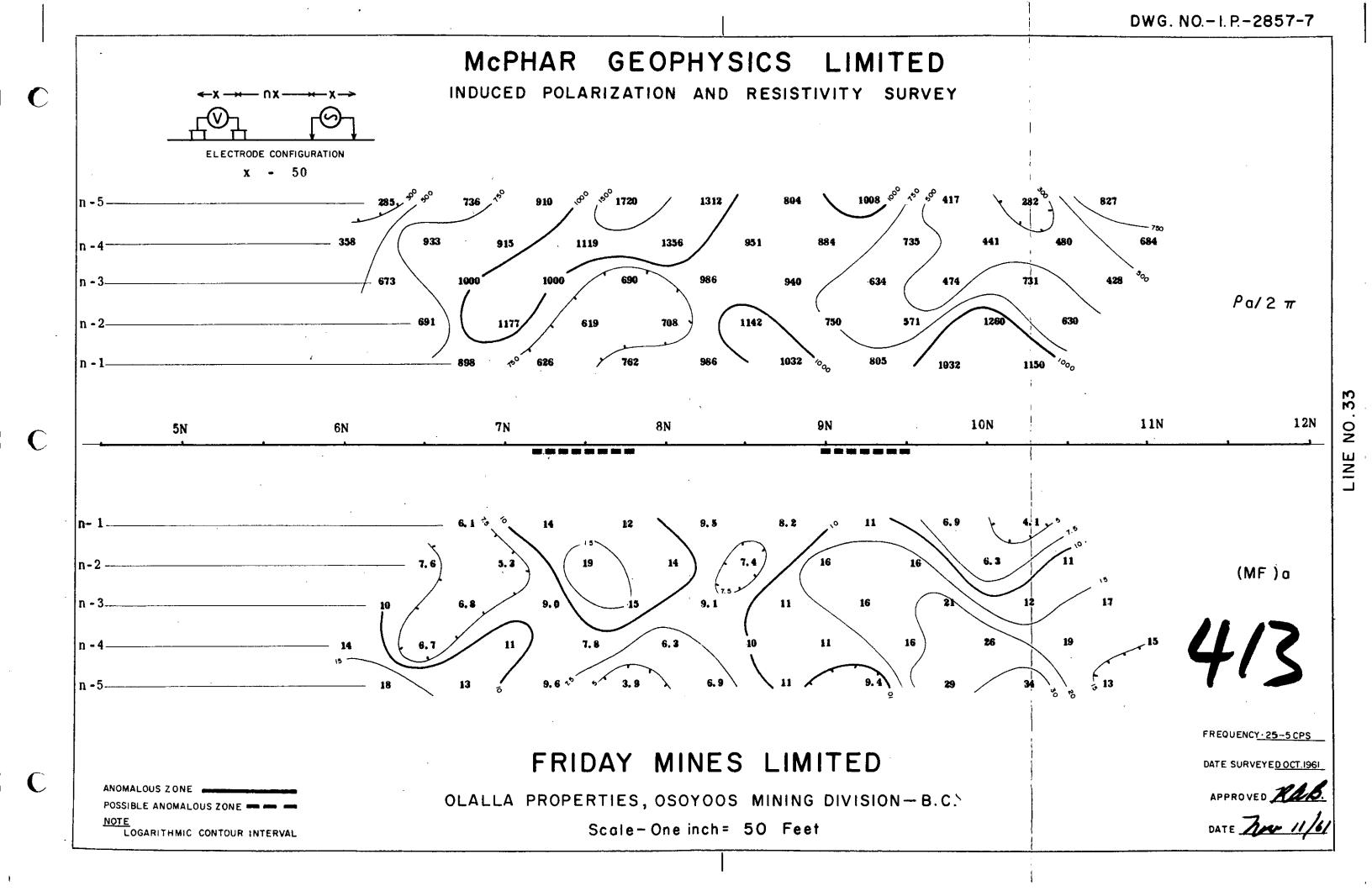


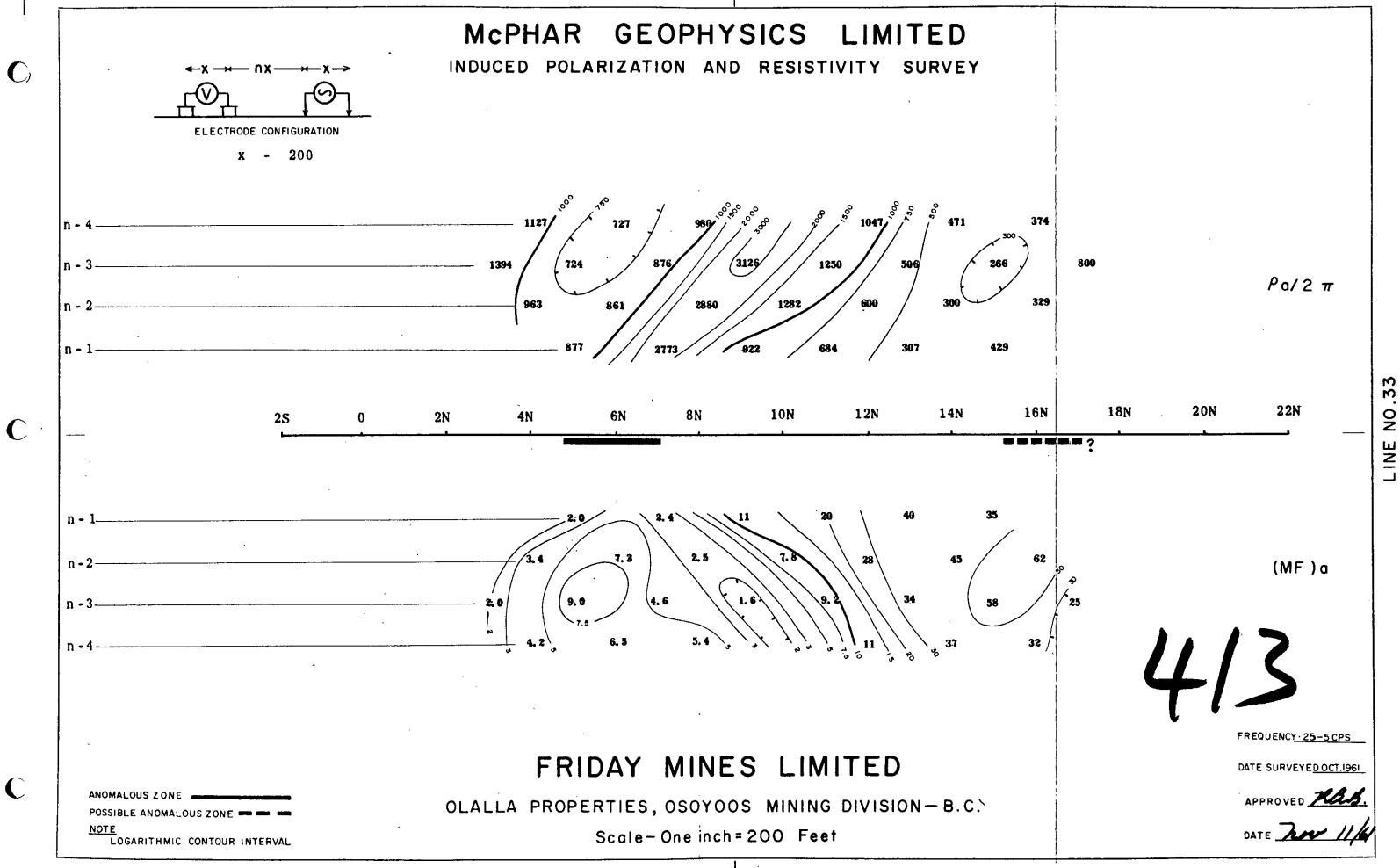




