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REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE COPPER KING PROPERTY CHERRY CREEK AREA, KAMLOOPS MINING DIVISION, B.C. FOR TORWEST RESOURCES (1962) LTD. N.P.L.

BY

PHILIP G. HALLOF, Ph.D.

AND

MARION A. GOUDIE, B.Sc.

NAME AND LOCATION OF PROPERTY

COPPER KING PROPERTY, CHERRY CREEK AREA

KAMLOOPS MINING DIVISION, B.C. 50°43'N, 120°37'W

DATE STARTED: MAY 6, 1972

DATE FINISHED: JULY 25, 1972

McPHAR GEOPHYSICS

NOTES ON THE THEORY, METHOD OF FIELD OPERATION AND PRESENTATION OF DATA FOR THE INDUCED POLARIZATION METHOD

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 appreciably reduce the amount of 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 per cent frequency effect or F. E. are a measurement of the polarization in the rock mass. However, since the measurement of the degree of polarization is related to the apparent resistivity of the rock mass it is found that the metal factor values or M. F. are the most useful values in determining the amount of polarization present in the rock mass. The MF values are obtained by normalizing the F. E. values for varying resistivities.

The induced polarization measurement is perhaps the most powerful geophysical method for the direct detection of metallic sulphide mineralization, even when this mineralization is of very low concentration. The lower limit of volume per cent sulphide necessary to produce a recognizable IP anomaly will vary with the geometry and geologic environment of the source, and the method of executing the survey. However, sulphide mineralization of less than one per cent by volume has been detected by the IP method under proper geological conditions.

The greatest application of the IP method has been in the search for disseminated metallic sulphides of less than 20% by volume. However, it has also been used successfully in the search for massive sulphides in situations where, due to source geometry, depth of source, or low resistivity of surface layer, the EM method can not be successfully applied. The ability to differentiate ionic conductors, such as water filled shear zones, makes the IP method a useful tool in checking EM anomalies which are suspected of being due to these causes.

In normal field applications the IP method does not differentiate between the economically important metallic minerals such as chalcopyrite, chalcocite, molybdenite, galena, etc., and the other metallic minerals such as pyrite. The induced polarization effect is due to the total of all electronic conducting minerals in the rock mass. Other electronic conducting materials which can produce an IP response are magnetite, pyrolusite, graphite, and some forms of hematite.

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 in distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current 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, apparent per cent frequency effect, 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. (See Figure A.) The resistivity values are plotted above the line as a mirror image of the metal factor values below. On a second line, below the metal factor values, are plotted the values of the per cent frequency effect. In some cases the values of per cent frequency effect are plotted as superscripts of the metal factor value. In this second case the frequency effect values are not contoured. The lateral displacement of a given value is determined by the location along the survey 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. The 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 results, model study results and theoretical investigations. The position of the electrodes when anomalous values are measured is important 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 25 feet to 2000 feet for (X). In each case, the decision as to the distance (X) and the values of (n) to be used 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.

The diagram in Figure A demonstrates the method used in plotting the results. Each value of the apparent resistivity, apparent metal factor, and apparent per cent frequency effect 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. When the F.E. values are plotted as superscripts to the MF values the third section of data values is not presented and the F.E. values are not contoured.

The actual data plots included with the report are prepared utilizing an IBM 360/75 Computer and a Calcomp 770/763 Incremental Plotting System. The data values are calculated, plotted, and contoured according to a programme developed by McPhar Geophysics. Certain symbols have been incorporated into the programme to explain various situations in recording the data in the field.

The IP measurement is basically obtained by measuring the difference in potential or voltage (ΔV) obtained at two operating frequencies. The voltage is the product of the current through the ground and the apparent resistivity of the ground. Therefore in field situations where the current is very low due to poor electrode contact, or the apparent resistivity is very low, or a combination of the two effects; the value of (ΔV) the change in potential will be too small to be measurable. The symbol "TL" on the data plots indicates this situation.

In some situations spurious noise, either man made or natural, will render it impossible to obtain a reading. The symbol "N" on the data plots indicates a station at which it is too noisey to record a reading. If a reading can be obtained, but for reasons of noise there is some doubt as to its accuracy, the reading is bracketed in the data plot ( ).

In certain situations negative values of Apparent Frequency Effect are recorded. This may be due to the geologic environment or spurious electrical effects. The actual negative frequency effect value recorded is indicated on the data plot, however the symbol "NEG" is indicated for the corresponding value of Apparent Metal Factor. In contouring negative values the contour lines are indicated to the nearest positive value in the immediate vicinity of the negative value.

The symbol "NR" indicates that for some reason the operator did not attempt to record a reading although normal survey procedures would suggest that one was required. This may be due to inaccessible topography or other similar reasons. Any symbol other than those discussed above is unique to a particular situation and is described within the body of the report.

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

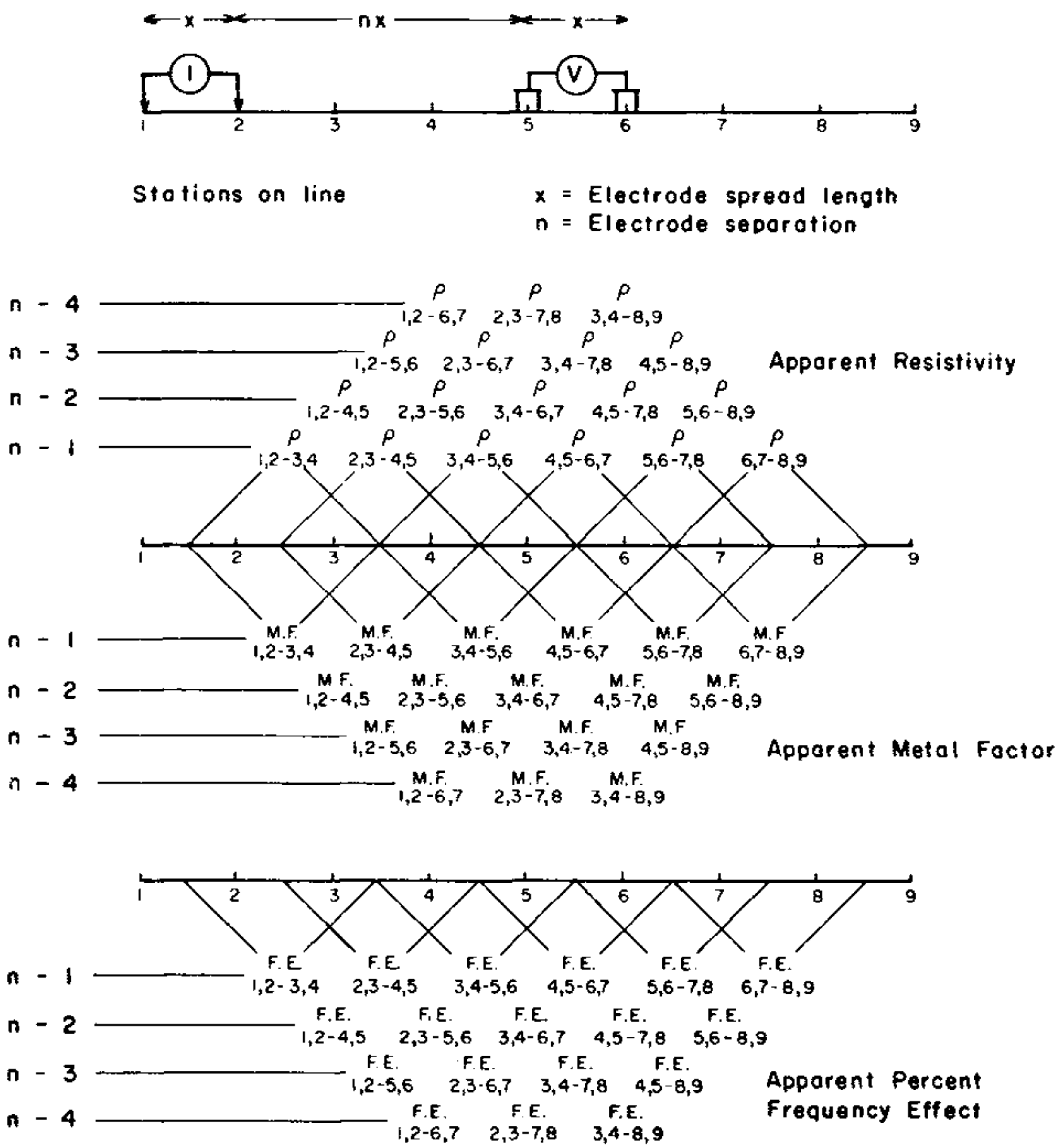

Fig. A

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McPHAR GEOPHYSICS LIMITED

REPORT ON THE
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
ON THE
COPPER KING PROPERTY
CHERRY CREEK AREA,
KAMLOOPS MINING DIVISION, B.C.
FOR
TORWEST RESOURCES (1962) LTD. N.P.L.

1. INTRODUCTION

At the request of the client, we have completed an Induced Polarization and Resistivity survey on the Copper King property in the Cherry Creek area, Kamloops Mining Division, British Columbia for Torwest Resources (1962) Ltd. The intersection point of 50°43' north latitude and 120°37' west longitude occurs in claim Cad 3 in the northwest portion of the claim group.

The survey grid is underlain by rocks of the Iron Mask batholith, an intrusive of Jurassic or later age. Copper deposits are associated with the batholith contact with the country rocks, and some deposits are within the batholith as well as in intruded border rocks. Hydrothermal alteration is found both near ore bodies and at some distance from mineralized zones.

The principal copper minerals in the area are chalcopyrite and bornite with lesser amounts of chalcocite, cuprite, azurite and malachite. Associated minerals are magnetite and pyrite; gold and silver values are also reported. Some native copper has been found.

Copper has been mined in the past from the Copper King property and the ore also yielded gold and silver.

The ore, which consisted of chalcopyrite, pyrrhotite and bornite, with some magnetite, occurred in a fractured zone in diorite. Veins of magnetite were associated with the ore. Previous work includes a magnetometer survey.

The IP survey was carried out to locate any economic deposits of metallic mineralization which might be present. The work was completed in May, June and July, 1972, using a McPhar P660 high power variable frequency IP unit operating at 0.3 and 5.0 cps over the following claims:

MAC Claim Group

Bill	-	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24
Cad	-	1 Fraction, 2, 3, 4, 5
Window	-	19, 22, 23 Fraction, 24, 27 Fraction
Bob	-	3, 4, 5, 6, 7, 8, 9, 10, 13
Sage	-	5
Hill	-	1, 11
L	-	4654
Norah M.C.		Lot 413
Beta M.C.		Lot 414
Glen Iron M.C.		Lot 1415
Peggy M.C.		Lot 1416
Copper King M.C.		Lot 1457

Nippon Fraction M.C.	Lot 2553
Britannia M.C. Fraction	Lot 2554
Signorina M.C.	Lot 2555
Klondyke M.C.	Lot 2556
Copper Jack M.C.	Lot 2557
Peacock M.C.	Lot 2558
Prince of Wales M.C.	Lot 2559
Tunnel Fraction M.C.	Lot 2560

These claims are held under option from Rolling Hills Mining Company by Torwest Resources (1962) Ltd. N.P.L.

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	Electrode Intervals	Dwg. No.
800 W BLA	300 feet	IP 5975-1
400 W BLA	300 feet	IP 5975-2
0 BLA	300 feet	IP 5975-3
7600 W	300 feet	IP 5975-4
7200 W	300 feet	IP 5975-5
6800 W	300 feet	IP 5975-6
6400 W	300 feet	IP 5975-7
6000 W	300 feet	IP 5975-8
5600 W	300 feet	IP 5975-9
5200 W	300 feet	IP 5975-10

Line	Electrode Intervals	Dwg. No.
4800 W	300 feet	IP 5975-11
4400 W	300 feet	IP 5975-12
4000 W	300 feet	IP 5975-13
3600 W	300 feet	IP 5975-14
3200 W	300 feet	IP 5975-15
2800 W	300 feet	IP 5975-16
2400 W	300 feet	IP 5975-17
2000 W	300 feet	IP 5975-18
1600 W	300 feet	IP 5975-19
1200 W	300 feet	IP 5975-20
800 W	300 feet	IP 5975-21
400 W	300 feet	IP 5975-22
0	300 feet	IP 5975-23
400 E	300 feet	IP 5975-24
800 E	300 feet	IP 5975-25
1200 E	300 feet	IP 5975-26
1600 E	300 feet	IP 5975-27
2000 E	300 feet	IP 5975-28
2400 E	300 feet	IP 5975-29
2800 E	300 feet	IP 5975-30
3200 E	300 feet	IP 5975-31
3600 E	300 feet	IP 5975-32
4000 E	300 feet	IP 5975-33
4400 E	300 feet	IP 5975-34

Also enclosed with this report is Dwg. I.P.P. 4854, a plan map of the Copper King Grid at a scale of 1" = 400'. The definite, probable and possible Induced Polarization anomalies are indicated by bars, in the manner shown on the legend, on this plan map as well as on 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 anomaly can be located with more accuracy than the electrode interval length; i.e. when using 300' electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 300' apart. In order to definitely locate, and fully evaluate, a narrow, shallow source it is necessary to use shorter electrode intervals. In order to locate sources at some depth, larger electrode intervals must be used, with a corresponding increase in the uncertainties of location. Therefore, while the centre 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.

The claim information shown on Dwg. I.P.P. 4854 has been taken from maps made available by the staff of Torwest Resources (1962) Ltd. N.P.L.

3. DISCUSSION OF RESULTS

Three short lines were surveyed in the extreme northwest of the grid on a separate base line, designated Base Line A.

Two features have been mapped in addition to the IP results. The first feature is a zone of low frequency effects, with values of less than 1.0, which extends from Line 400 W on Grid A to Line 800 W on Base Line 1. The barren rock which is the source of this zone is deep on Line 2800 W and Line 1600 W, underlying more conductive rocks. On Line 6800 W, Line 6400 W and Line 6000 W, it is very shallow and overlies more conductive rock. This could be a fault zone.

The second feature is the boundary between low resistivity rocks and high resistivity rocks, indicating a change in rock type or a widespread zone of alteration to the west-southwest. On many of the lines, this boundary seems to control the anomalies, but on others the anomalies cross the contact. It is generally true, though, that the stronger metal factor anomalies occur in the rocks with lower resistivities.

The survey data have been interpreted from two different viewpoints. Dwg. I.P.P. 4854 shows the normal McPhar IP interpretation; e.g. metal factor anomalies, immediately under the line representation. Beneath these anomalies are shown frequency effect anomalies.

The metal factor anomalies indicate a zone of definite and probable anomalies with a northwest to southeast strike, extending from Line 7600 W to Line 5600 W in the west and to Line 4800 W to the east. A diamond drill hole was drilled to a total depth of 670' into one of the definite anomalies. The hole, collared at 4N and drilled at a 45° angle to the east, recovered mainly magnetite and pyrite, with a 20' section of chalcopyrite and pyrite from 380' to 400'. Percussion holes tested definite, probable and possible anomalies in this zone as illustrated in Dwg. I.P.P. 4854. Most of this zone is contained within high-resistivity rocks.

The frequency effect anomalies, while varying from the metal factor anomalies in magnitude and extent, also form this same zone.

The source of the zone appears to be concentrated metallic mineralization which is mainly pyrite and magnetite on Line 7200 W at the point where it was drilled. The less concentrated mineralization in the zone has been tested in one place on Line 6000 W and pyrite and minor magnetite were recovered.

A second zone of metal factor anomalies, lying within the low-resistivity rocks, extends from Line 6400 W to Line 1200 E, although it is very weakly represented on Line 2000 W, Line 1600 W and Line 800 W. The source of most of the anomalies in the zone is interrupted by the low-frequency zone. Frequency effect anomalies, generally of lower magnitude, are present in the northern and southern portion of the zone. The source of the anomalies appears to vary from concentrated mineralization to disseminated mineralization.

An extensive zone of weak frequency effect anomalies from Line 4000 W to Line 400 W, located in the high-resistivity rocks, has no metal factor anomalies of any extent. This anomalous frequency effect zone extends to Line 2000 E; southeast of Line 2000 E the zone has less continuity, but from Line 0 to Line 4400 E possible to probable metal factor anomalies appear. The major portion of the metal factor anomalies lies within a spur of low-resistivity rocks.

The old Copper King Mine is located 50' east of Line 0 at 800 N. Here there is no metal factor anomaly; the frequency effect anomaly is probable.

The mineralization is said to have been chalcopyrite, pyrrhotite and bornite with some magnetite in a fractured zone in diorite. There is also disseminated mineralization in the country rock. Six percussion holes have been drilled on Line 0, but detailed results are not available.

The source of these anomalies appears to be weakly disseminated mineralization with local areas of greater concentration; e.g. the frequency effect probable anomalies towards the northeastern end of Line 6000 W to Line 3600 W and also in the area of the old mine. This type of anomaly should be more thoroughly tested by drilling.

4. CONCLUSIONS AND RECOMMENDATIONS

The IP survey has located three definite types of anomalous responses. These are: (I) Strongly anomalous metal factor and frequency effect anomalies which occur mainly in high-resistivity rocks but which extend partially into low-resistivity rocks. (II) Mainly weakly disseminated anomalies of both types with local areas of greater concentration. (III) Metal factor anomalies, coinciding in the north and south with frequency effect anomalies, generally definite to probable, in rocks of low resistivity.

Type I

The definite portion of this type of metal factor anomaly has been tested by diamond drilling on Line 7200 W and by percussion drilling on Line 6250 W and Line 4800 W. Pyrite seems to be the prime source on Line 7200 W and Line 6250 W; magnetite was recovered on Line 4800 W.

The results of the magnetometer survey should be used to eliminate areas of concentrated magnetite. Unless 12N on Line 6400 W is included in a magnetic high, a drill hole to test a probable metal factor anomaly and a definite frequency effect anomaly is recommended.

A second possible drill hole location is on Line 6000 W with the hole collared at 16N, drilled to the east at an angle of 45° to a total depth of 700'. This should test probable and definite frequency effect anomalies and possible and probable metal factor anomalies.

Type II

This type of anomaly could be tested on Line 800 E with a diamond drill hole collared at 4N, drilled at an angle of 45° to the east to a total depth of 600' to 700'. This would test probable and possible frequency effect anomalies and definite and probable metal factor anomalies. These anomalies are on strike with the old mine. Again, results of the magnetometer survey should be used to locate magnetic highs.

Type III

Two drill hole locations are initially recommended to test this zone.

Line 5600 W - A hole collared at 10S, drilled at a 45° angle to the southwest to a depth of 650' to 700'. This will test a definite metal factor anomaly and possible and probable metal factor anomalies.

Line 0 - A hole collared at 5S, drilled at a 45° angle to the southwest to a total depth of 400'. This will test a probable metal factor anomaly and a possible frequency effect anomaly.

The drilling results should be used as a guide to further drilling and to compare and evaluate the two methods of interpretation.

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof,
Geophysicist.

Marion A. Goudie,
Geologist.

Dated: August 29, 1972

ASSESSMENT DETAILS

PROPERTY: Copper King | MINING DIVISION: Kamloops

SPONSOR: Torwest Resources (1962) Ltd. N.P.L. | PROVINCE: British Columbia

LOCATION: Cherry Creek Area

TYPE OF SURVEY: Induced Polarization

OPERATING MAN DAYS:	116	DATE STARTED:	May 6, 1972
EQUIVALENT 8 HR. MAN DAYS:	174	DATE FINISHED:	July 25, 1972
CONSULTING MAN DAYS:	4	NUMBER OF STATIONS:	1831
DRAUGHTING MAN DAYS:	10	NUMBER OF READINGS:	4005
TOTAL MAN DAYS:	188	MILES OF LINE SURVEYED:	34

CONSULTANTS:

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FIELD TECHNICIANS:

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Plus Extra Labour:
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J. Addlington, 1025 Turner Street, Victoria, B.C.
D. Irish, c/o McPhar, Suite 811, 837 W. Hastings Street, Vancouver, B.C.
R. Fernholm, Haileybury, Ontario.

DRAUGHTSMEN:

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V. Young, 703 Cortez Avenue, Bay Ridges, Ontario.
N. Lade, 299 Jasper Avenue, Oshawa, Ontario.

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof

Philip G. Hallof,
Geophysicist.

Dated: August 29, 1972

STATEMENT OF COST

Terwest Resources (1962) Ltd. N.P.L. - IP Survey
Copper King Property, Cherry Creek Area, Kamloops Mining Division, B.C.

Crew:	May 6 - 14	G. Trefenanko & J. Warner
	May 15-26	G. Trefenanko & J. Parker
	June 1-29	G. Trefenanko & R. Mertens
	July 24-25	G. Trefenanko & G. Silver

Total Survey Cost

29 Operating days (all incl. rate)	@ $420.00 per day	$12,180.00

Breakdown of Cost

29 days	Operating		@ $209.00/day	$6,061.00
2 days	Preparation)			
3 days	Bad Weather)	5½ days	@ $100.00/day	550.00
½ day	Standby)			
2½ days	Off			N.C.
				$6,611.00

Expenses - prorated

Meals and Accommodation	$ 978.98	
Vehicle Expense	495.00	
Field Expense	32.52	
	1,506.50	
Plus 10%	150.65	
	1,657.15	$1,657.15

Extra Labour	$3,259.47	
Plus 20%	651.89	
	$3,911.36	$3,911.36
		$12,179.51

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof,
Geophysicist.

Dated: August 29, 1972

CERTIFICATE

I, Philip George Hallof, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geophysicist residing at 15 Barnwood Court, Don Mills, Ontario.

2. I am a graduate of the Massachusetts Institute of Technology with a B.Sc. Degree (1952) in Geology and Geophysics, and a Ph.D. Degree (1957) in Geophysics.

3. I am a member of the Society of Exploration Geophysicists and the European Association of the Exploration Geophysicists.

4. I am a Professional Geophysicist, registered in the Province of Ontario, the Province of British Columbia and the State of Arizona.

5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Torwest Resources (1962) Ltd. N.P.L. or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto

This 29th day of August 1972

Philip G. Hallof, Ph.D.

CERTIFICATE

I, Marion A. Goudie, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geologist residing at 739 Military Trail, West Hill, Ontario.

2. I am a graduate of the University of Western Ontario with a B.Sc. Degree (1950) in Honours Geology.

3. I am a member of the Geological Society of America.

4. I have been practising my profession for 23 years.

5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Torwest Resources (1962) Ltd. N.P.L. or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto

This 29th day of August 1972

Marion A. Goudie

Marion A. Goudie, B.Sc.

APPENDIX A

EXPECTED IP ANOMALIES FROM "PORPHYRY COPPER" TYPE ZONES OF DISSEMINATED SULPHIDE MINERALIZATION

Our experience in other areas has shown that the induced polarization method can be successfully used to locate, and outline, zones of disseminated sulphide mineralization of the "porphyry copper" type. In most cases the interpretation of the IP results is simple and straightforward. The results shown in Figure 1 and Figure 2 are typical.

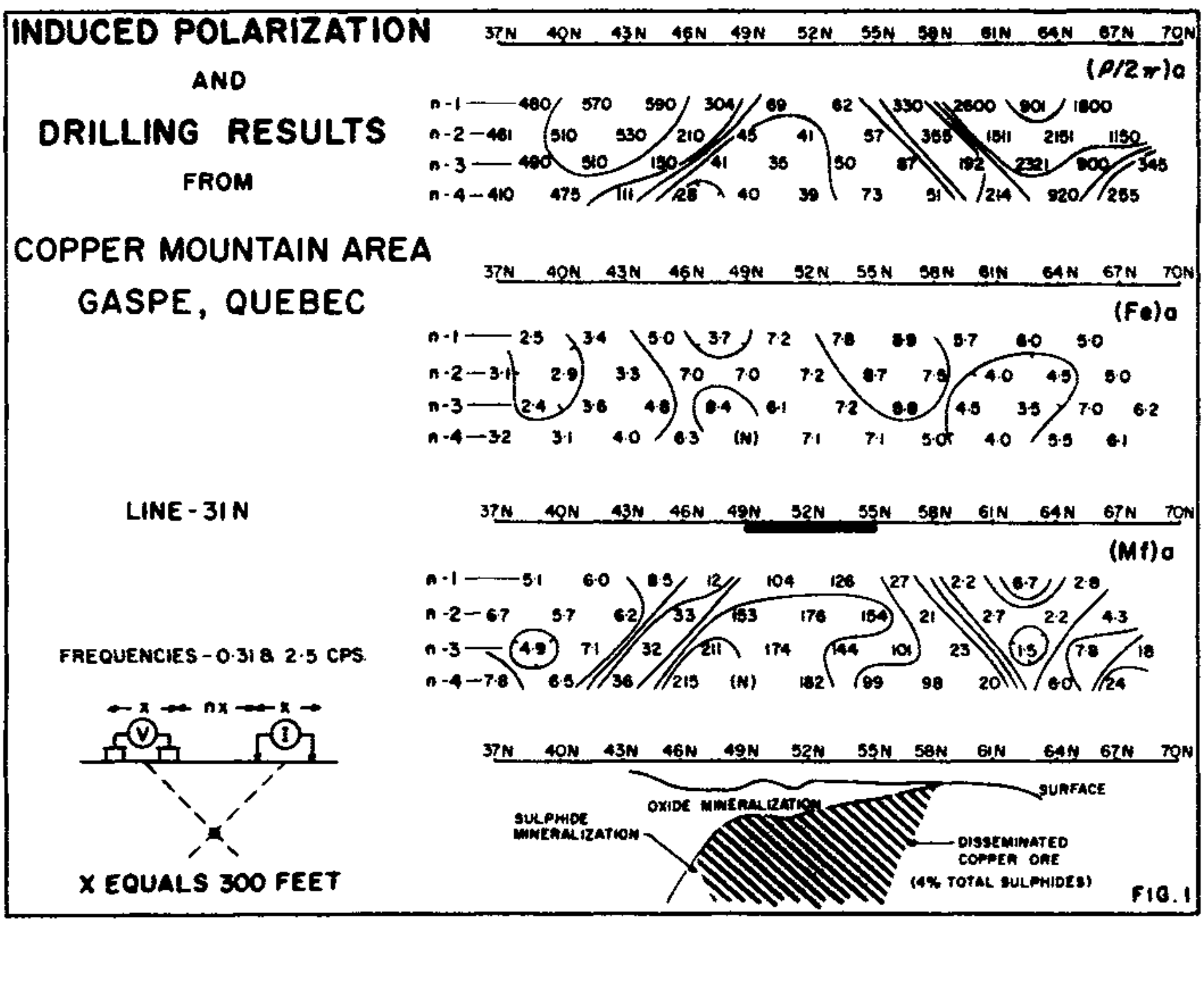


FIG. 1

The source of the moderate magnitude IP anomaly shown in Figure 1 contains approximately 4% metallic mineralization. The zone is of limited lateral extent and enough copper is present to make the mineralization "ore grade". The presence of the surface oxidation can be seen in the fact that the apparent IP effects increase for n = 2.

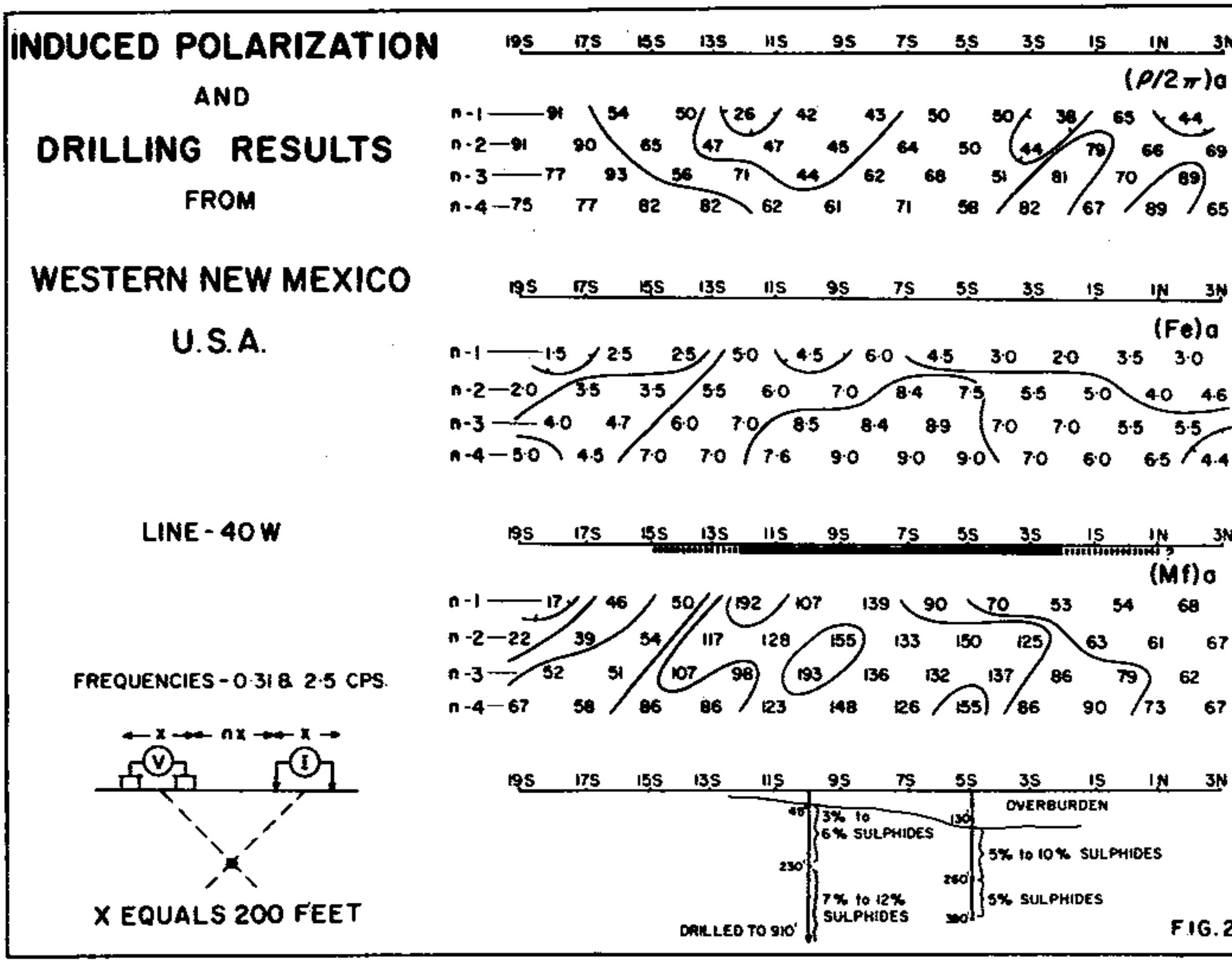


FIG. 2

The IP anomaly shown in Figure 2 has about the same magnitude as that described above. It should be noted that appreciably greater concentrations of metallic mineralization are present; further, there is little or no copper present. These results illustrate the fact that IP results can not be used to determine the exact amount of metallic mineralization present or to determine the economic importance of a mineralized zone. In some geologic situations zoning is present; the zones of mineralization of greatest economic value may contain less total metallic mineralization than other zones in the same general area.

In the proper geologic environment, the method will detect even very low concentrations of metallic mineralization. The IP results shown in Figure 3 located the ore zone at the Brenda Property near Peachland, B. C. The zone contains 1.0 to 1.5 per cent metallic mineralization; however, the mineralization is "ore grade" because only molybdenite and chalcopyrite are present.

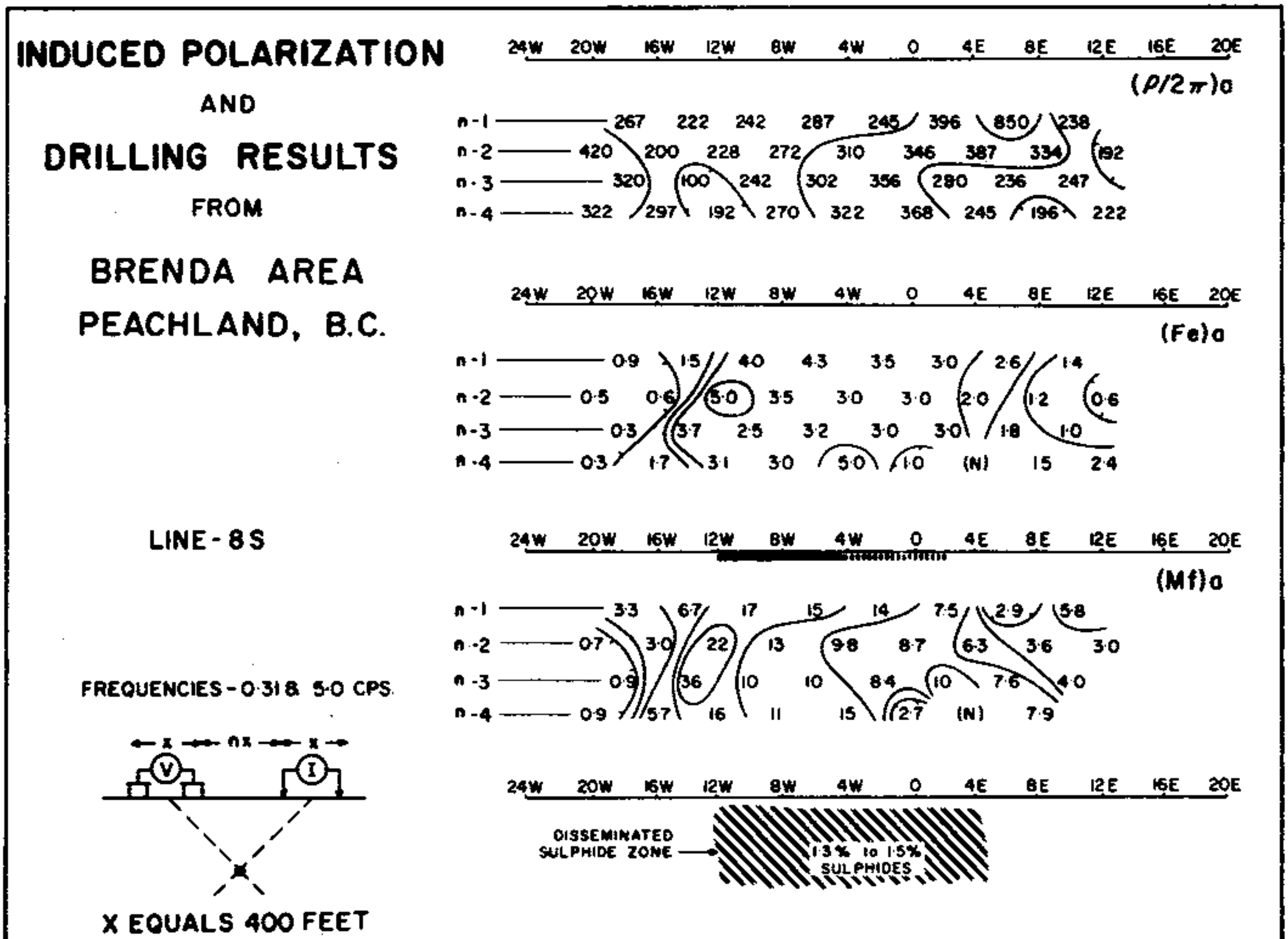


FIG. 3

APPENDIX B

THE INTERPRETATION OF INDUCED POLARIZATION ANOMALIES FROM RELATIVELY SMALL SOURCES

The induced polarization method was originally developed to detect disseminated sulphides and has proven to be very successful in the search for "porphyry copper" deposits. In recent years we have found that the IP method can also be very useful in exploring for more concentrated deposits of limited size. This type of source gives sharp IP anomalies that are often difficult to interpret.

The anomalous patterns that develop on the contoured data plots will depend on the size, depth and position of the source and the relative size of the electrode interval. The data plots are not sections showing the electrical parameters of the ground. When the electrode interval (X) is appreciably greater than the width of the source, a large volume of unmineralized rock is averaged into each measurement. This is particularly true for the large values of the electrode separation (n).

The theoretical scale model results shown in Figure 1 and Figure 2 indicate the effect of depth. If the depth to the top of the source is small compared to the electrode interval (i. e. d X) the measurement for n = 1 will be anomalous. In Figure 1 the depth is 0. 5 units (X = 1. 0 units) and the n = 1 value is definitely anomalous; the pattern on the contoured data plot is typical for a relatively shallow, narrow, near-vertical tabular source. The results in Figure 2 are for the same source with the depth increased to 1. 5 units. Here the n = 1 value is not anomalous; the larger values of (n) are anomalous but the magnitudes are much lower than for the source at less depth.

When the electrode interval is greater than the width of the source, it is not possible to determine its width or exact position between the electrodes. The true IP effect within the source is also indeterminate; the anomaly from a very narrow source with a very large true IP effect will be much the same as that from a zone with twice the width and 1/2 the true IP effect. The theoretical scale model data shown in Figure 3 and Figure 4 demonstrate this problem. The depth and position of the source are unchanged but the width and true IP effect are varied. The anomalous patterns and magnitudes are essentially the same, hence the data are insufficient to evaluate the source completely.

The normal practise is to indicate the IP anomalies by solid, broken, or dashed bars, depending upon their degree of distinctiveness. 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. As illustrated in Figure 1, Figure 2, Figure 3 and Figure 4, no anomaly can be located with more accuracy than the spread length. While the centre of the solid bar indicating the anomaly corresponds fairly well with the source, the length of the bar should not be taken to represent the exact edges of the anomalous material.

If the source is shallow, the anomaly can be better evaluated using a shorter electrode interval. When the electrode interval used approaches the width of the source, the apparent effects measured will be nearly equal to the true effects within the source. When there is some depth to the top of the source, it is not possible to use electrode intervals that are much less than the depth to the source. In this situation, one must realize that a definite ambiguity exists regarding the width of the source and the IP effect within the source.

Our experience has confirmed the desirability of doing detail. When a reconnaissance IP survey using a relatively large electrode interval indicates the presence of a narrow, shallow source, detail with shorter electrode intervals is necessary in order to better locate, and evaluate, the source. The data of most usefulness is obtained when the maximum apparent IP effect is measured for n = 2 or n = 3. For instance, an anomaly originally located using X = 300' may be checked with X = 200' and then X = 100'. The data with X = 100' will be quite different from the original reconnaissance results with X = 300'.

The data shown in Figure 5 and Figure 6 are field results from a greenstone area in Quebec. The expected sources were narrow (less than 30' in width) zones of massive, high-grade, zinc-silver ore. An electrode interval of 200' was used for the reconnaissance survey in order to keep the rate of progress at an acceptable level. The anomalies located were low in magnitude.

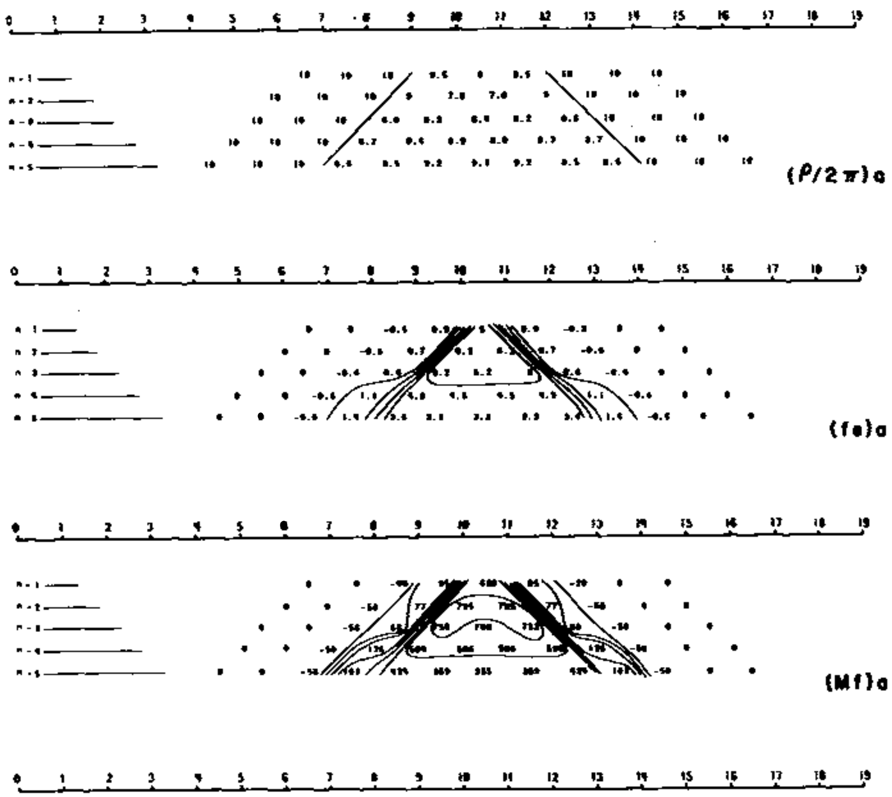
The very weak, shallow anomaly shown in Figure 5 is typical of those located by the X = 200' reconnaissance survey. Several anomalies of this type were detailed using shorter electrode intervals. In most cases the detail measurements suggested broad zones of very weak mineralization. However, in the case of the source at 20N to 22N, the measurements with shorter electrode intervals confirmed the presence of a strong, narrow source. The X = 50' results are shown in Figure 6. Subsequent drilling has shown the source to be 12.5' of massive sulphide mineralization containing significant zinc and silver values.

The change in the anomaly that results when the electrode interval is reduced is not unusual. The X = 50' data more accurately locates the narrow source, and permits the geophysicist to make a better evaluation of its importance. The completion of this type of detail is very important, in order to get the maximum usefulness from a reconnaissance IP survey.

McPHAR GEOPHYSICS LIMITED

Theoretical Induced Polarization and Resistivity Studies

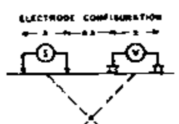
Scale Model Cases



$(\rho/2\pi)_1 = 10$ $\quad (\rho/2\pi)_2 = 2.51$

$(Mf)_1 = 0$ $\quad (Mf)_2 = 10000$

$(fe)_2 = 25\%$



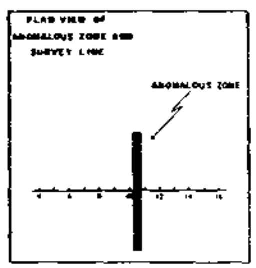


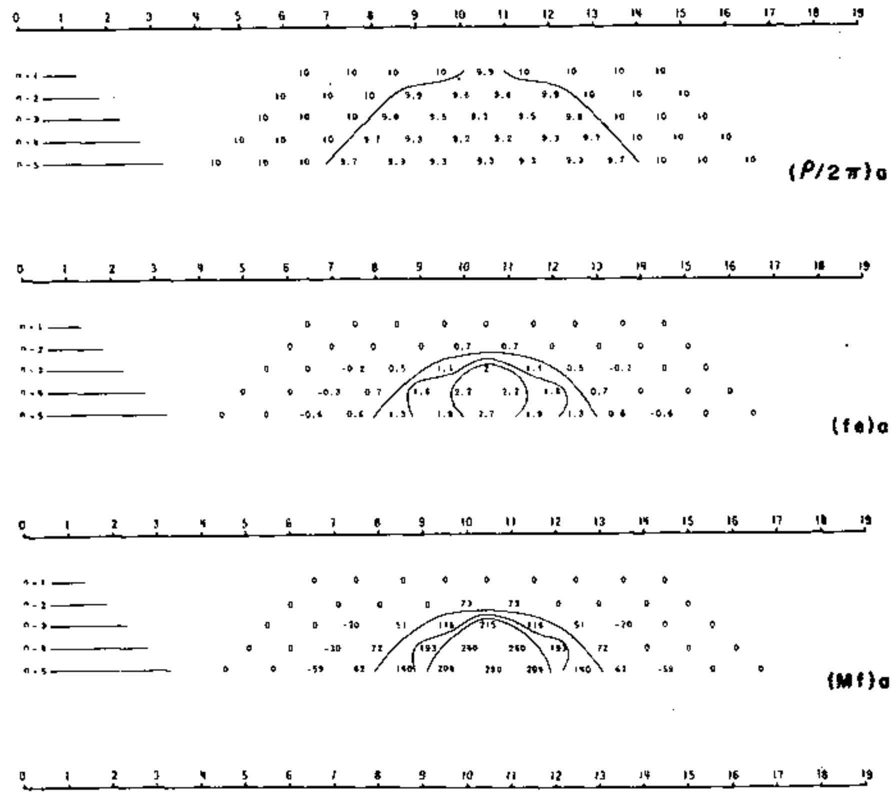
FIG. 1

CASE II-0.5-BU-10-a

McPHAR GEOPHYSICS LIMITED

Theoretical Induced Polarization and Resistivity Studies

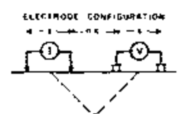
Scale Model Cases



$(\rho/2\pi)_1 = 10$ $\quad (\rho/2\pi)_2 = 2.6$

$(Mf)_1 = 0$ $\quad (Mf)_2 = 9250$

$(fe)_2 = 24\%$



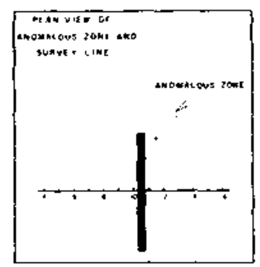


FIG. 2

CASE II-1.5-BU-10-a

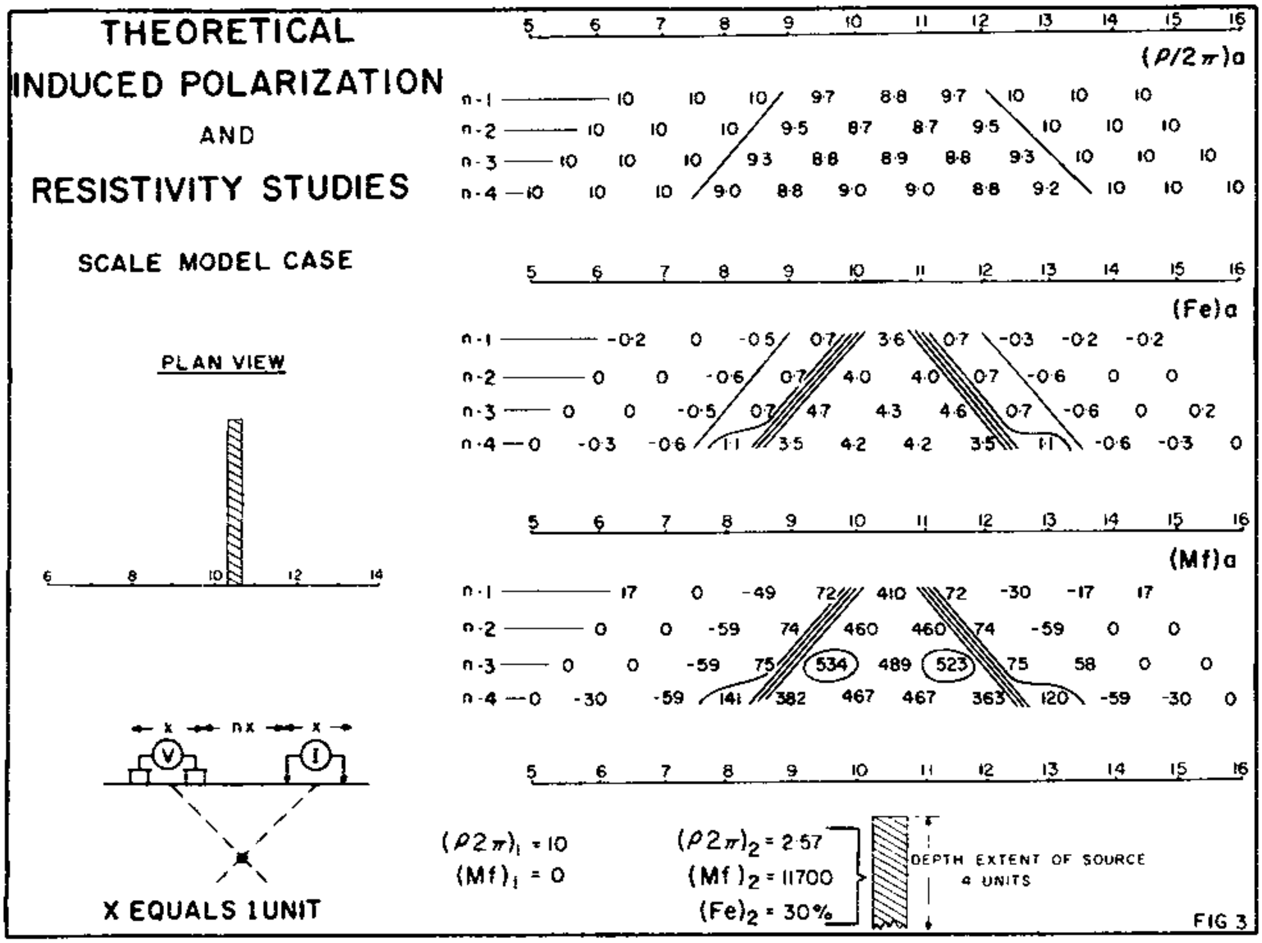

THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
x nx x
V I
X EQUALS 1 UNIT
5 6 7 8 9 10 11 12 13 14 15 16
(ρ/2π)a
n-1 10 10 10 9.7 8.8 9.7 10 10 10
n-2 10 10 10 9.5 8.7 8.7 9.5 10 10 10
n-3 10 10 10 9.3 8.8 8.9 8.8 9.3 10 10 10
n-4 10 10 10 9.0 8.8 9.0 9.0 8.8 9.2 10 10 10
(Fe)a
n-1 -0.2 0 -0.5 0.7 3.6 0.7 -0.3 -0.2 -0.2
n-2 0 0 -0.6 0.7 4.0 4.0 0.7 -0.6 0 0
n-3 0 0 -0.5 0.7 4.7 4.3 4.6 0.7 -0.6 0 0.2
n-4 0 -0.3 -0.6 1.1 3.5 4.2 4.2 3.5 1.1 -0.6 -0.3 0
(Mf)a
n-1 17 0 -49 72 410 72 -30 -17 17
n-2 0 0 -59 74 460 460 74 -59 0 0
n-3 0 0 -59 75 534 489 523 75 58 0 0
n-4 0 -30 -59 141 382 467 467 363 120 -59 -30 0
(ρ2π)1 = 10
(Mf)1 = 0
(ρ2π)2 = 2.57
(Mf)2 = 11700
(Fe)2 = 30%
DEPTH EXTENT OF SOURCE
4 UNITS