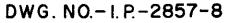


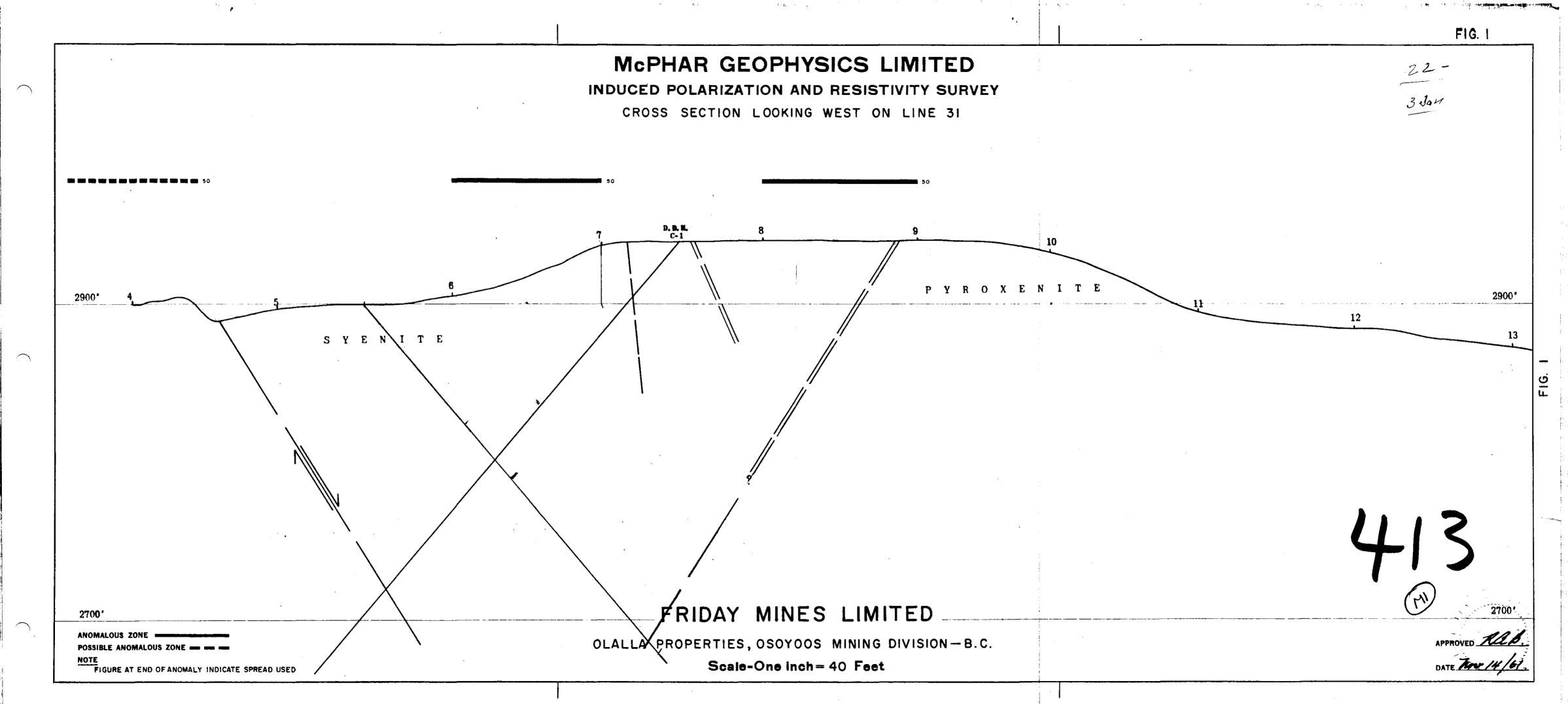


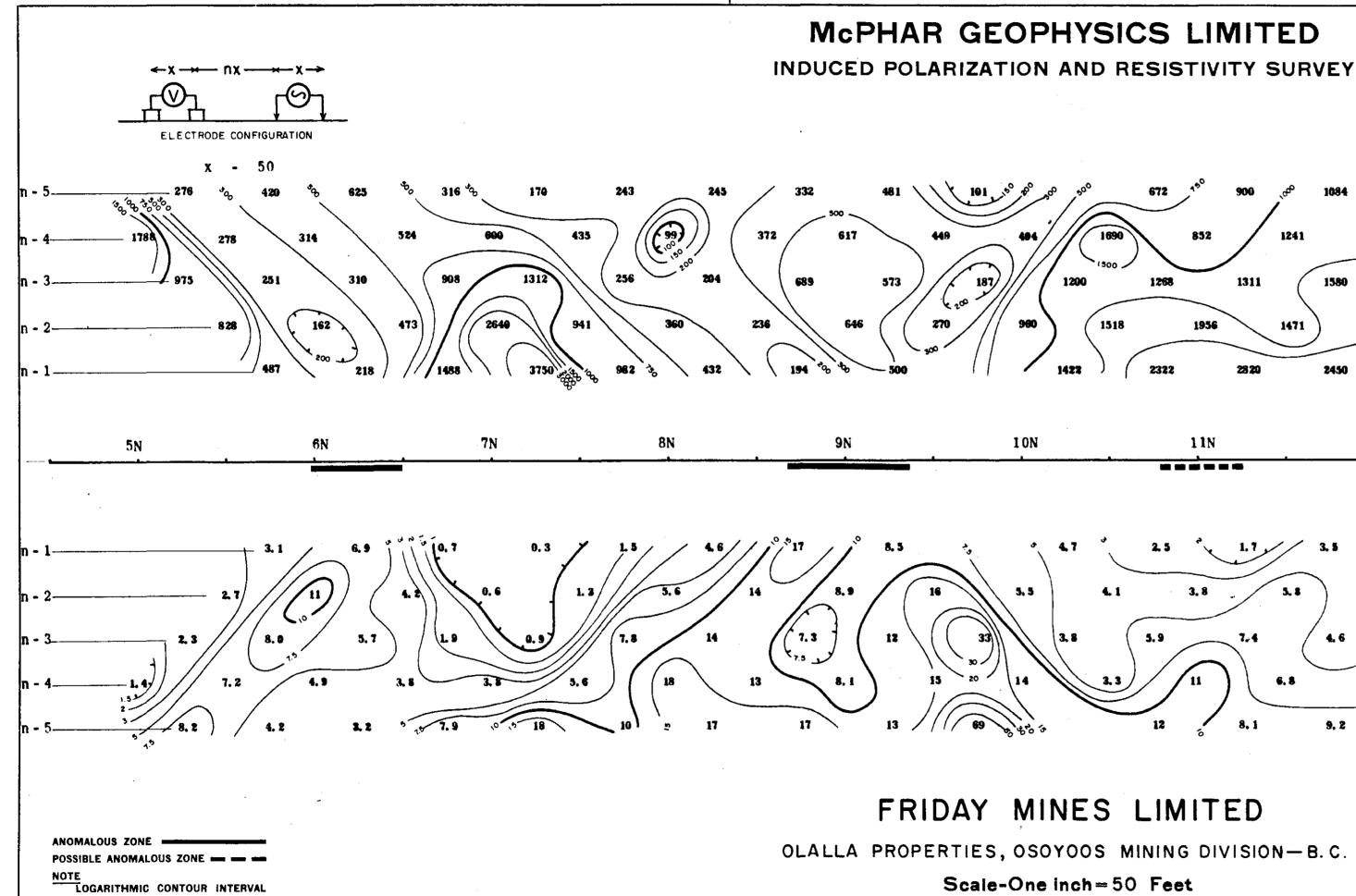