FIG 3

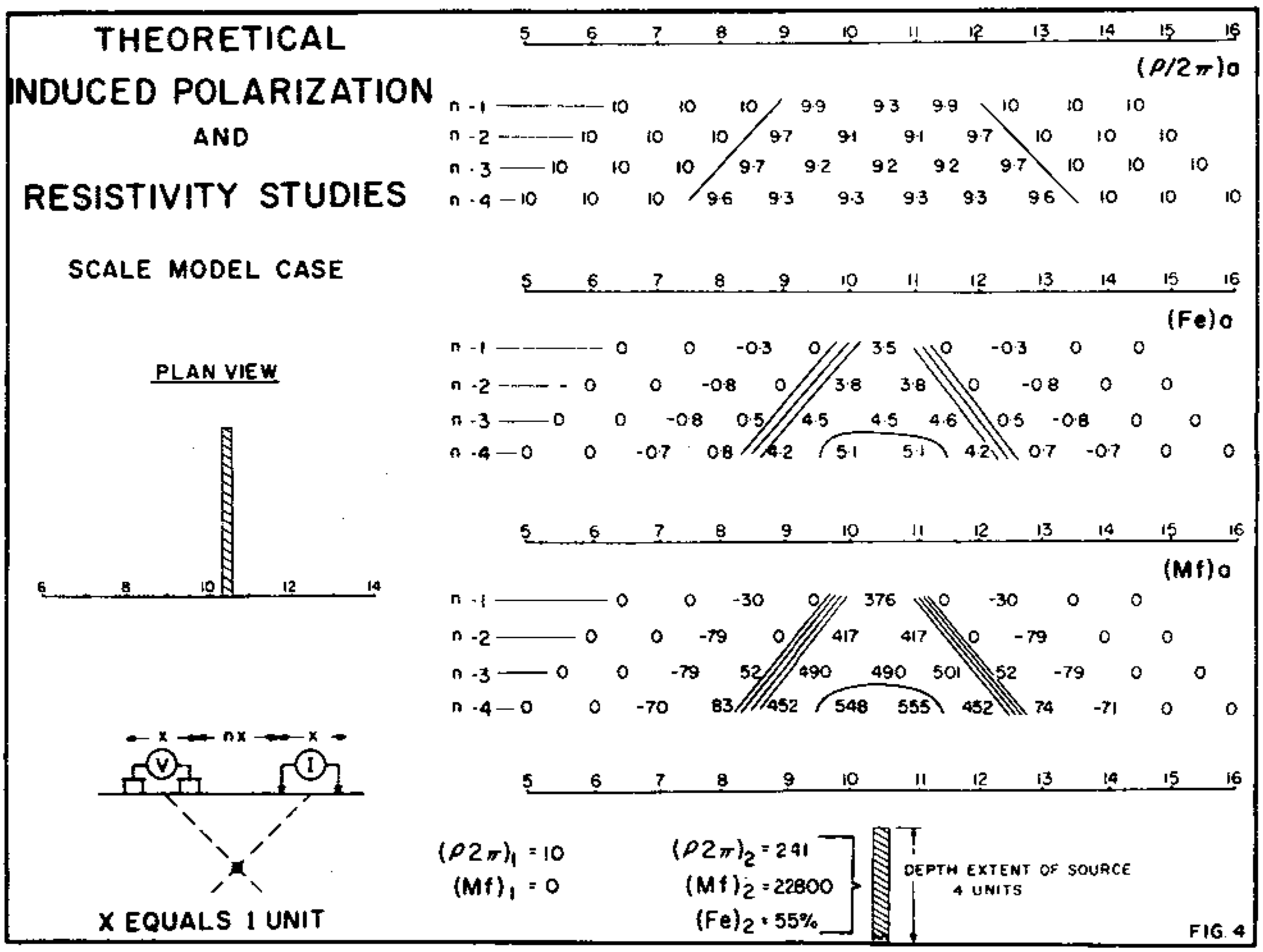
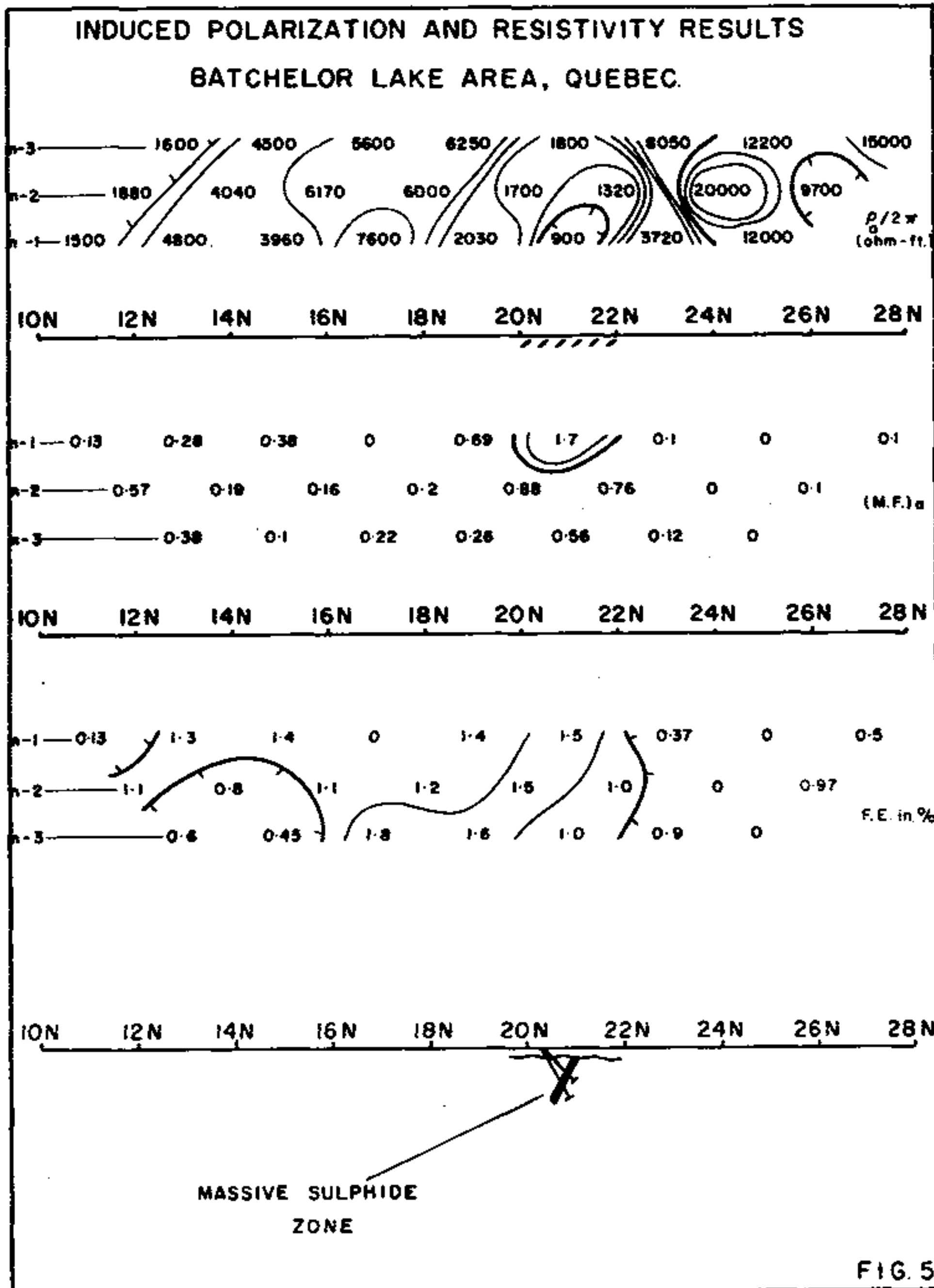
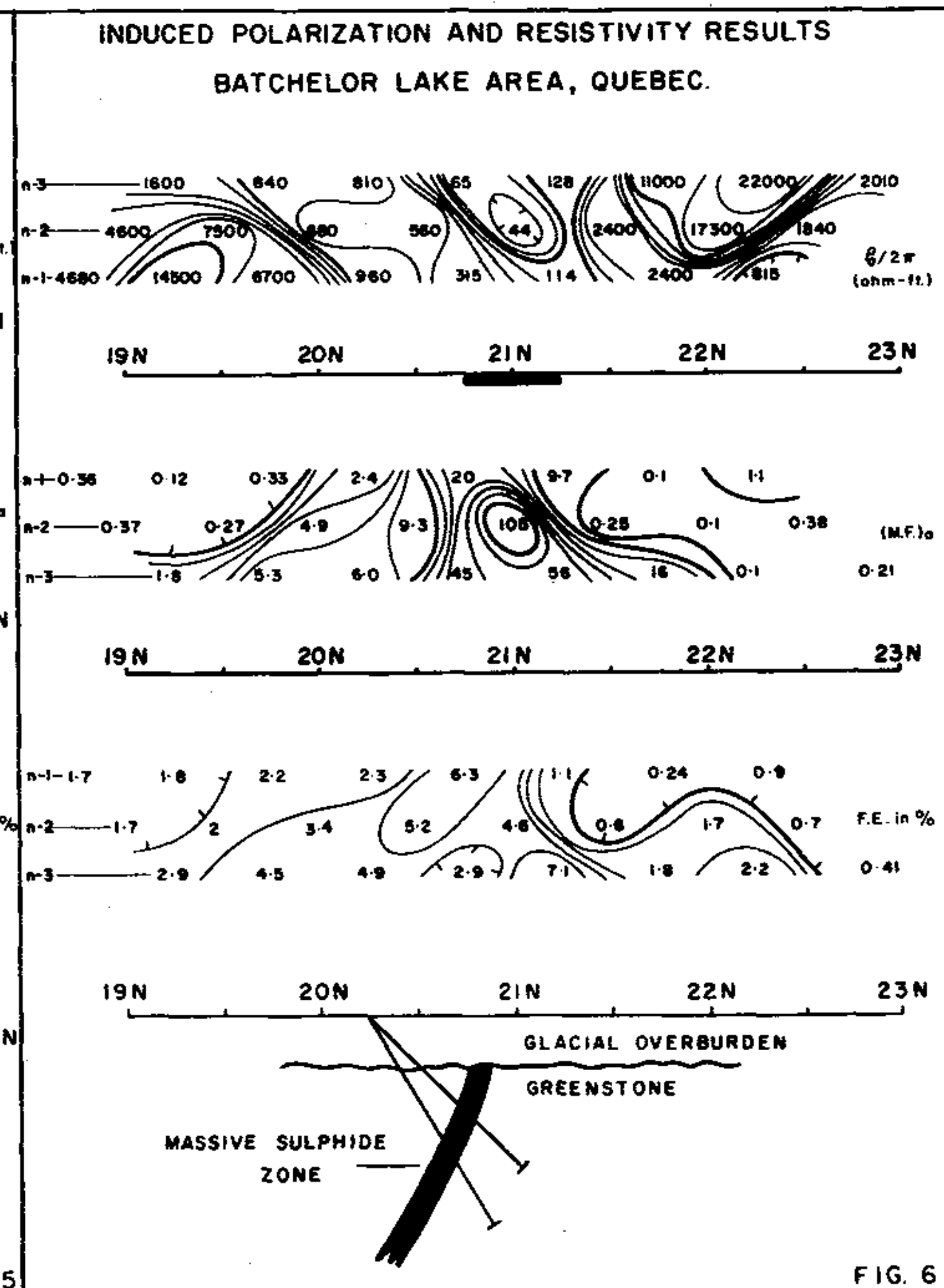

THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
x nx x
V I
X EQUALS 1 UNIT
5 6 7 8 9 10 11 12 13 14 15 16
(ρ/2π)a
n-1 10 10 10 9.9 9.3 9.9 10 10 10
n-2 10 10 10 9.7 9.1 9.1 9.7 10 10 10
n-3 10 10 10 9.7 9.2 9.2 9.2 9.7 10 10 10
n-4 10 10 10 9.6 9.3 9.3 9.3 9.3 9.6 10 10 10
(Fe)a
n-1 0 0 -0.3 0 3.5 0 -0.3 0 0
n-2 0 0 -0.8 0 3.8 3.8 0 -0.8 0 0
n-3 0 0 -0.8 0.5 4.5 4.5 4.6 0.5 -0.8 0 0
n-4 0 0 -0.7 0.8 4.2 5.1 5.1 4.2 0.7 -0.7 0 0
(Mf)a
n-1 0 0 -30 0 376 0 -30 0 0
n-2 0 0 -79 0 417 417 0 -79 0 0
n-3 0 0 -79 52 490 490 501 52 -79 0 0
n-4 0 0 -70 83 452 548 555 452 74 -71 0 0
(ρ2π)1 = 10
(Mf)1 = 0
(ρ2π)2 = 2.41
(Mf)2 = 22800
(Fe)2 = 55%
DEPTH EXTENT OF SOURCE
4 UNITS

FIG. 4

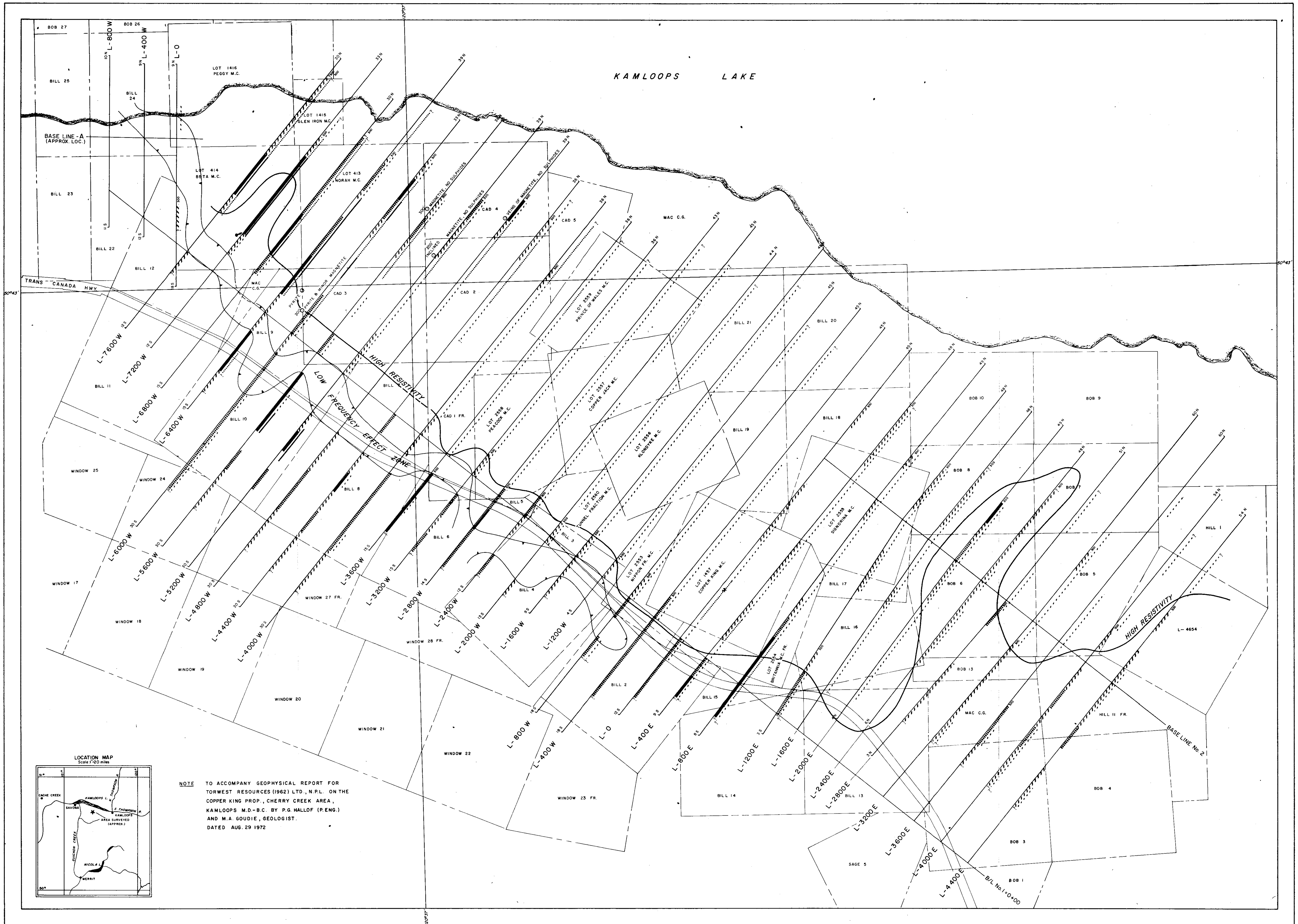

INDUCED POLARIZATION AND RESISTIVITY RESULTS
BATCHELOR LAKE AREA, QUEBEC.
ρa/2π (ohm-ft.)
(M.F.)a
F.E. in %
10N 12N 14N 16N 18N 20N 22N 24N 26N 28N
MASSIVE SULPHIDE ZONE
FIG. 5


INDUCED POLARIZATION AND RESISTIVITY RESULTS
BATCHELOR LAKE AREA, QUEBEC.
ρa/2π (ohm-ft.)
(M.F.)a
F.E. in %
19N 20N 21N 22N 23N
GLACIAL OVERBURDEN
GREENSTONE
MASSIVE SULPHIDE ZONE
FIG. 6

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP



SURFACE PROJECTION OF ANOMALOUS ZONES

(METAL FACTOR)		(FREQUENCY EFFECT)	
DEFINITE	▬▬▬	DEFINITE	────
PROBABLE	▬▬▬	PROBABLE	┈┈┈┈
POSSIBLE	\\\\\\	POSSIBLE	- - - -

Number at the end of anomaly indicates spread used.

TORWEST RESOURCES (1962) LTD., N. P. L.

COPPER KING PROPERTY, CHERRY CREEK AREA

KAMLOOPS M. D., BRITISH COLUMBIA.

SCALE

ONE INCH EQUALS FOUR HUNDRED FEET

3823 M-1

RESISTIVITY BOUNDARY

LOW FREQUENCY ZONE

Mines and ... Resources

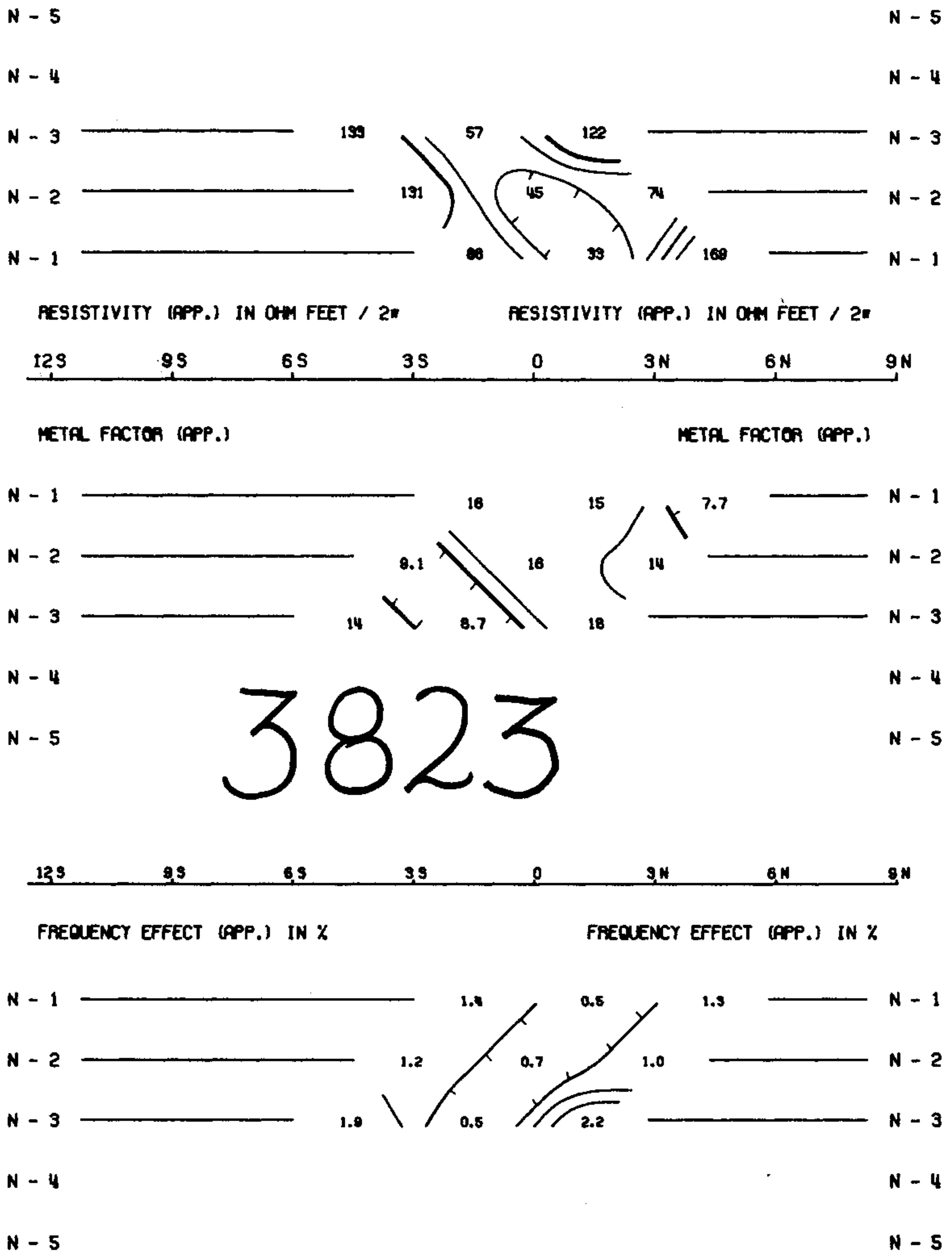
Assessment Report

NO. 3823 MAP #1

PROFESSIONAL ENGINEER — PHILIP G. HALLOF — BRITISH COLUMBIA — Expiry Date: February 25, 1973

8/29/72

DWG. IPP - 4854



DWG. NO.- I.P.- 5975 - 2

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 400W (B/L-A)

ELECTRODE CONFIGURATION

X   NX   X

V   I

PLOTTING POINT

X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1972

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED

DATE

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

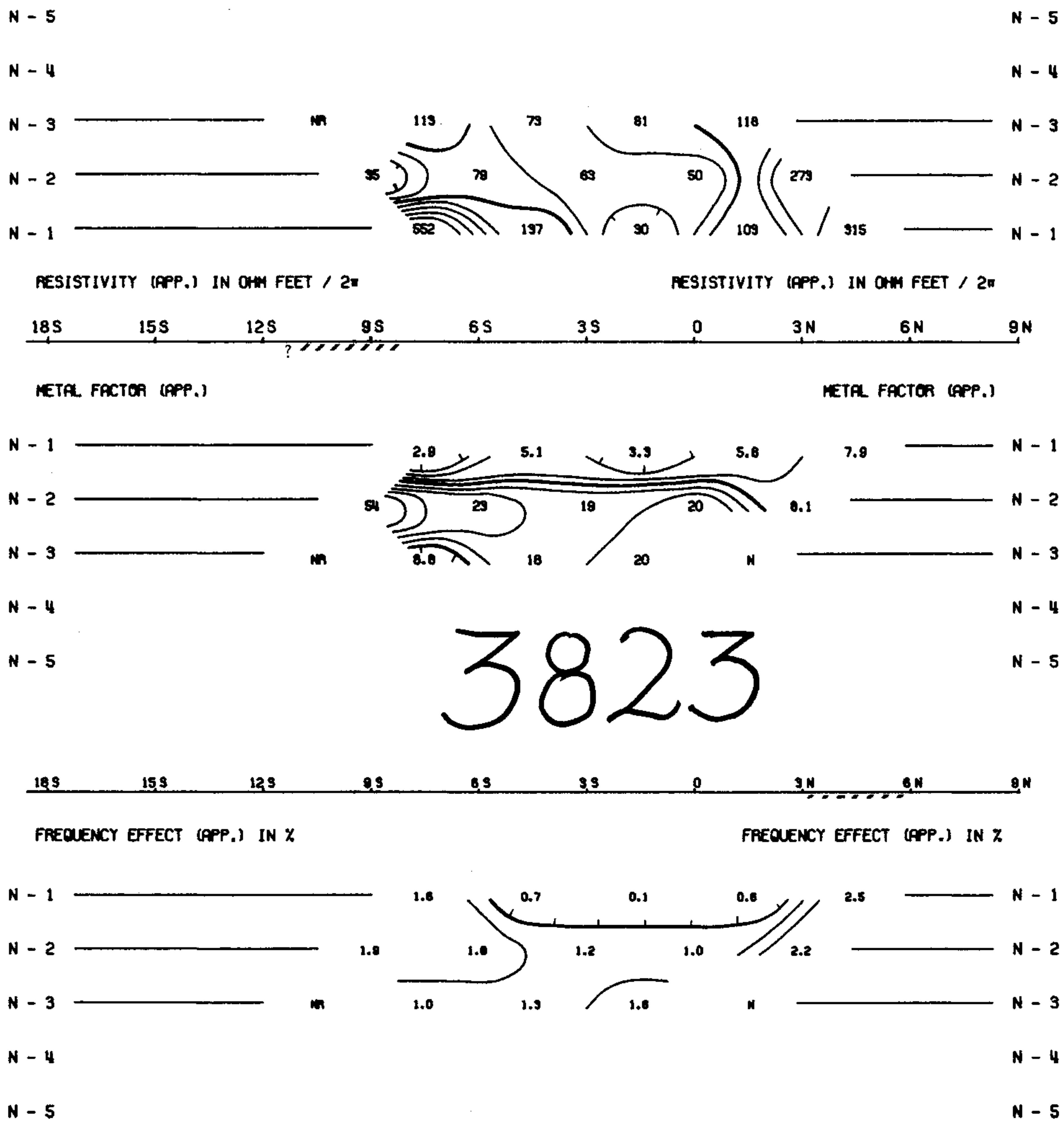
INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION

DWG. NO.- I.P.- 5975-3

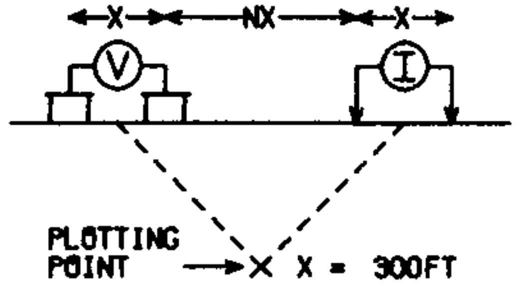
TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.



LINE NO.- 0 (B/L-A)

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

DATE: 19/8/72

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

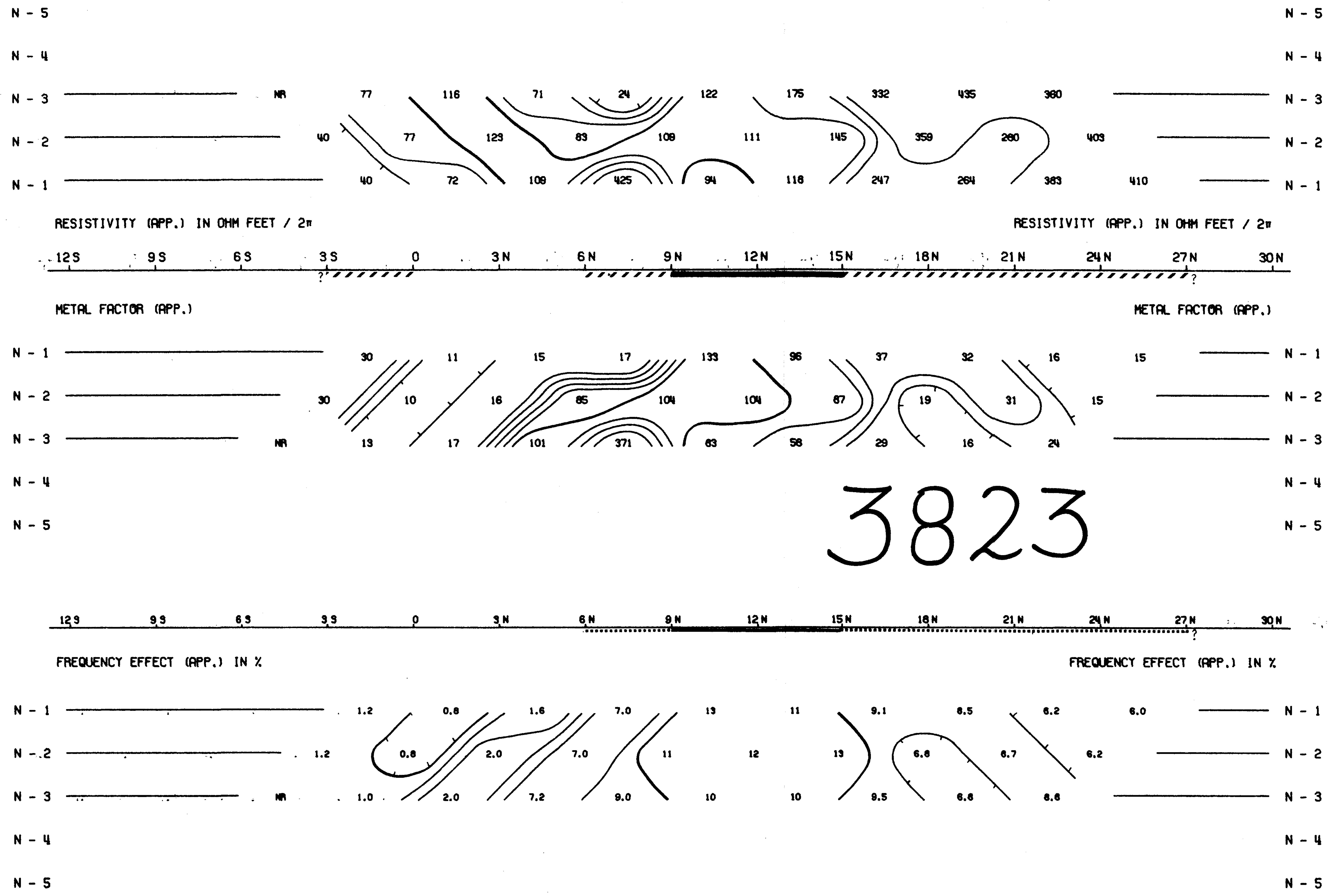
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



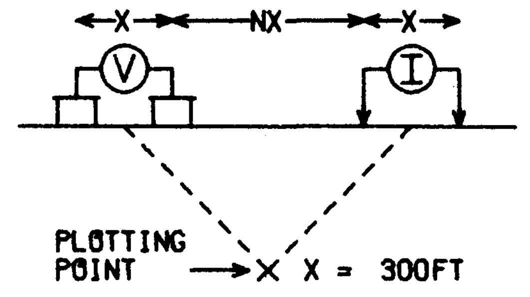
DWG. NO.- I.P.- 5975-4

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 7600W

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

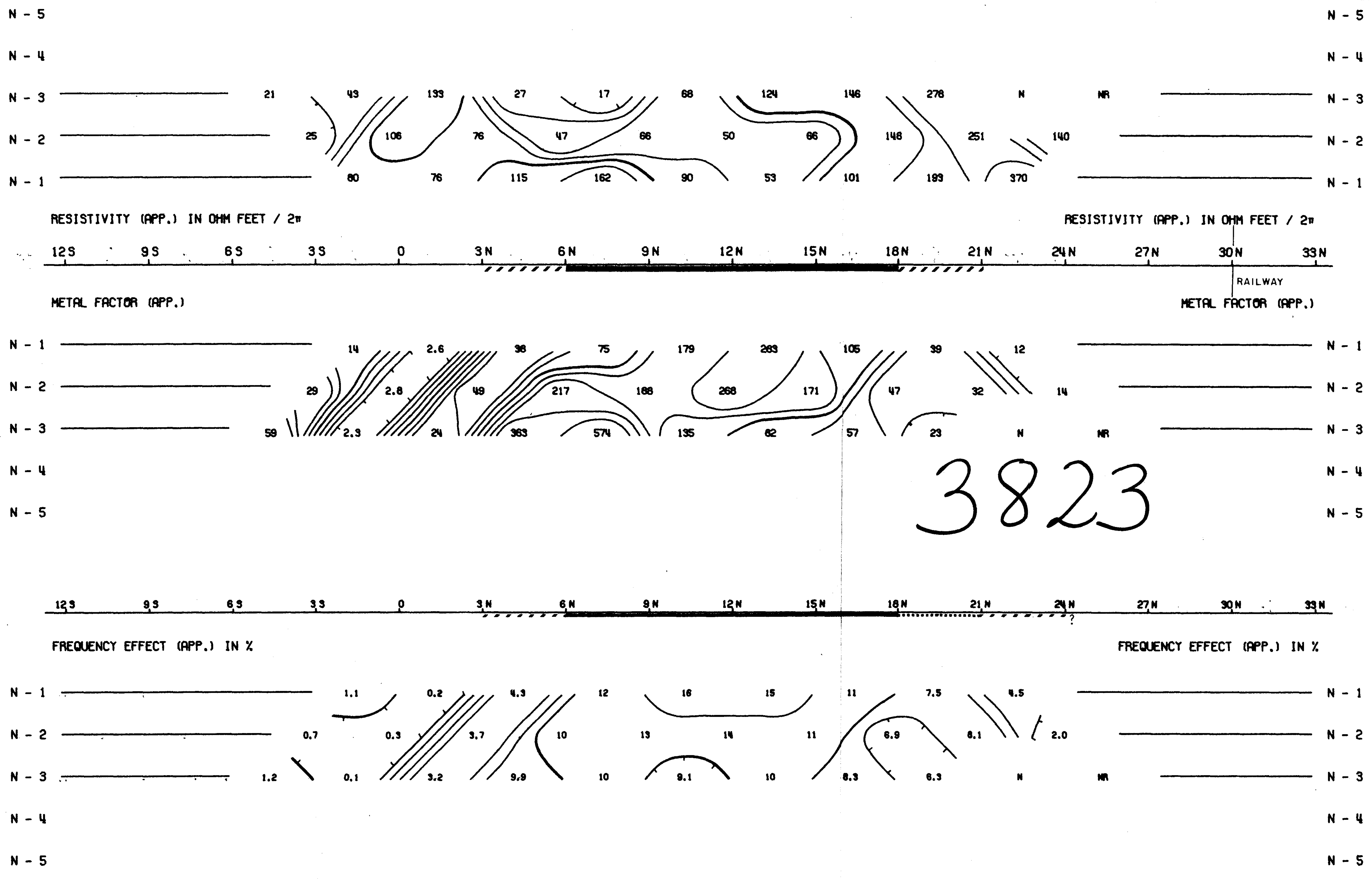
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.-5975-5

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 7200W

ELECTRODE CONFIGURATION

X — NX — X

V I

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

DATE

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

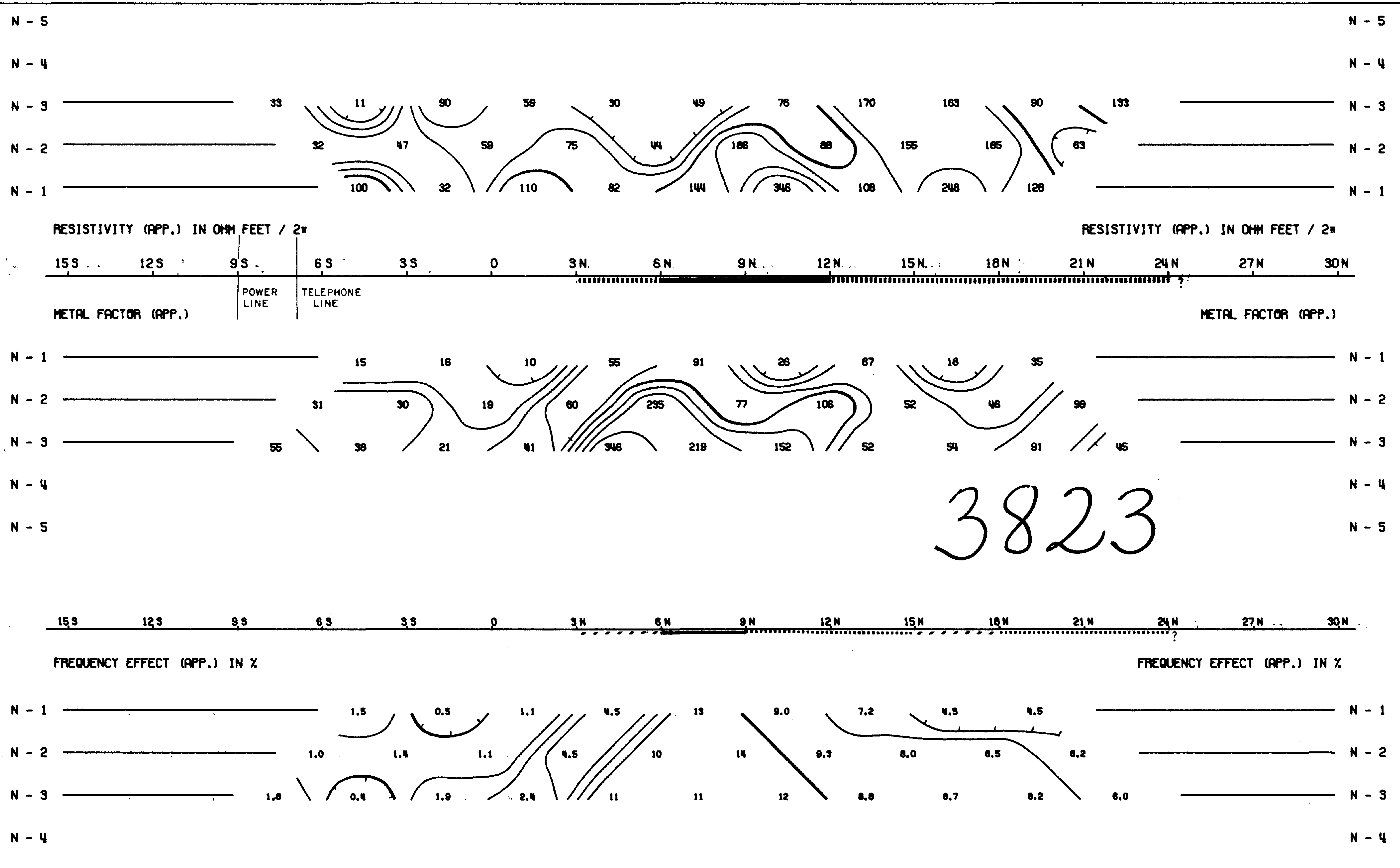
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 5975-6

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 6800W

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT → X   X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

APPROVED

DATE

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

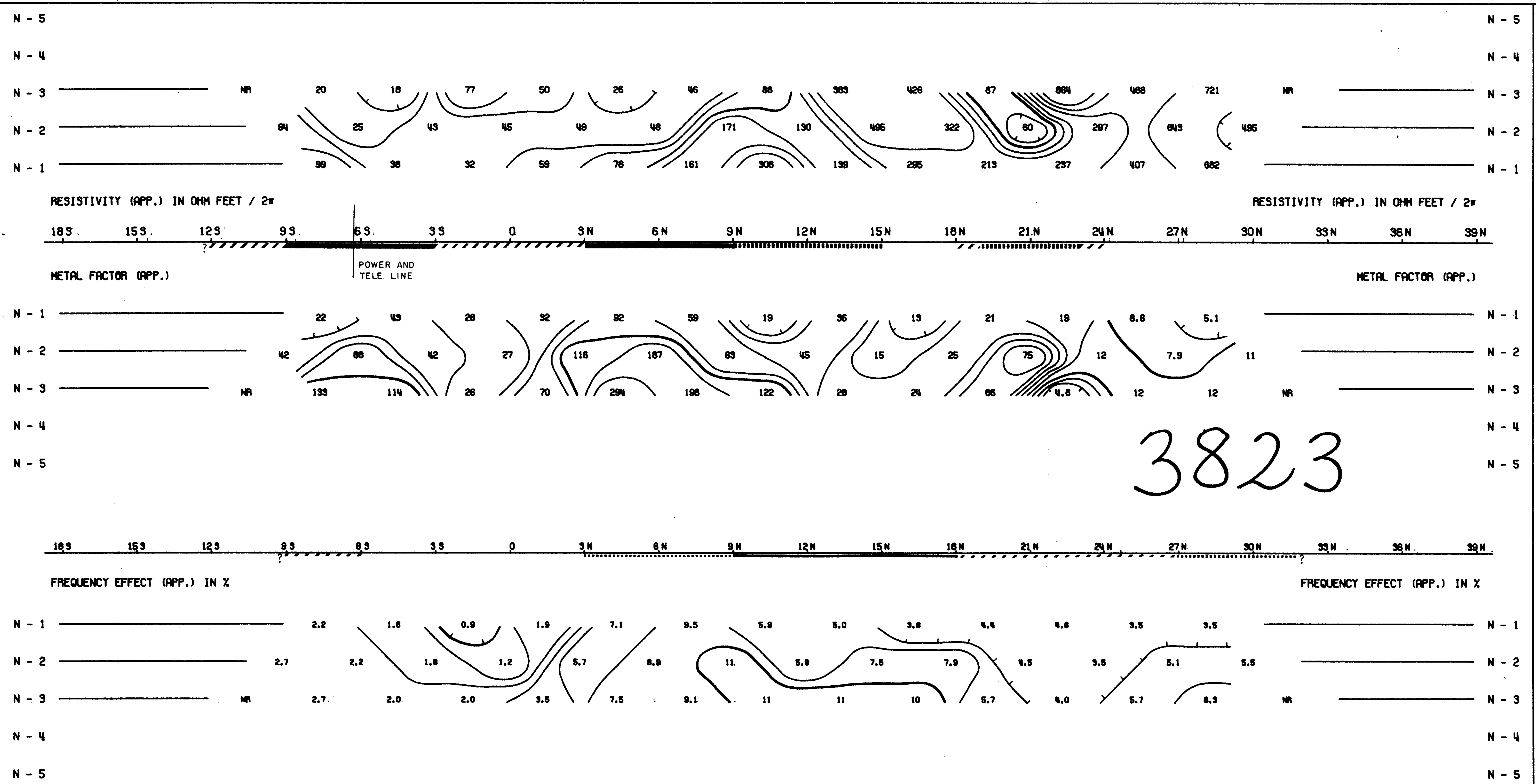
PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



3823

DWG. NO.- I.P.-5975-7

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 6400W

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

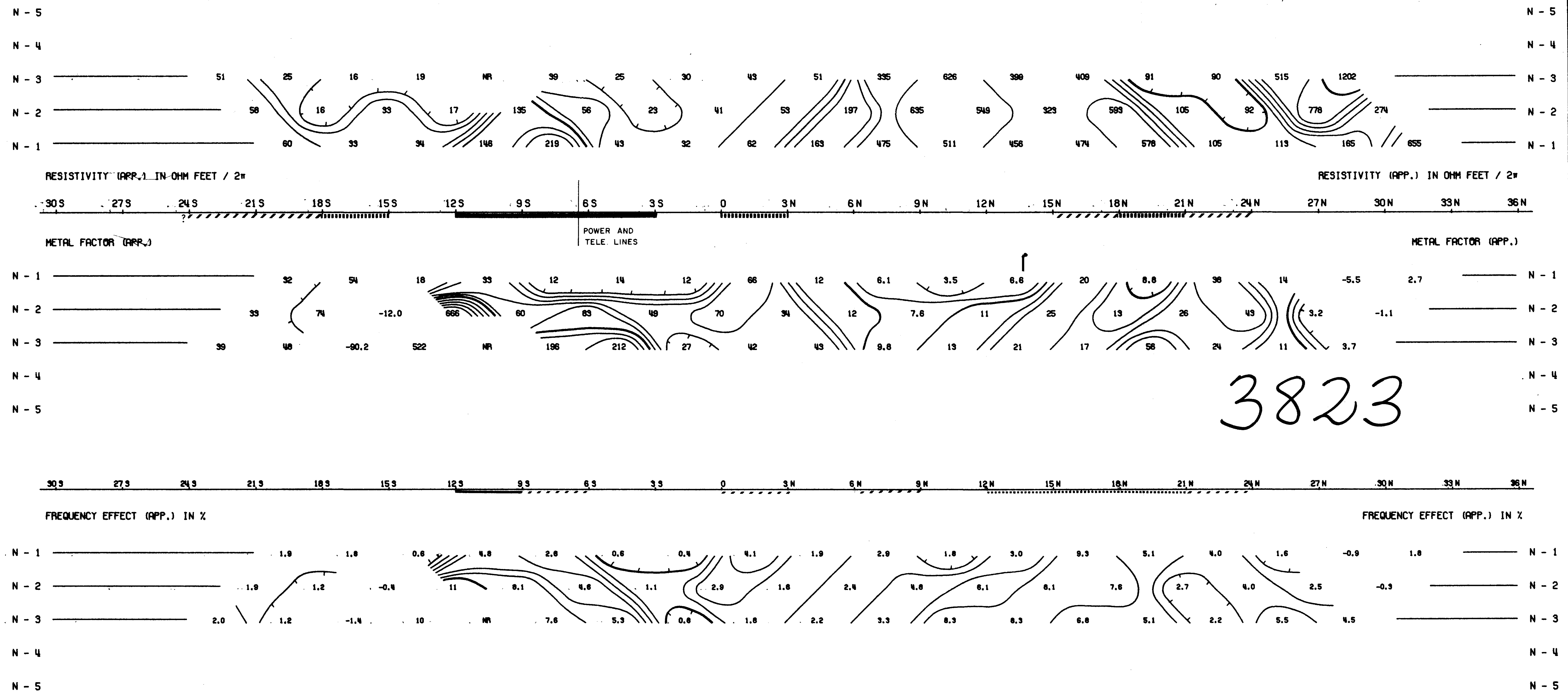
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.-5975-9

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 5600W

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

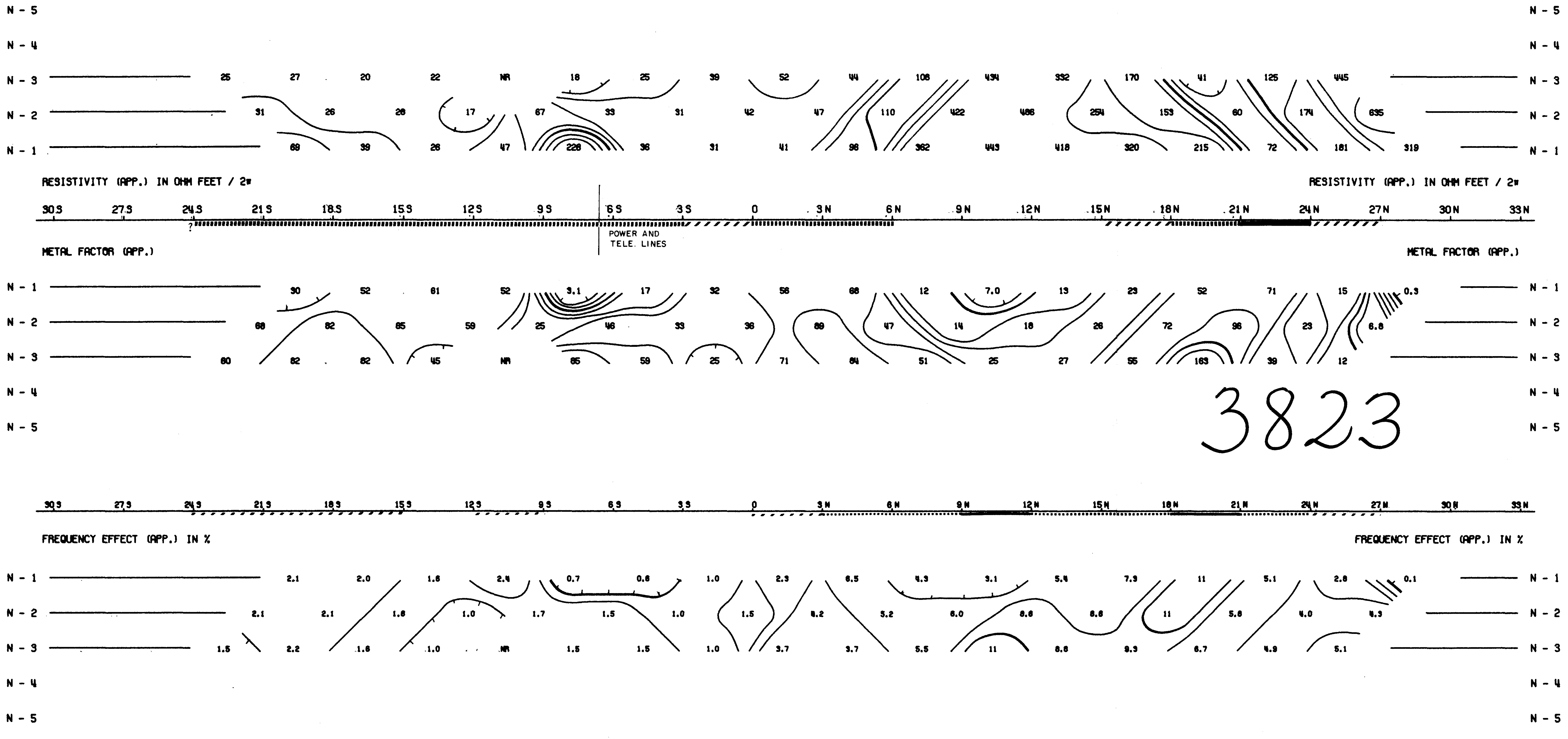
PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