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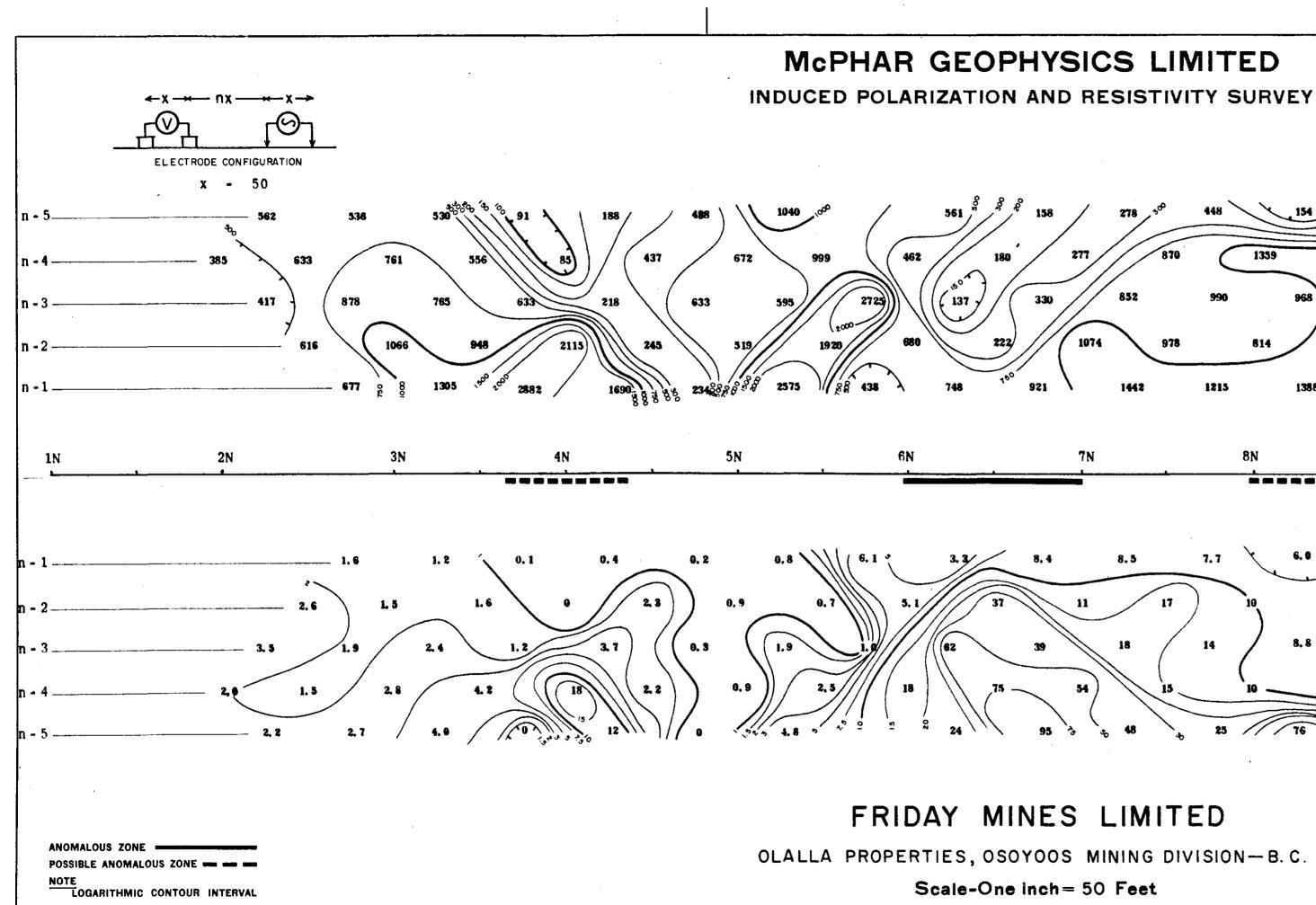