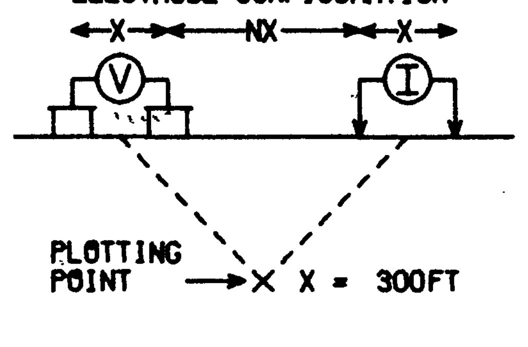
DWG. NO.- I.P.- 5975 - 8

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 6000W

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE [illegible] 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, PHILIP G. HALLOF

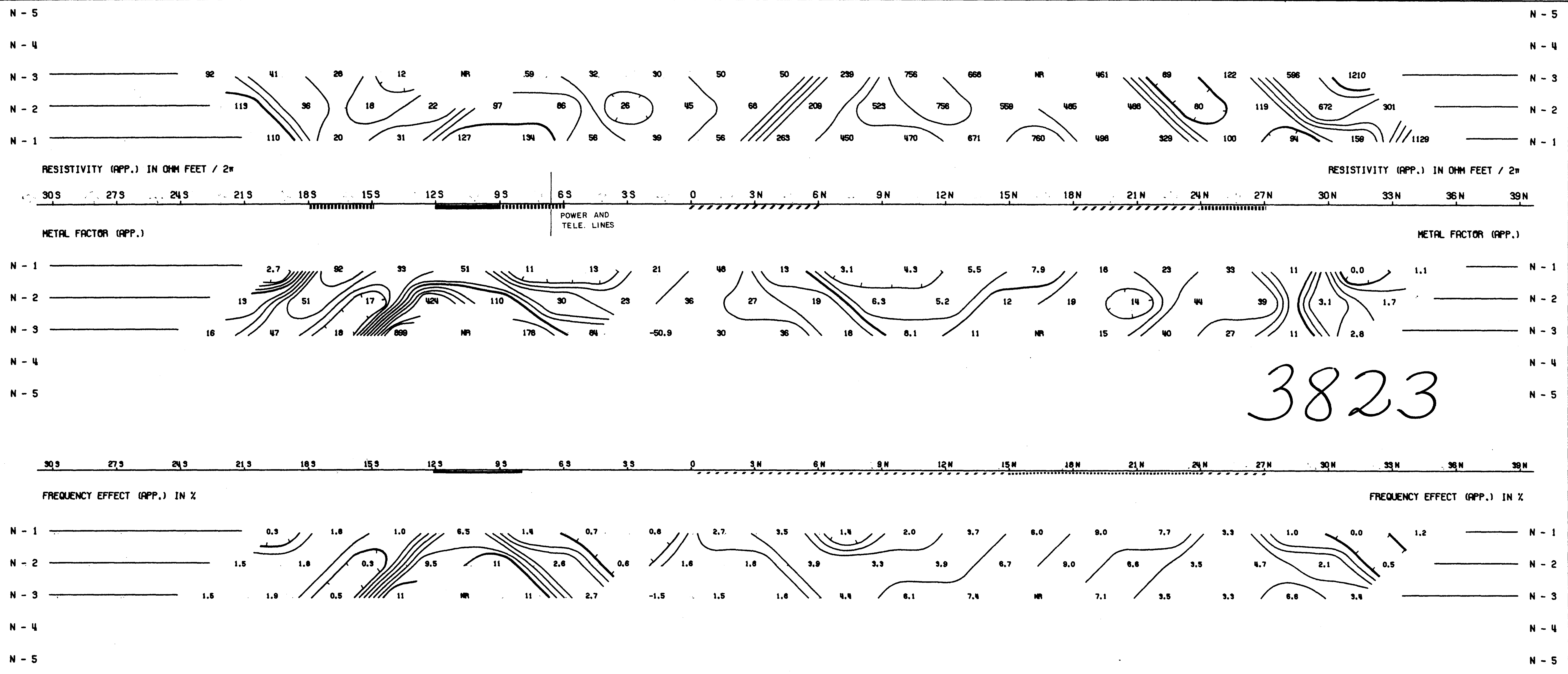
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



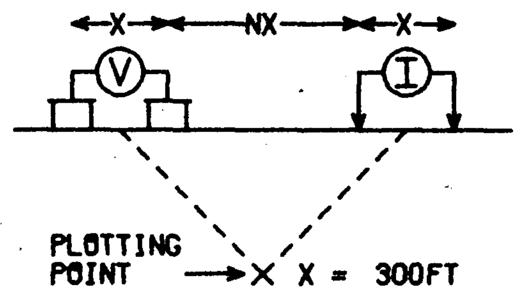
DWG. NO.- I.P.-5975-10

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 5200W

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION

DWG. NO.- I.P.-5975-11

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 4800W

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JAN 1972

APPROVED

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE

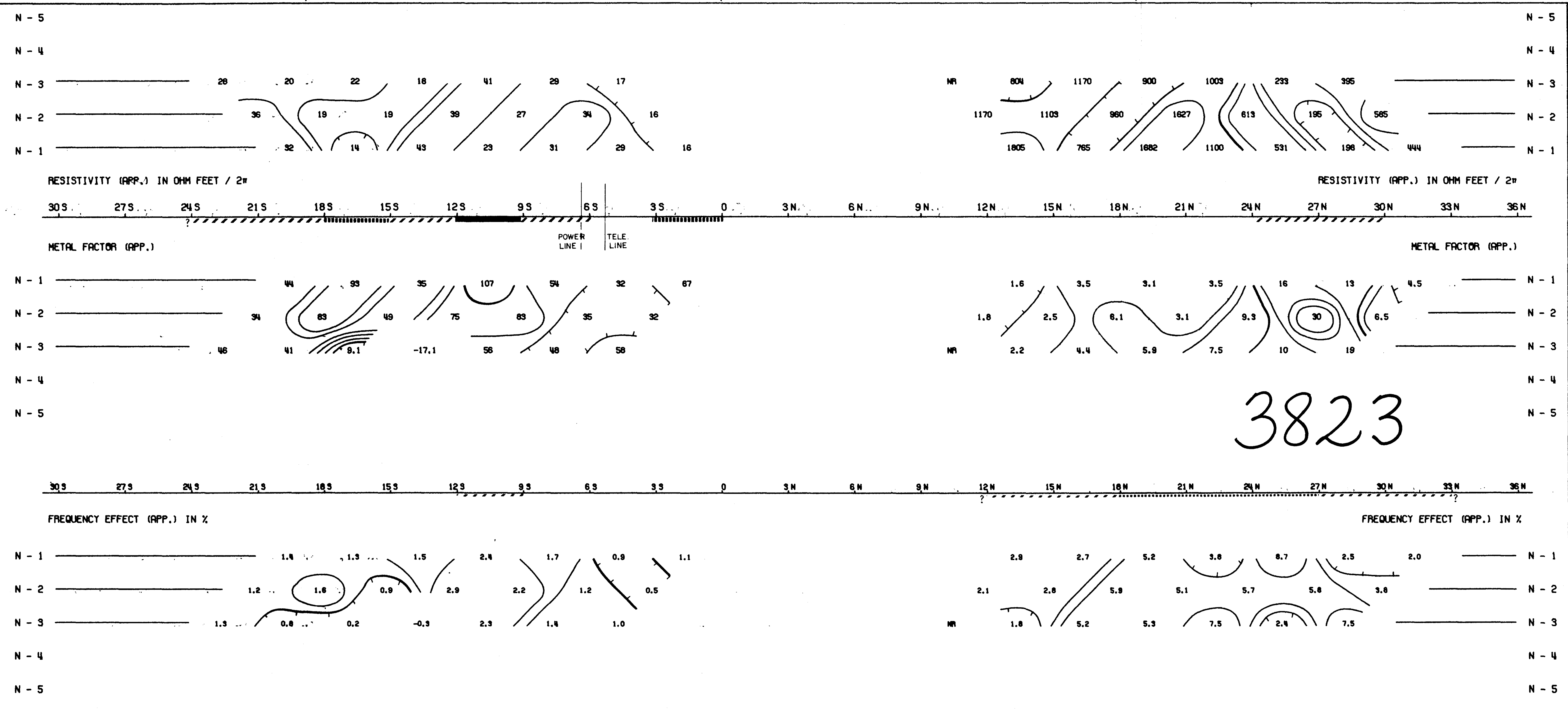
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



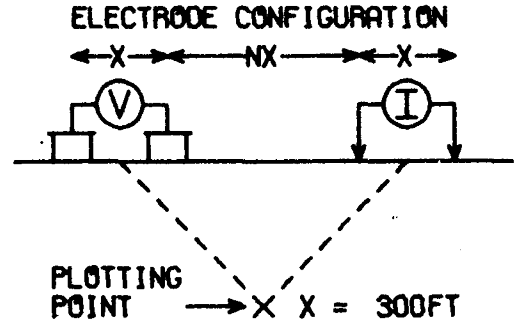
DWG. NO.- I.P.-5975-12

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 4400W

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25 1972

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION

DWG. NO.- I.P.-5975-13

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 4000W

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED

DATE

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

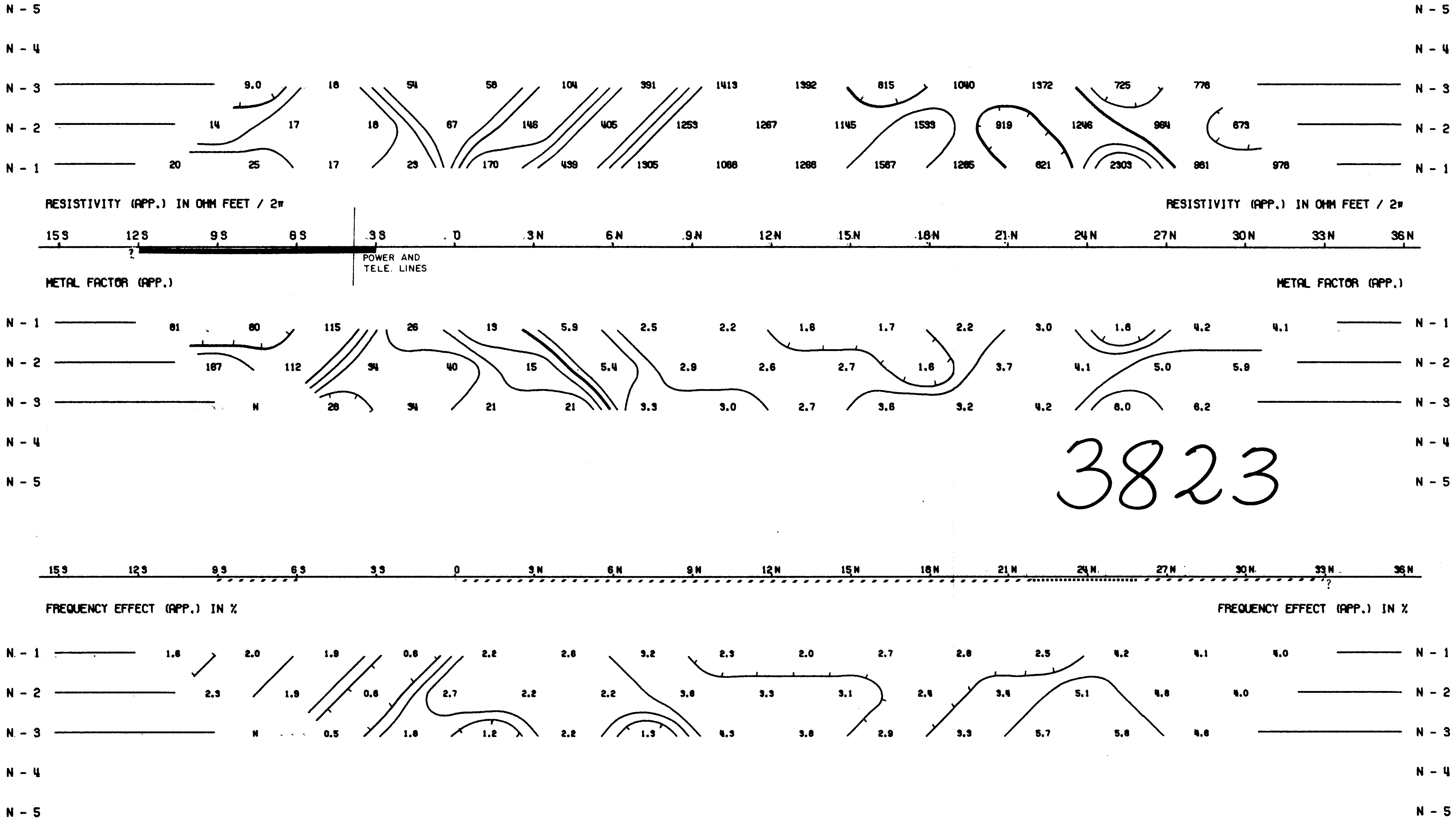
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

Expiry Date: February 25 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 5975 - 14

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 3600W

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

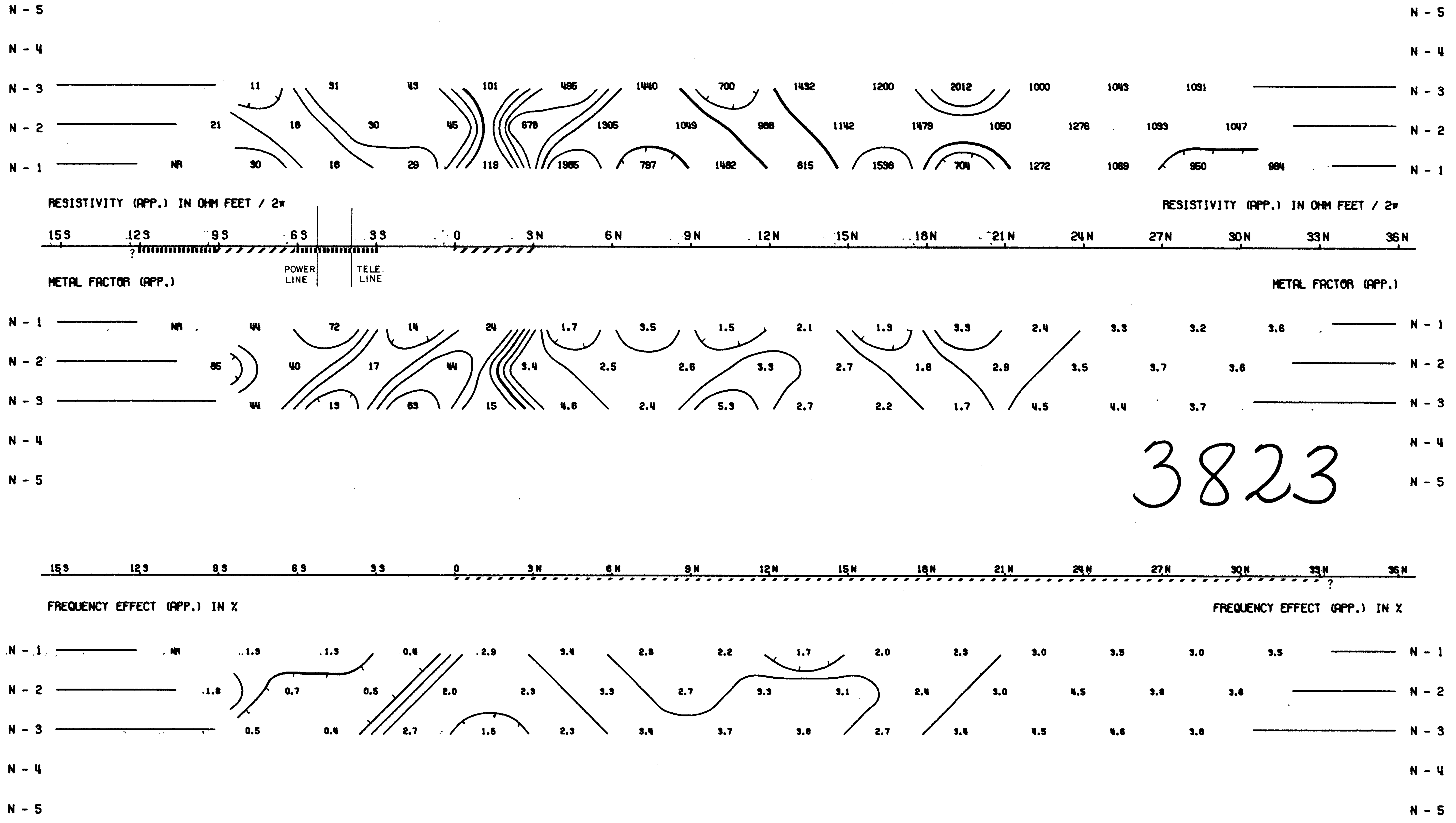
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.-5975-15

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 3200W

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE

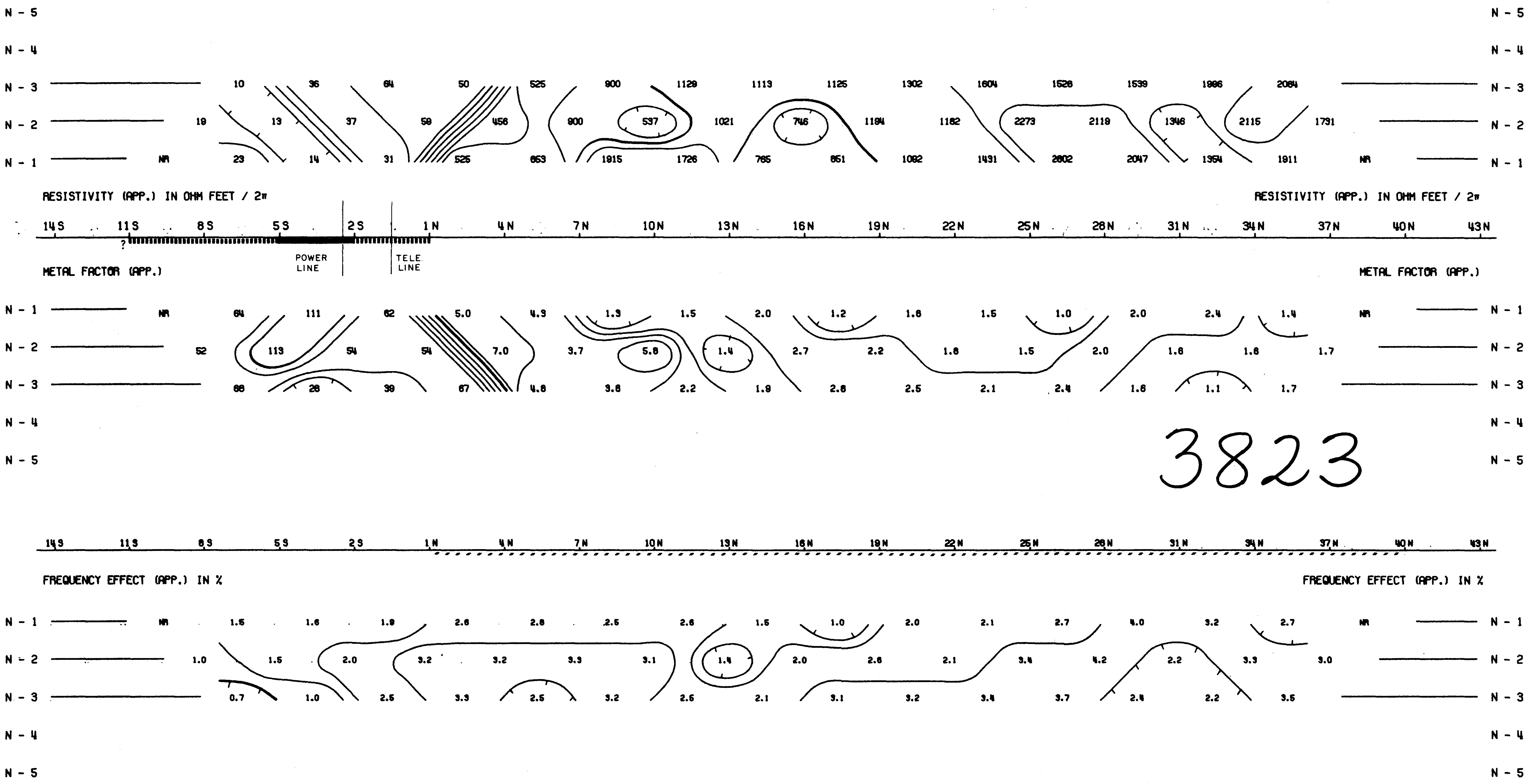
PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

Expiry Date February 25 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



3823

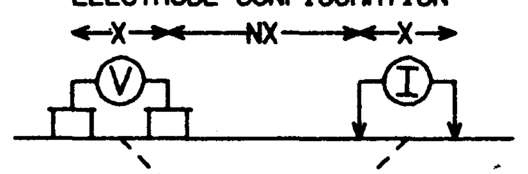
DWG. NO.- I.P.- 5975-16

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 2800W

ELECTRODE CONFIGURATION



PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED

DATE

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

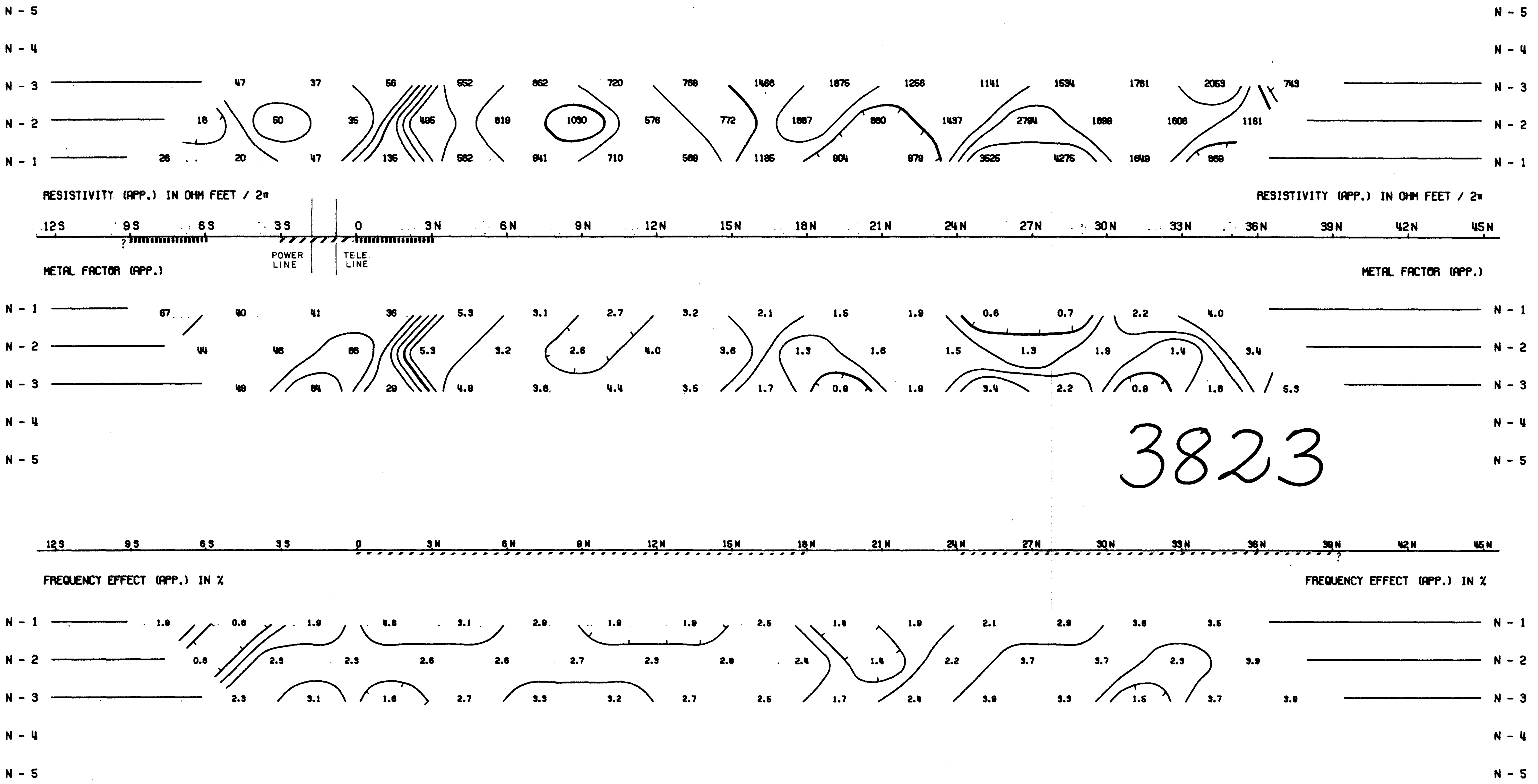
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA P. G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.-5975-17

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 2400W

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1972

APPROVED

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

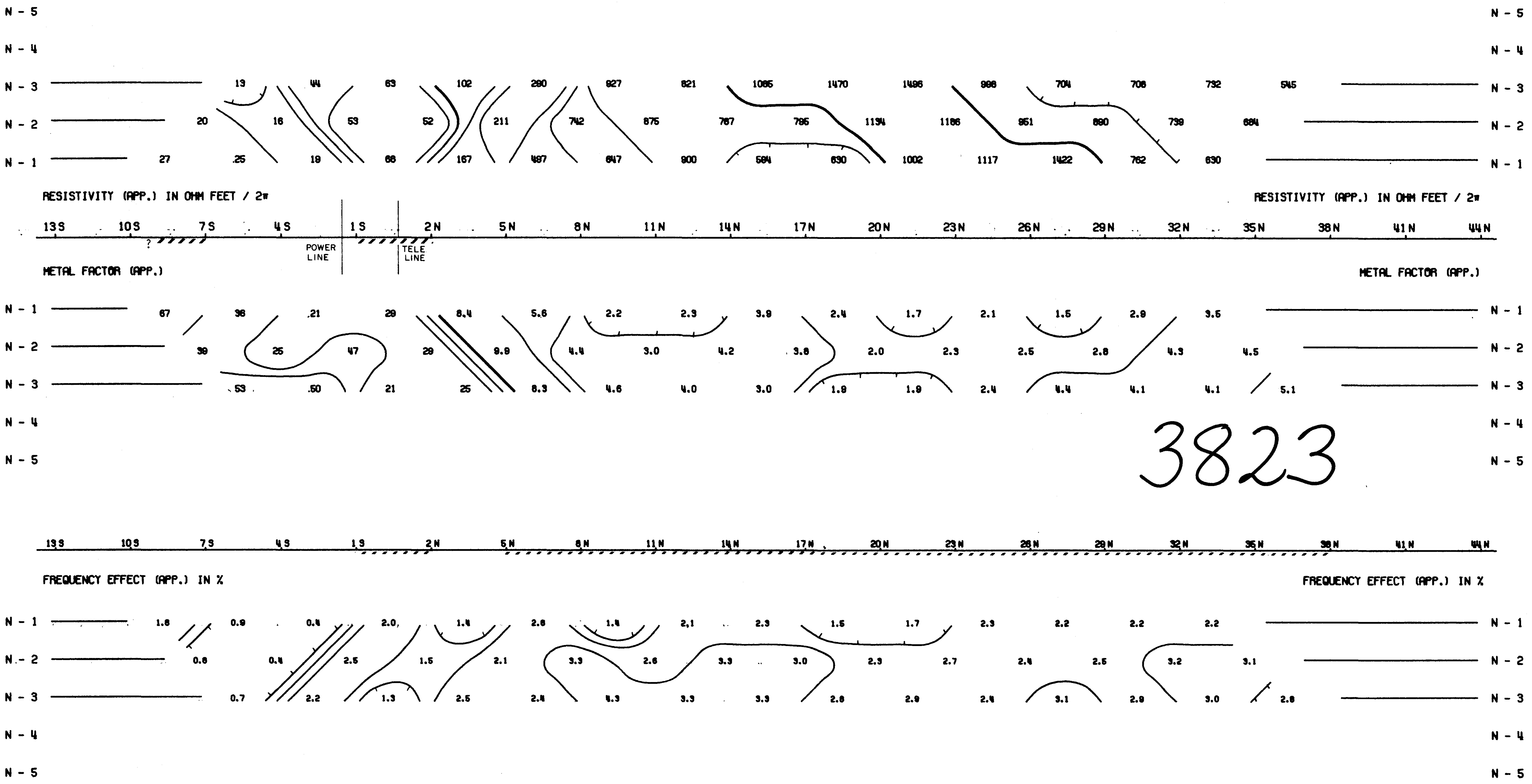
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



3823

DWG. NO.- I.P.- 5975-18

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 2000W

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JAN 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

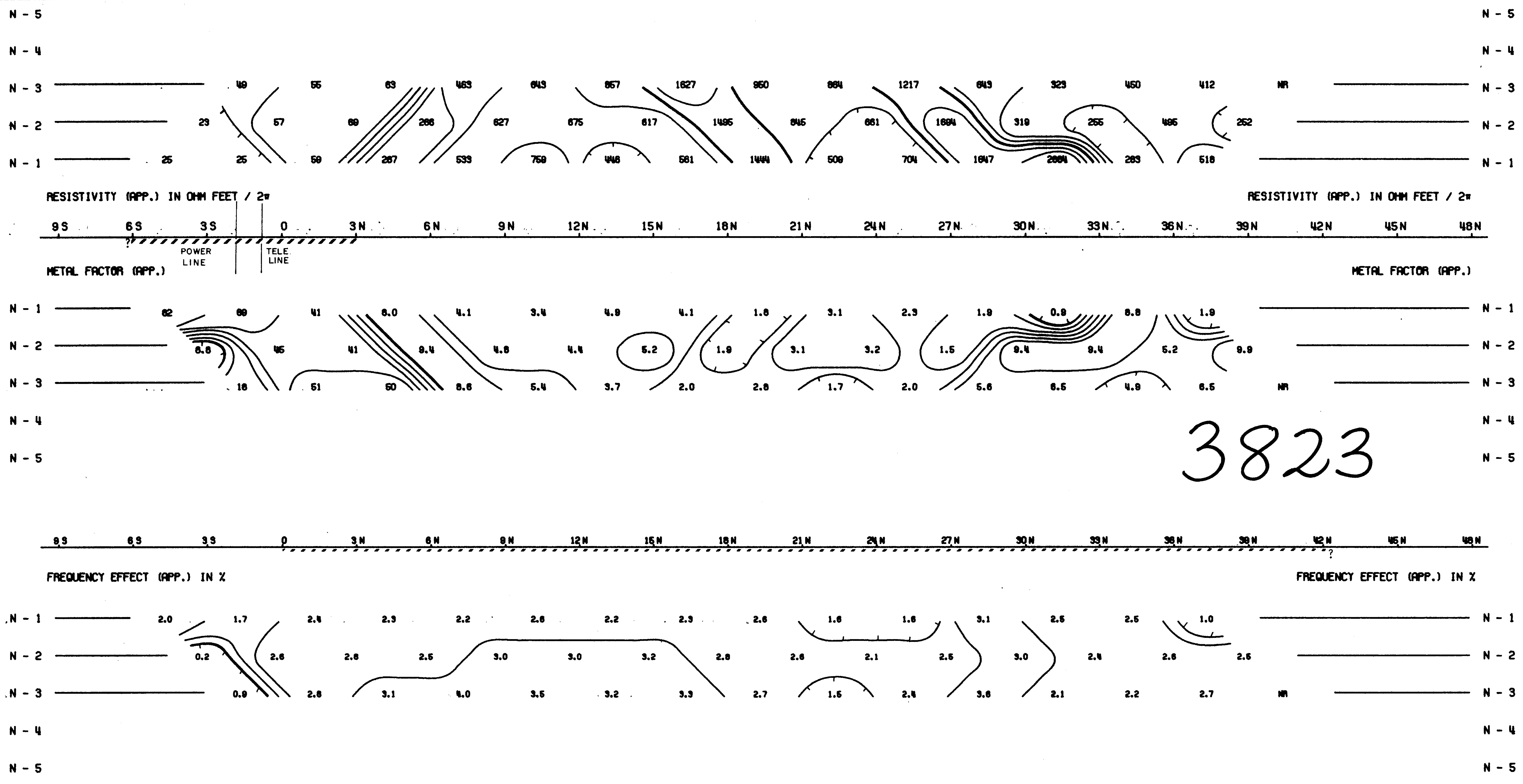
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.-5975-19

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 1600W

ELECTRODE CONFIGURATION

PLOTTING POINT

X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED:

DATE:

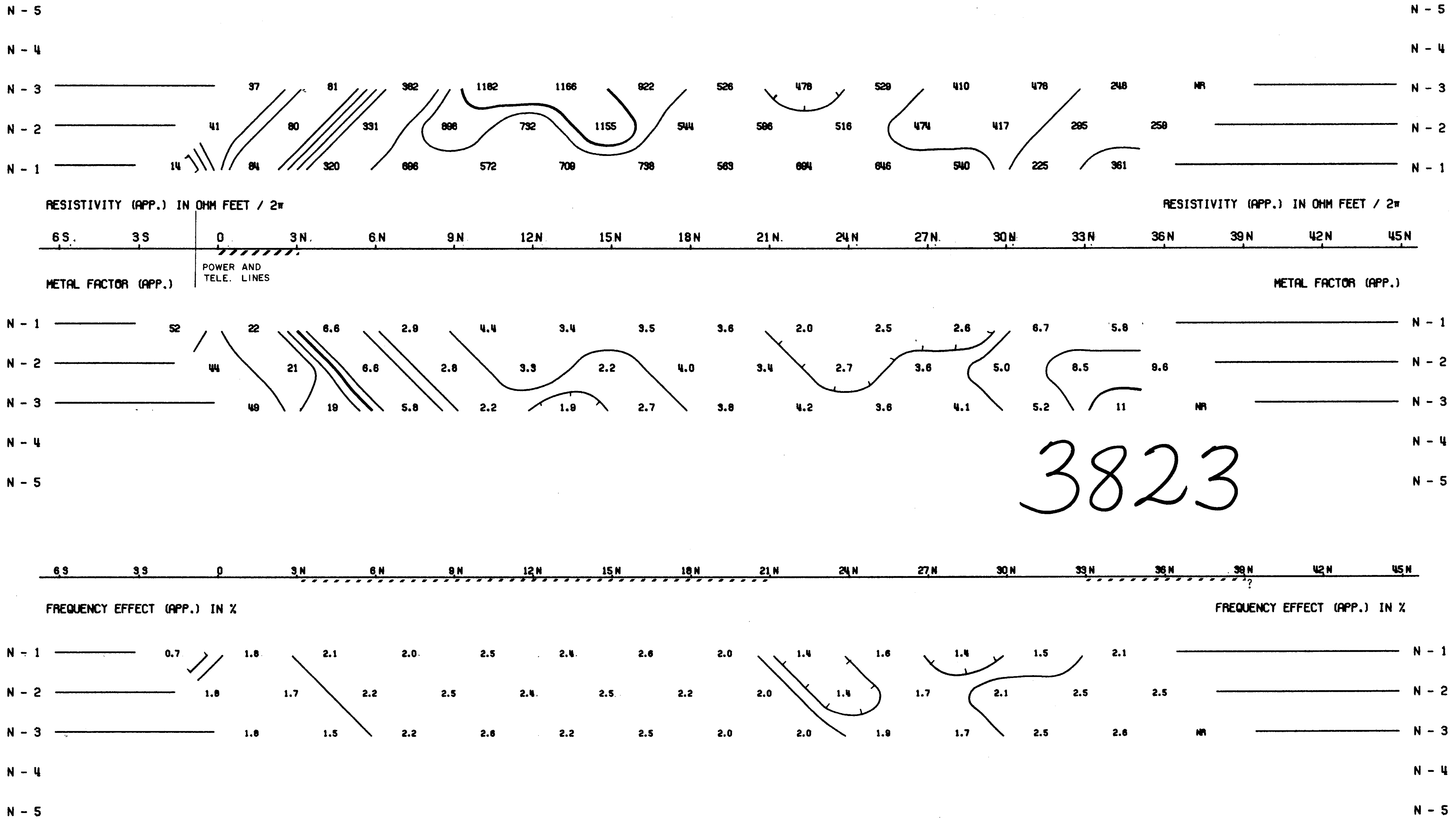
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 5975-20

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 1200W

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

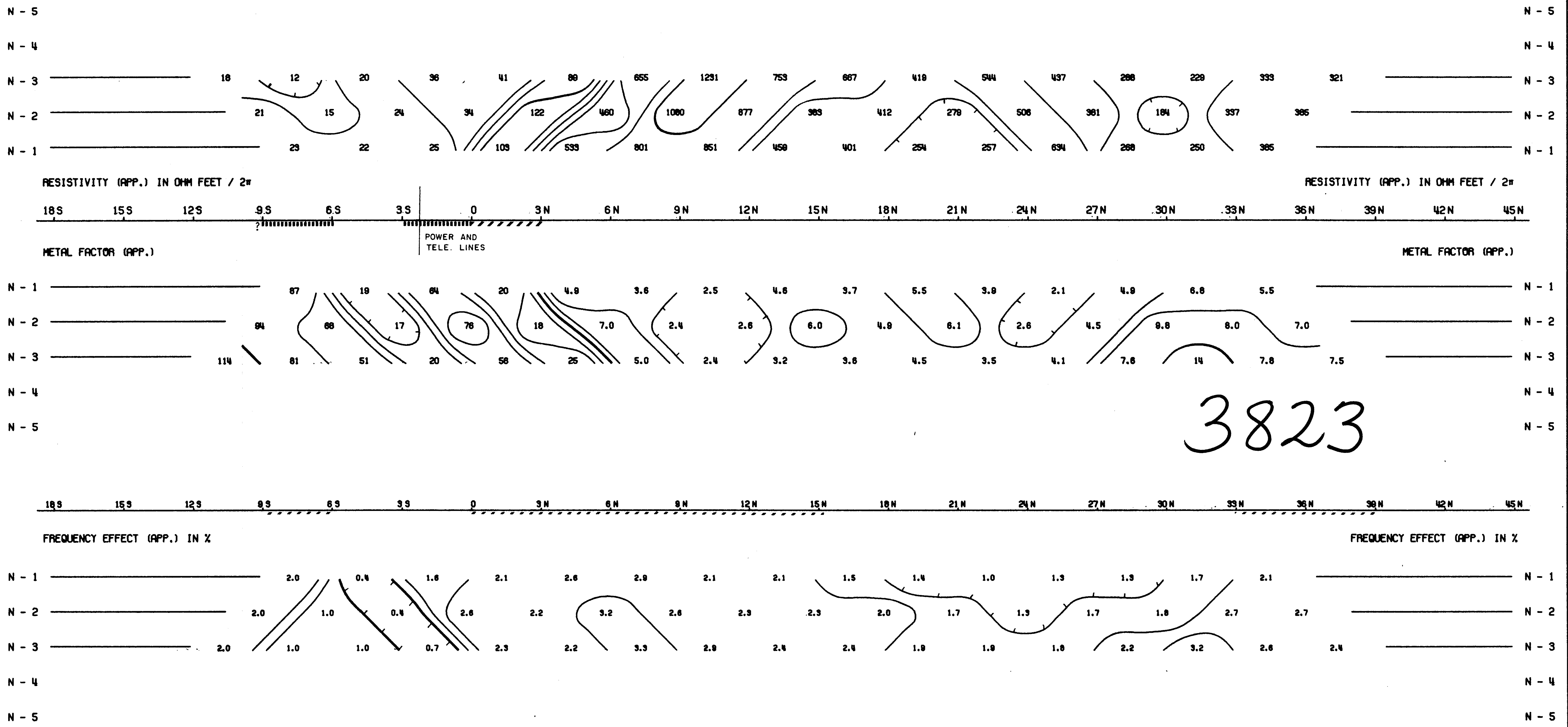
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



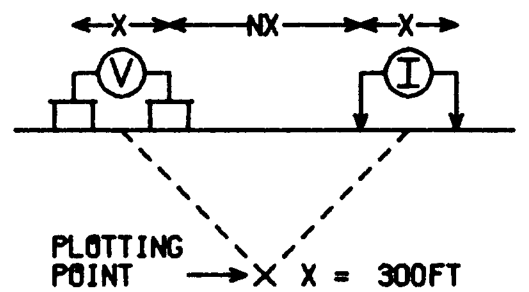
DWG. NO.- I.P.-5975-21

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 800W

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10.

DATE:

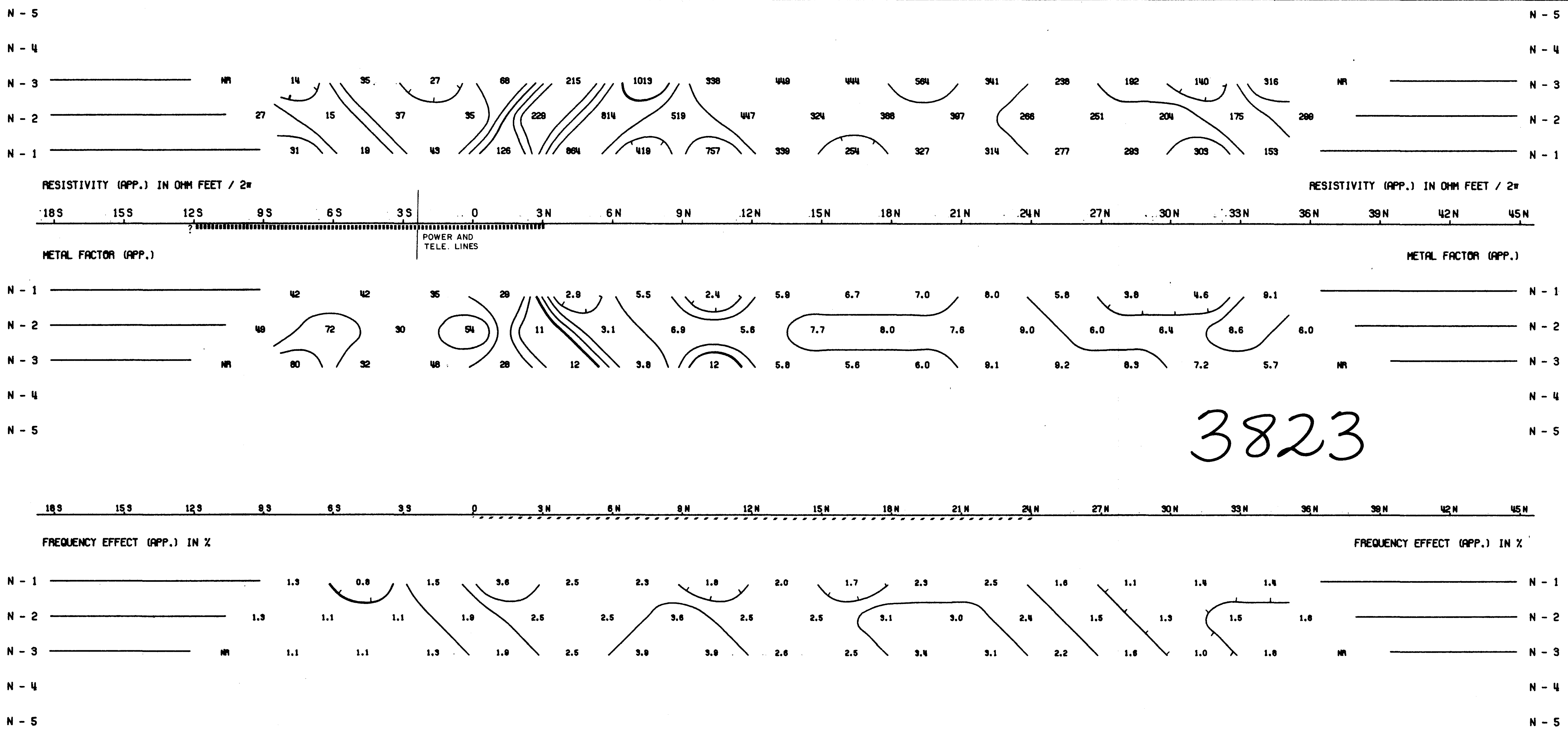
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 5975-22

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 400W

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
PHILIP G. HALLOF

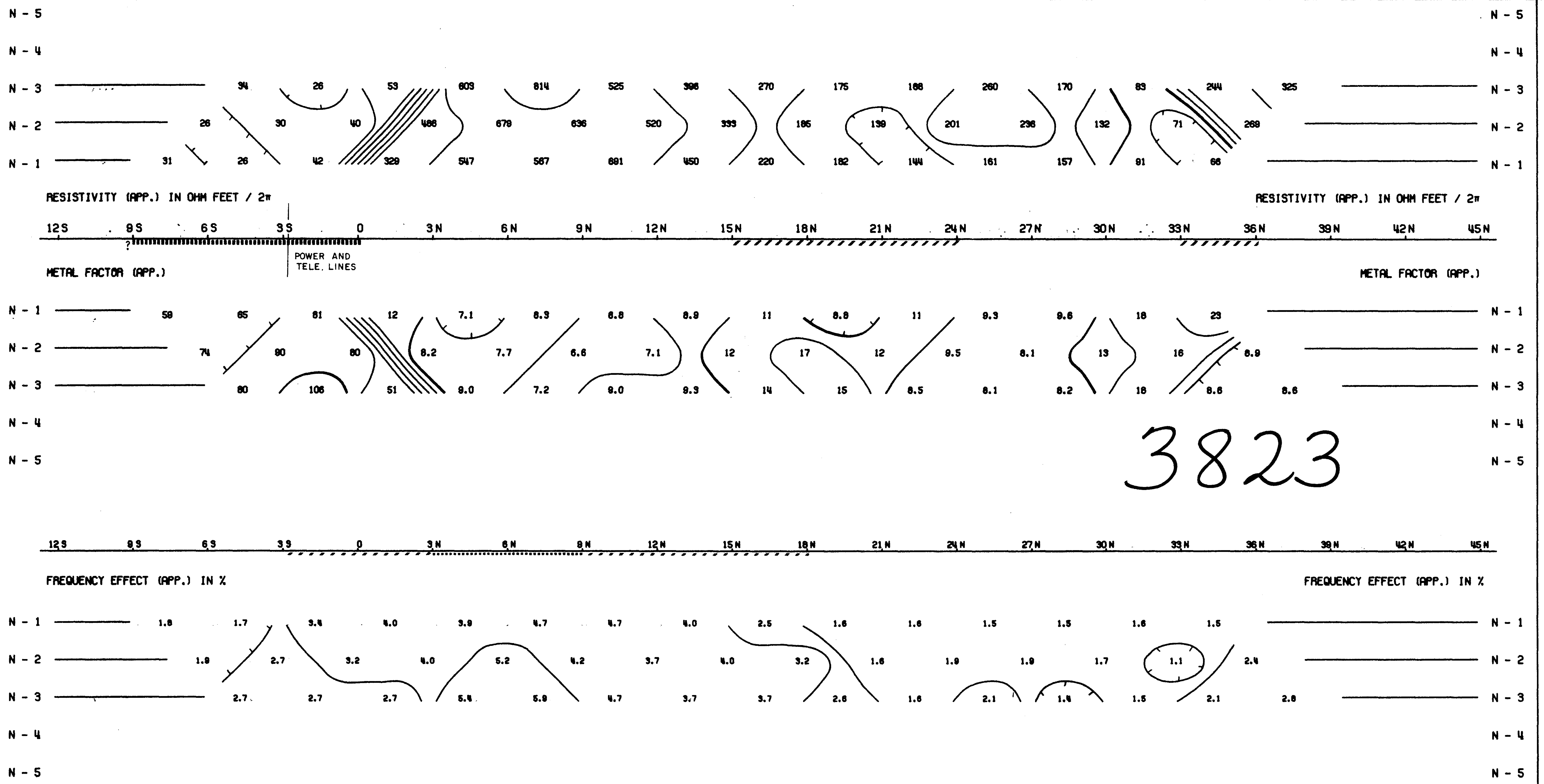
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 5975-23