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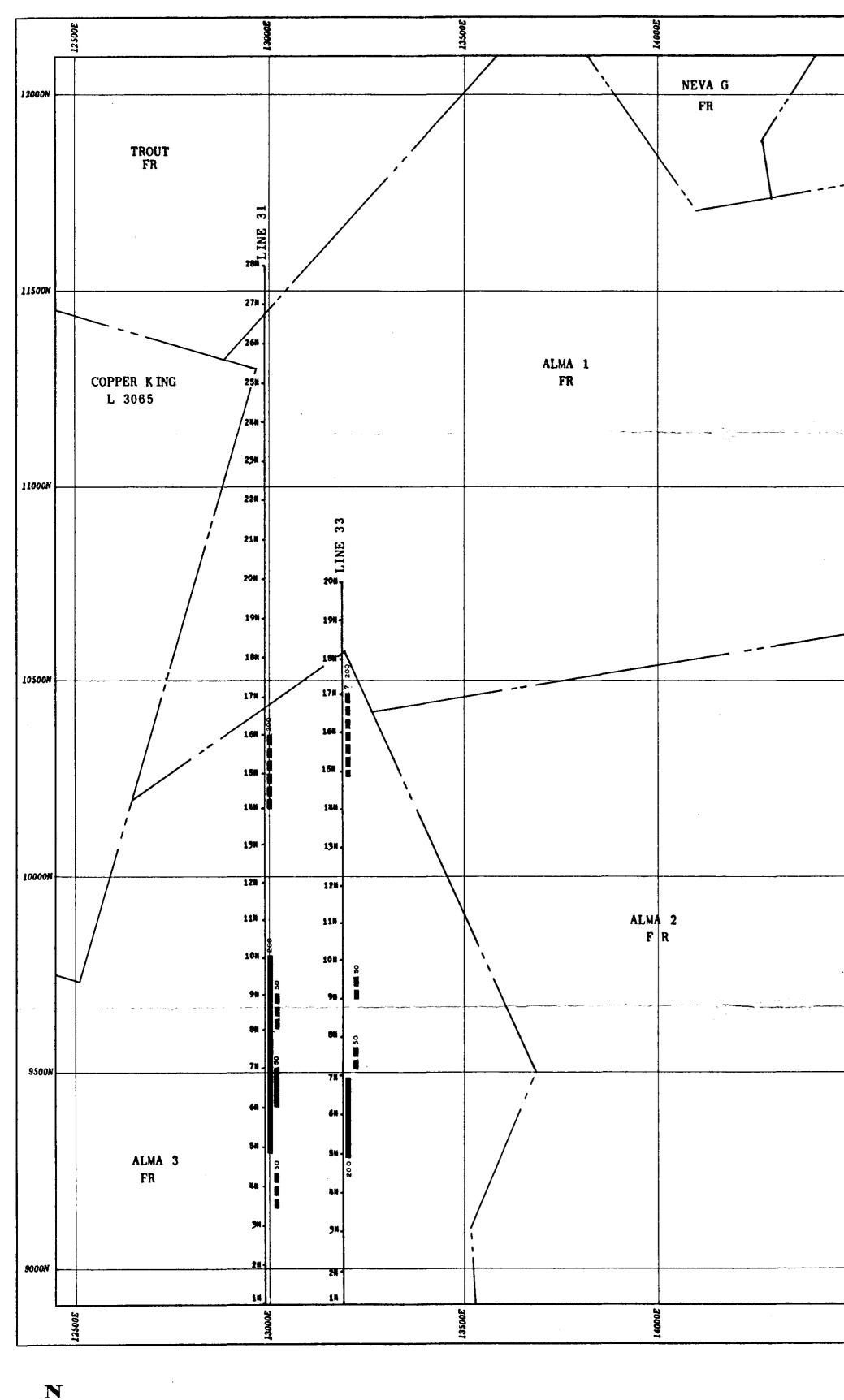
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# FRIDAY MINES LIMITED

OLALLA PROPERTIES, OSOYOOS MINING DIVISION-B.C.

SCALE 200 400 600

One Inch = Two Hundred Feet

200 150 100 50 0