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 0

ELECTRODE CONFIGURATION

PLOTTING POINT

X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

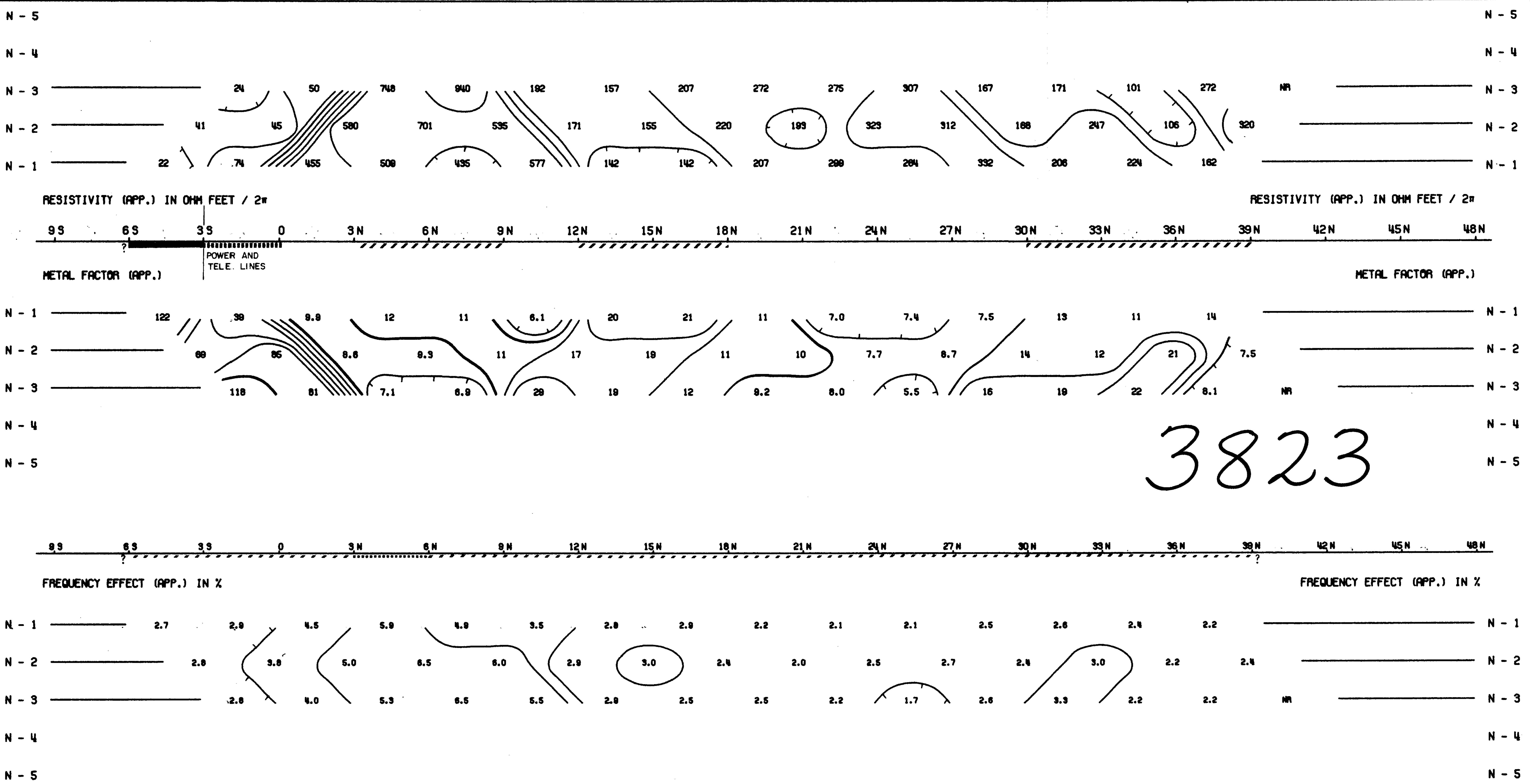
PROFESSIONAL ENGINEER
PHILIP G. HALLOF
BRITISH COLUMBIA

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



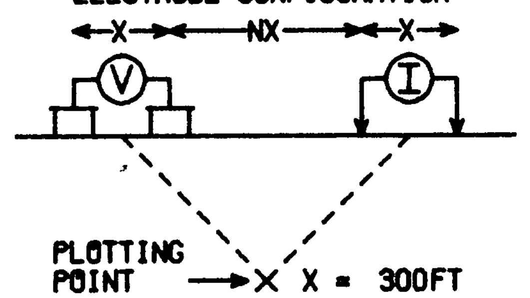
DWG. NO.- I.P.-5975-24

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 400E

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
PHILIP G. HALLOF

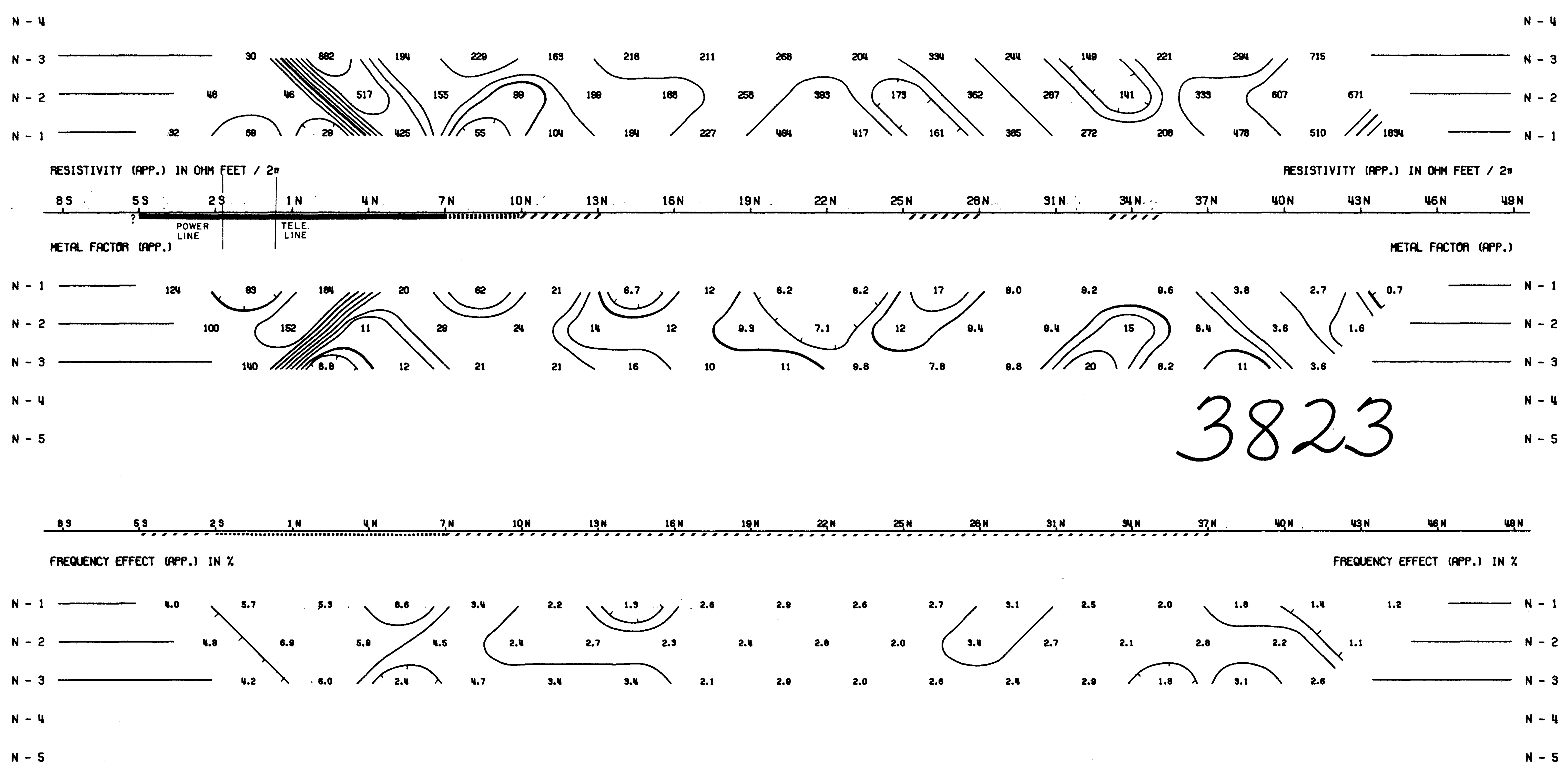
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.-5975-25

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 800E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED

DATE

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

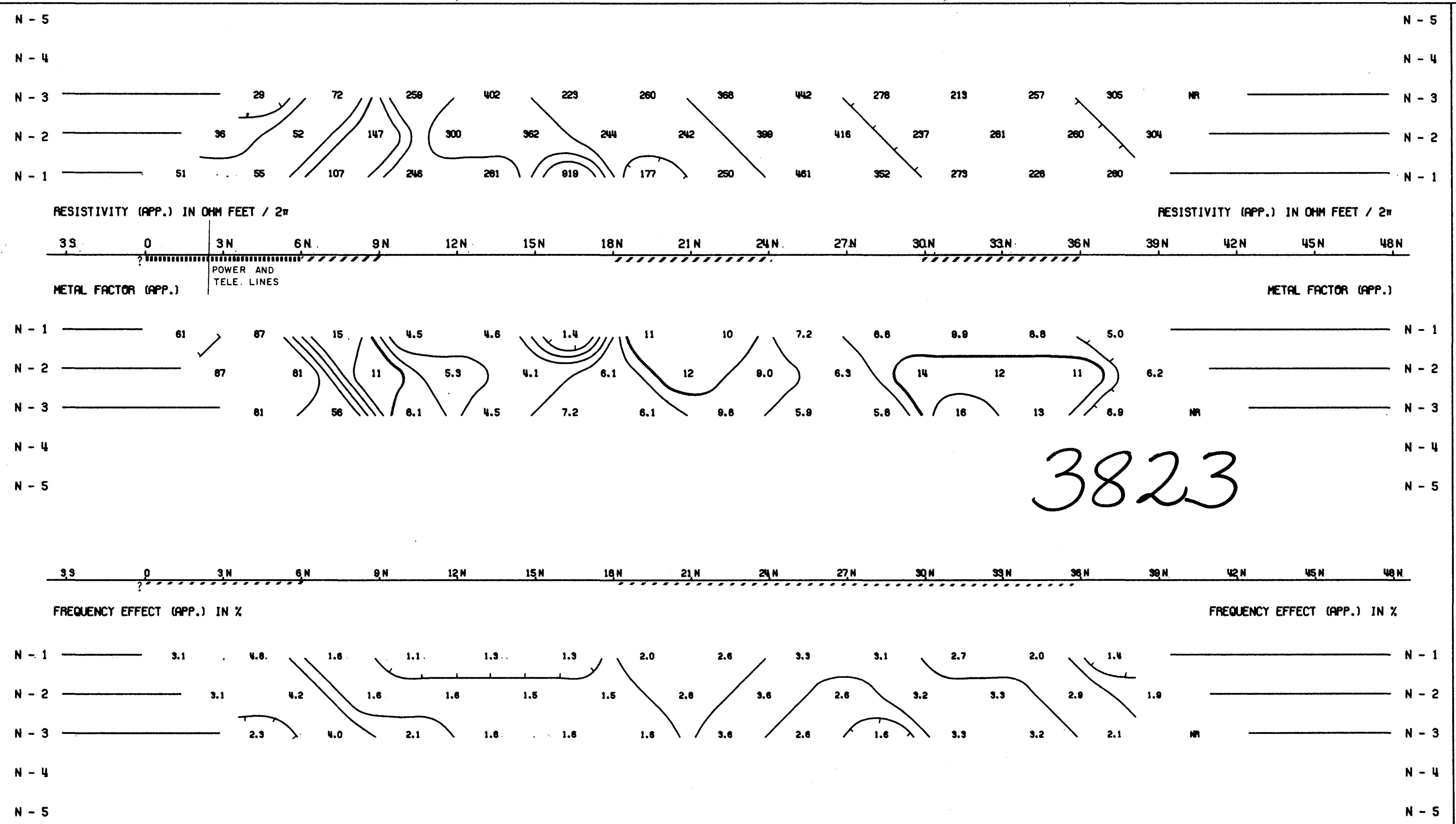
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



3823

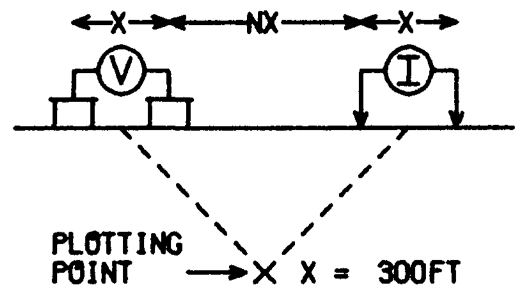
DWG. NO.- I.P.- 5975-26

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 1200E

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED

DATE

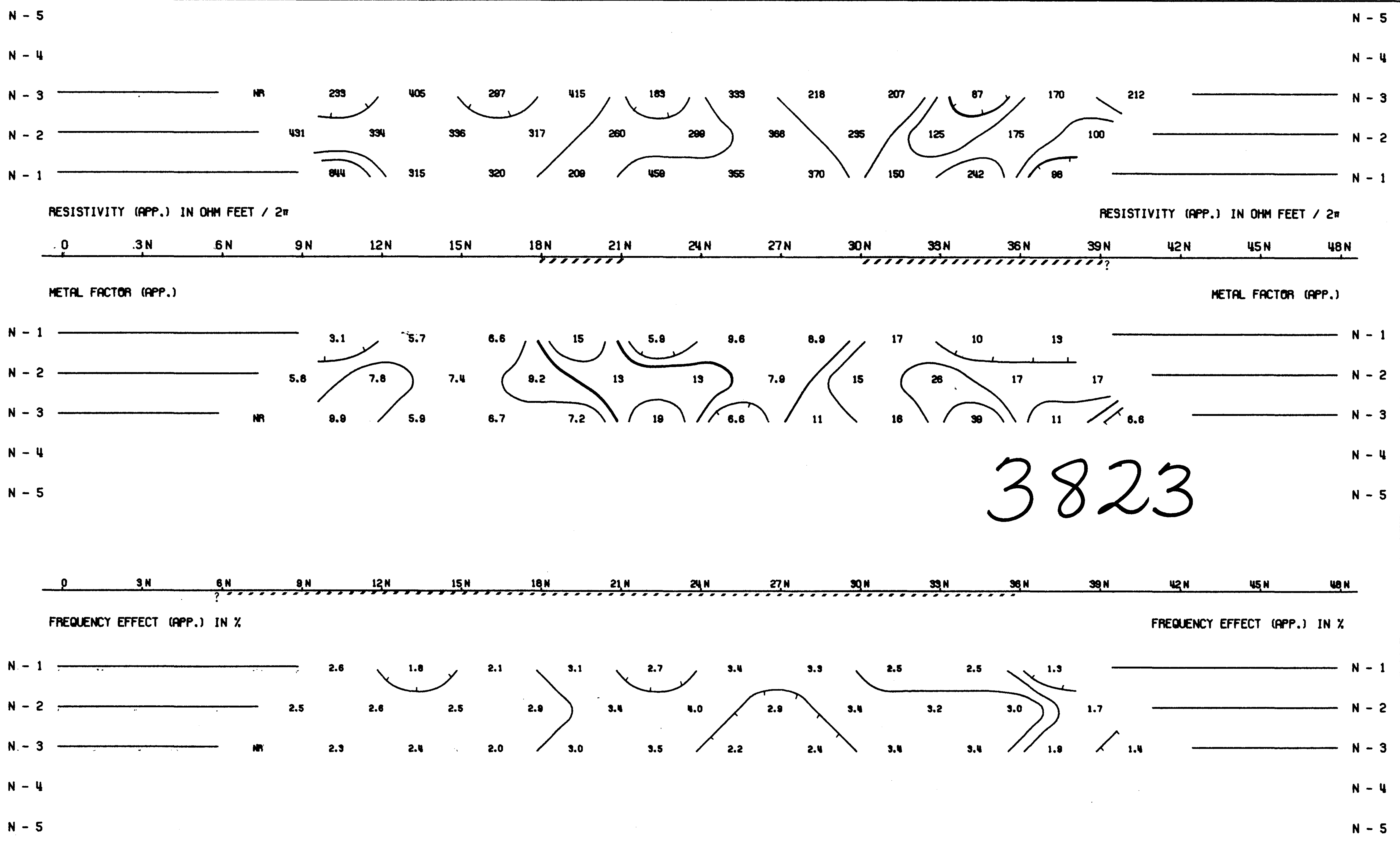
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



3823

DWG. NO.- I.P.-5975-27

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 1600E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

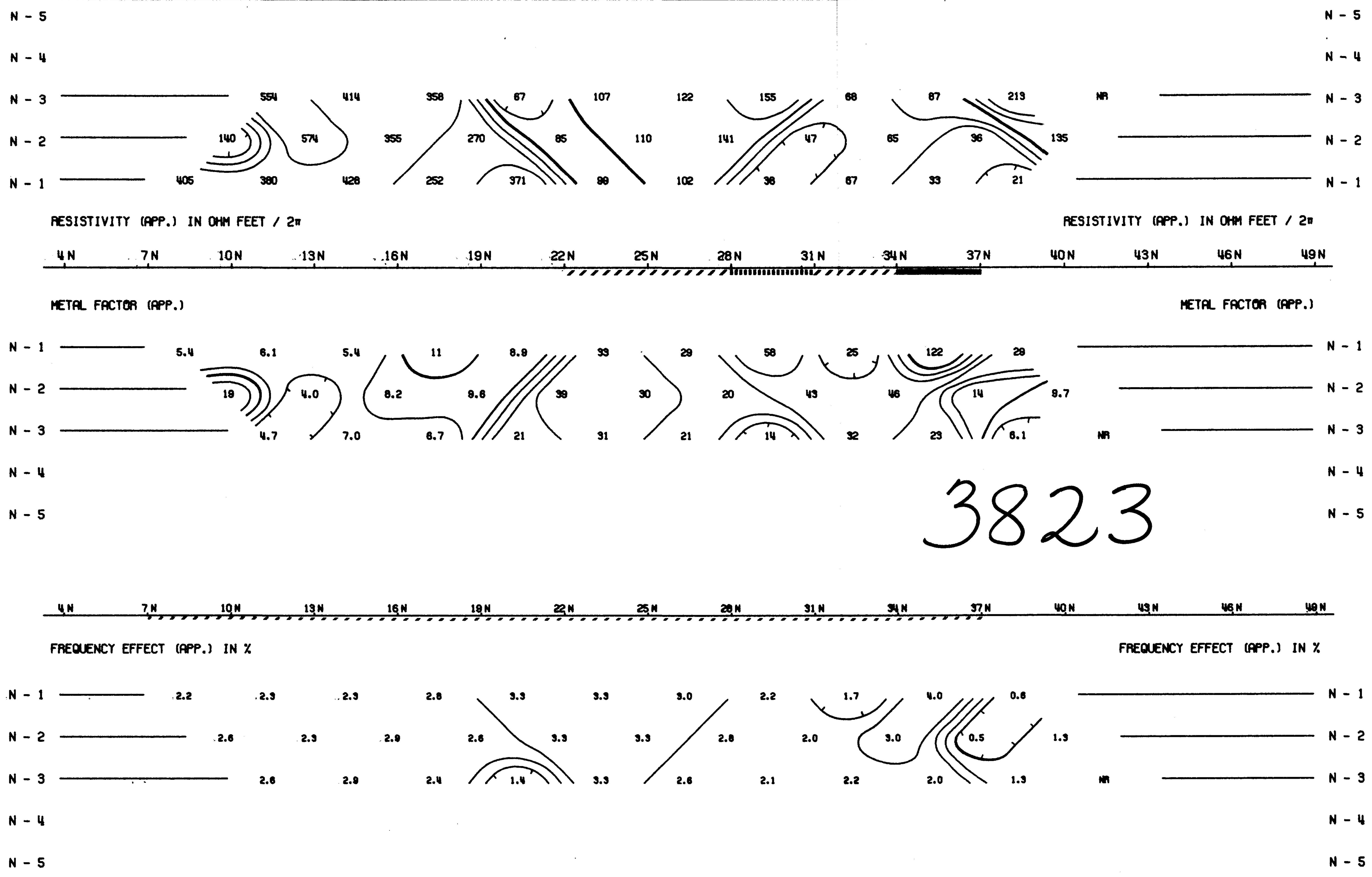
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.-5975-28

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 2000E

ELECTRODE CONFIGURATION

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

APPROVED:

DATE:

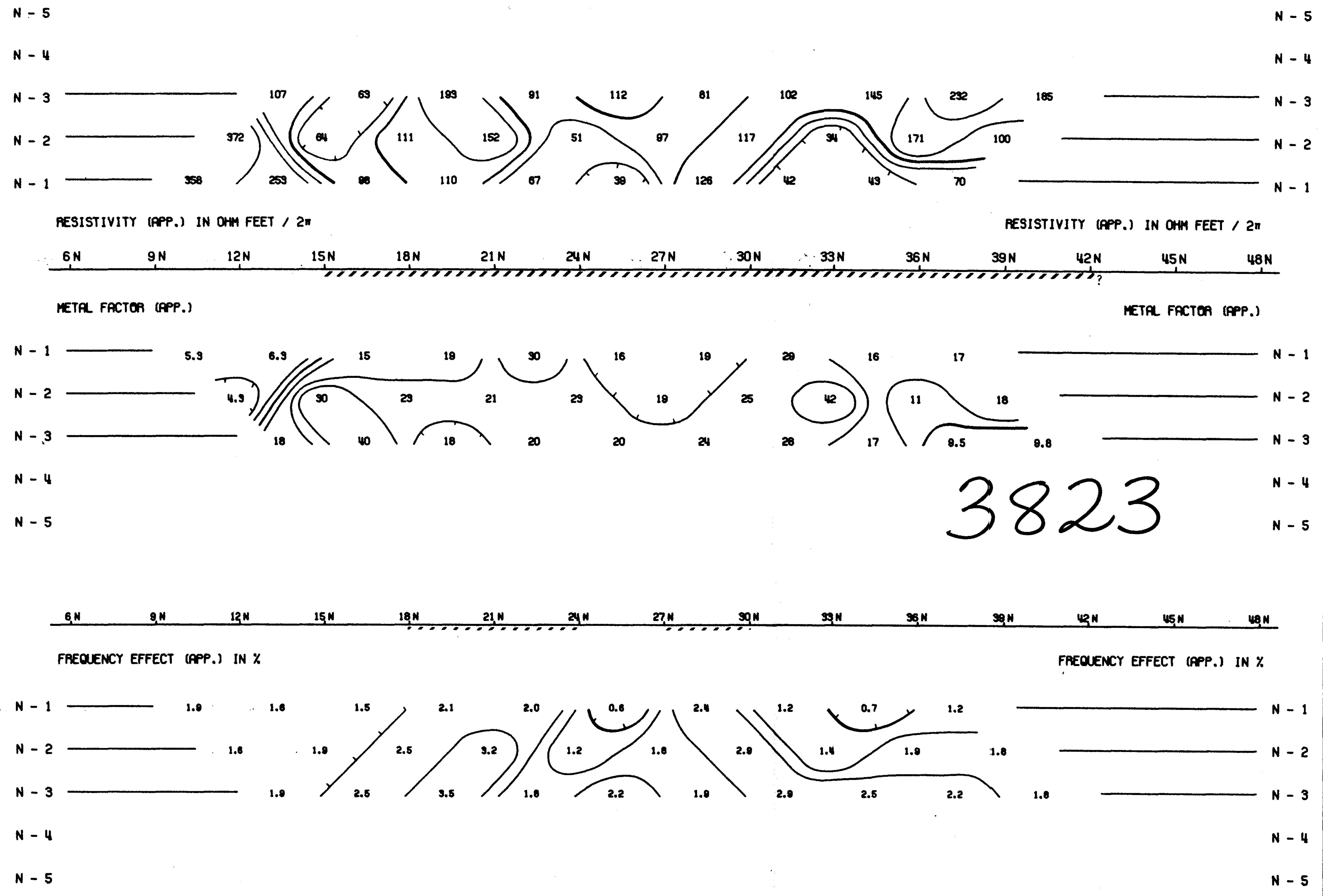
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 5975-29

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 2400E

ELECTRODE CONFIGURATION

X NX X

V I

PLOTTING POINT X   X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
PHILIP G. HALLOF

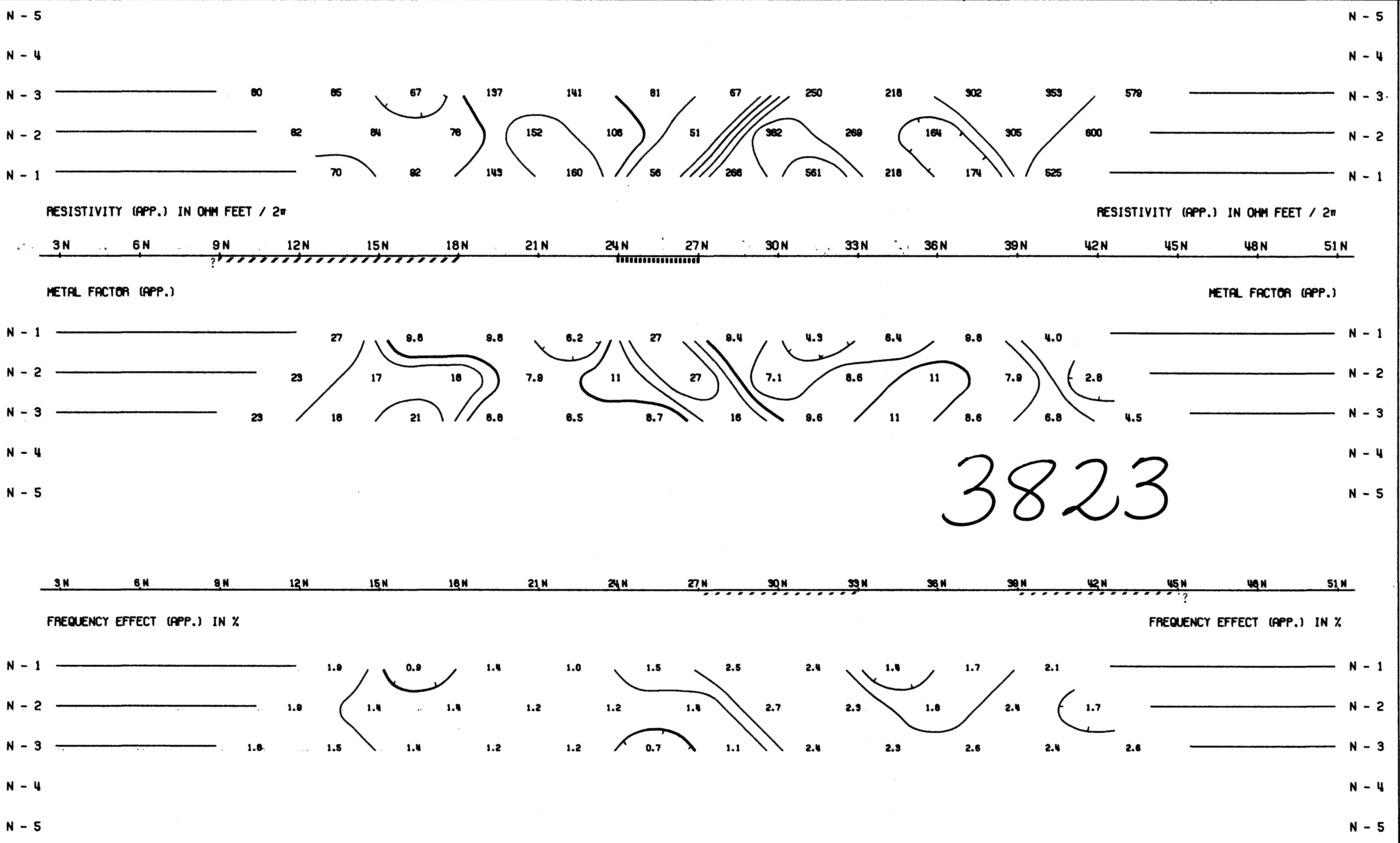
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



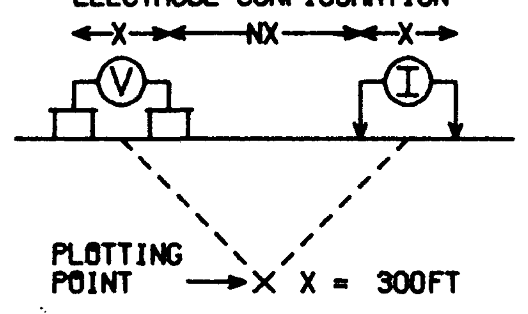
DWG. NO.- I.P.- 5975-30

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 2800E

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: MAY 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
PHILIP G. HALLOF

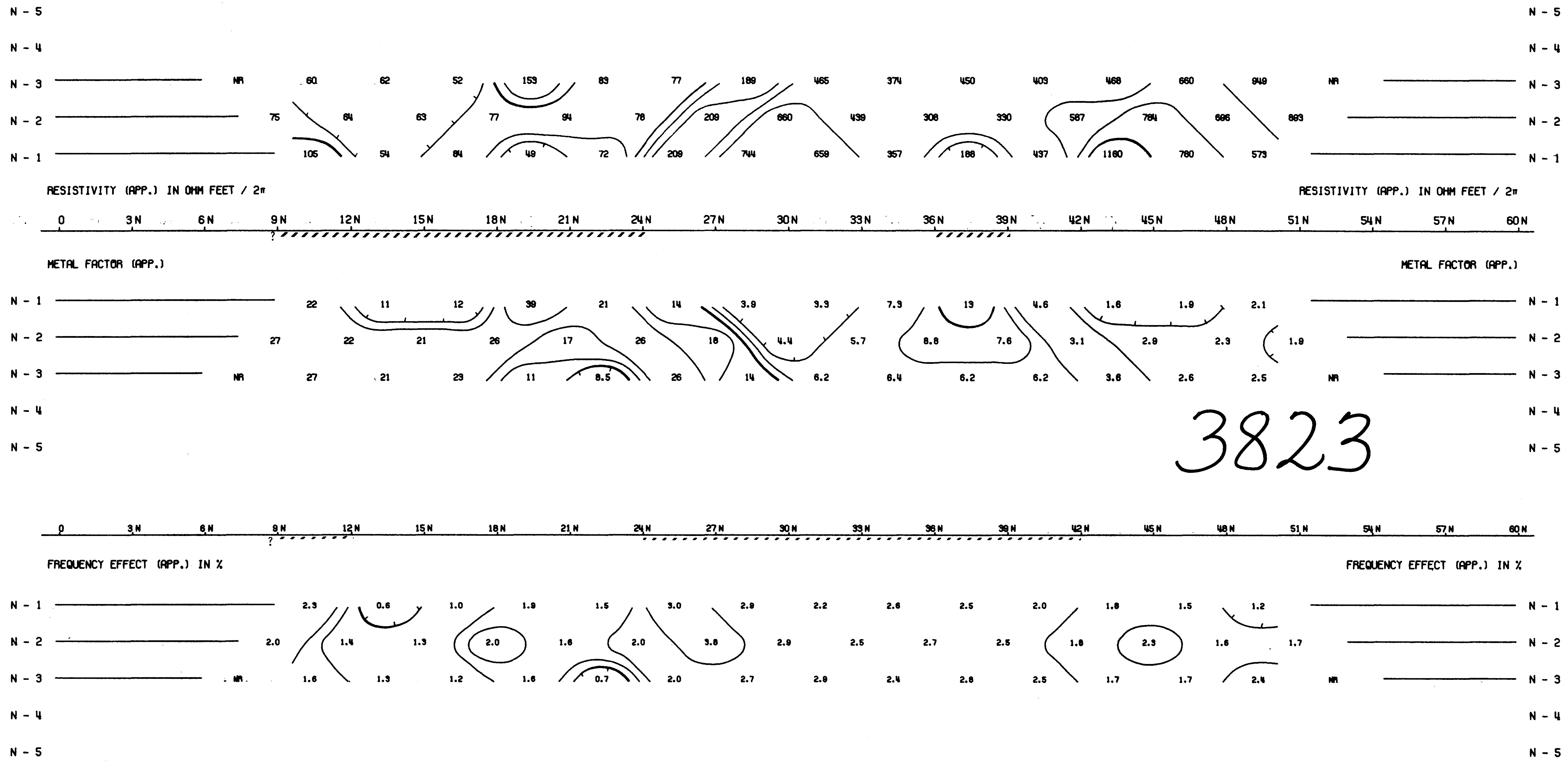
Expiry Date: February 25, 1974

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.-5975-31

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 3200E

ELECTRODE CONFIGURATION

X —— NX —— X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

DATE:

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

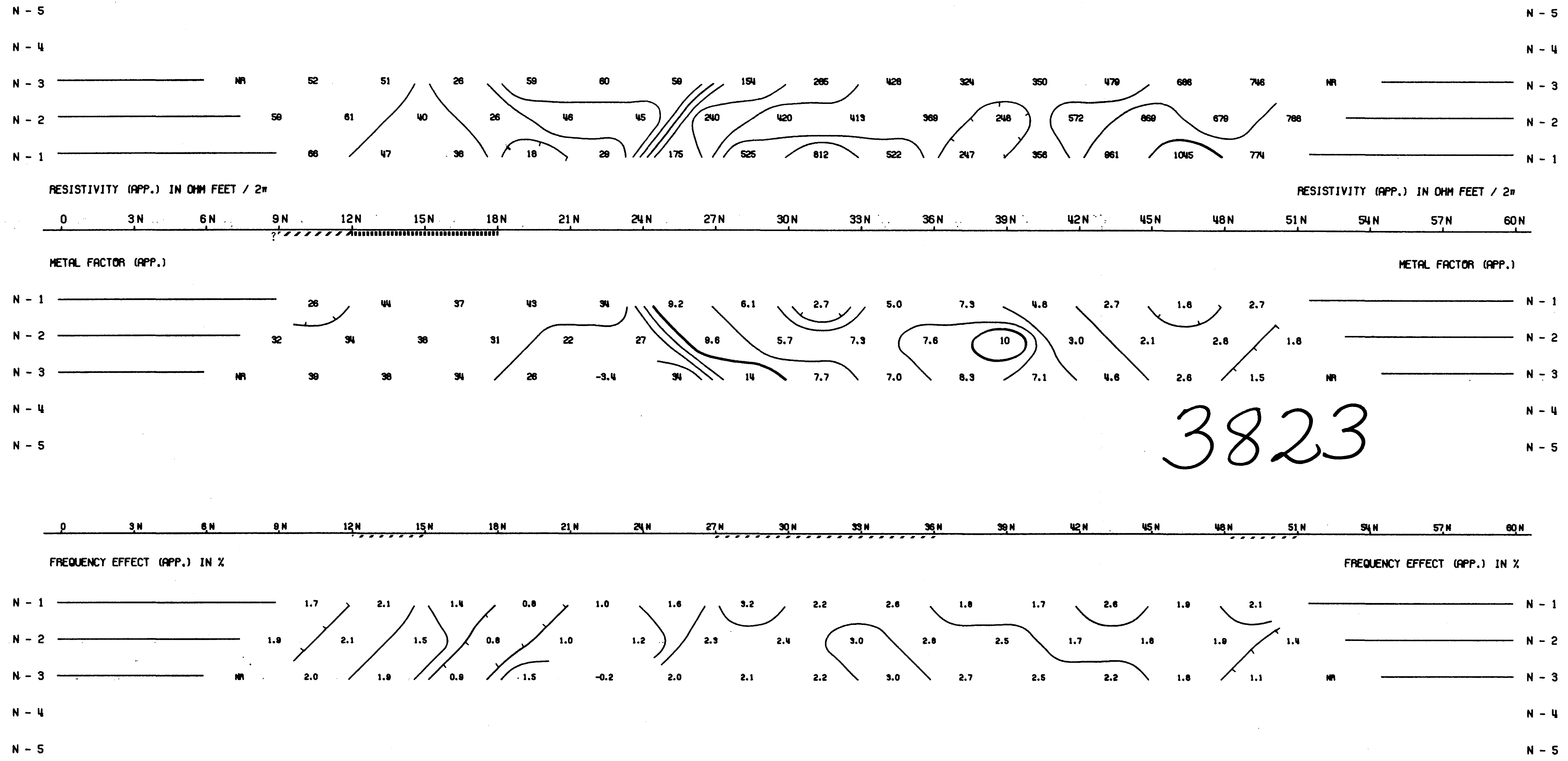
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 5975-32

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 3600E

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JAN 1972

APPROVED:

DATE

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

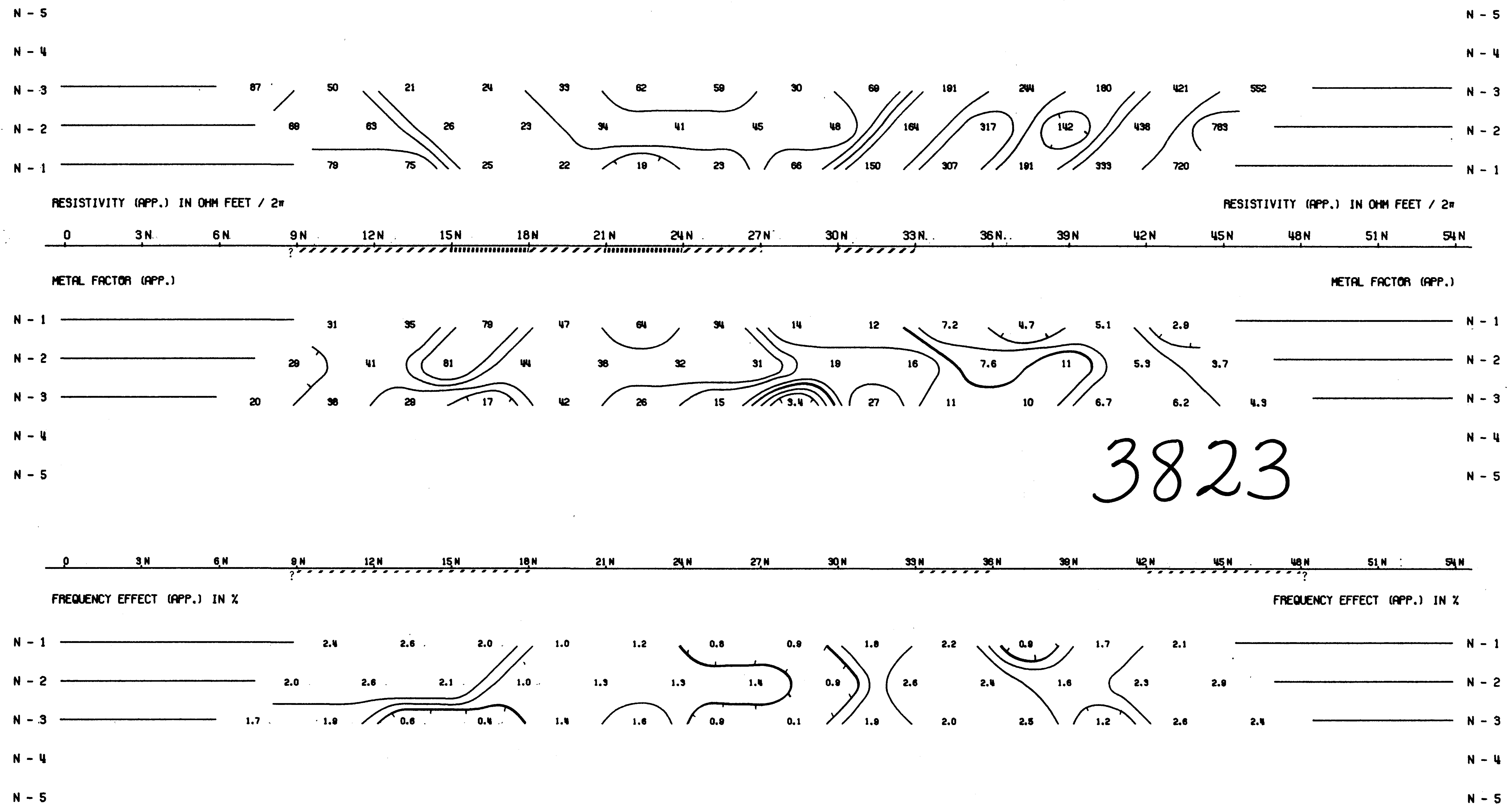
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 5975-33

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA, KAMLOOPS M.D., B.C.

LINE NO.- 4000E

ELECTRODE CONFIGURATION

X — NX — X

V   I

PLOTTING POINT — X   X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

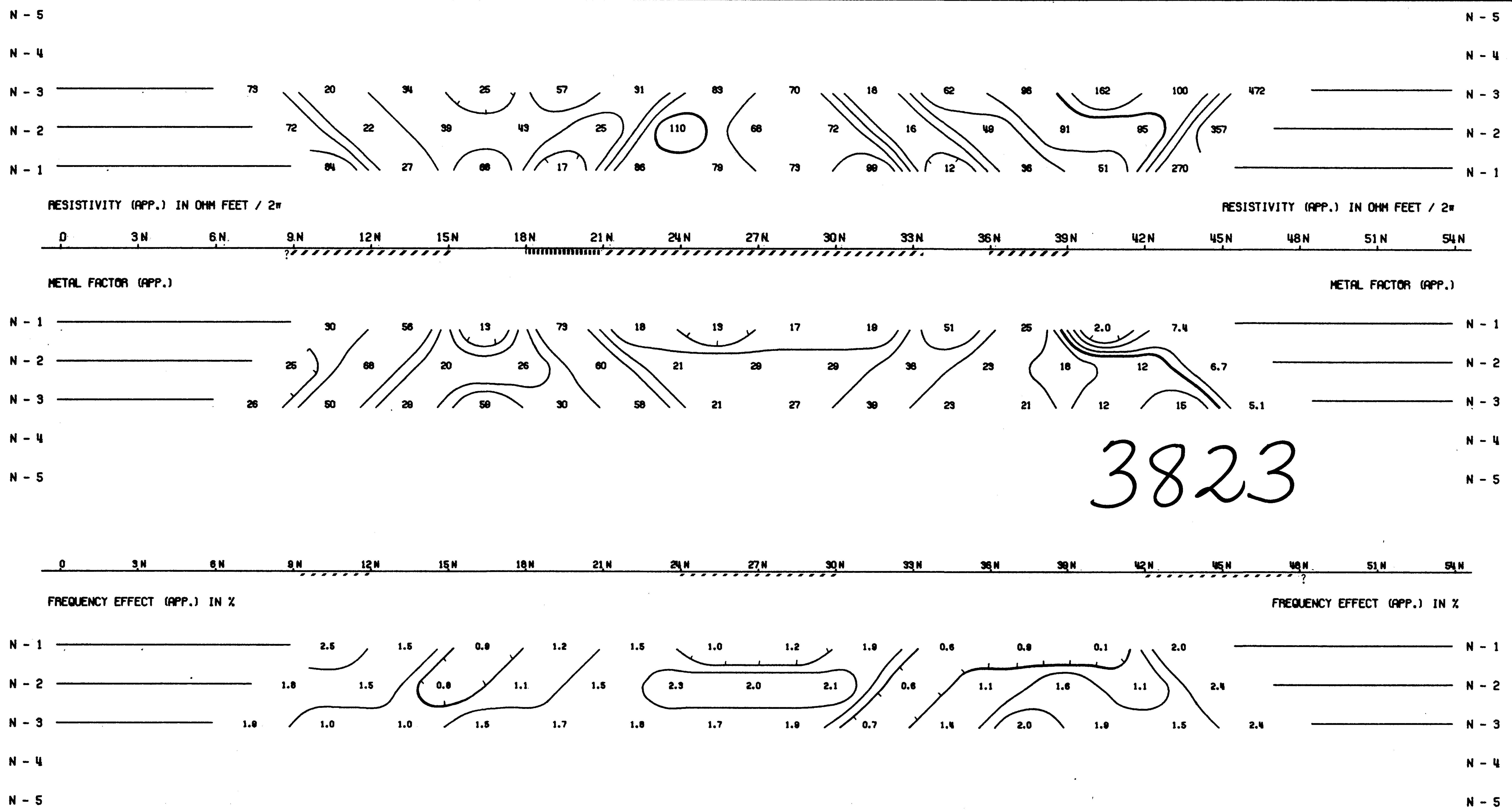
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

Expiry Date: February 28, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.-5975-34

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 4400E

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUN 1972

APPROVED:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
PHILIP G. HALLOF

DATE:

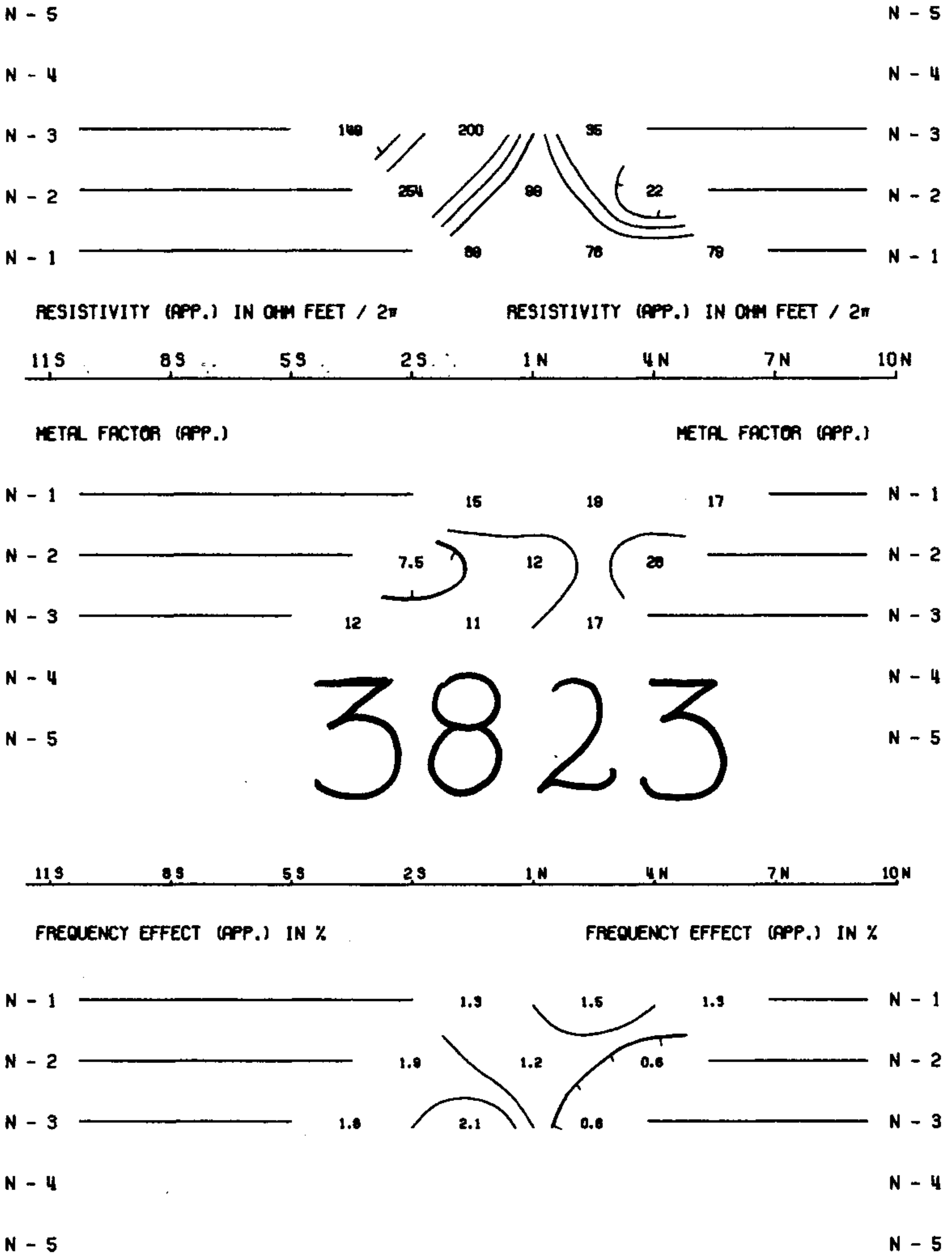
Expiry Date: February 25, 1973

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



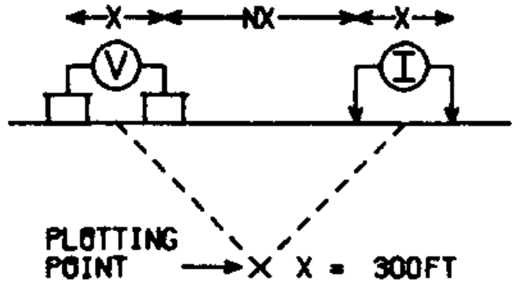
DWG. NO.- I.P.- 5975-1

TORWEST RESOURCES (1962) LTD., N.P.L.

COPPER KING PROPERTY, CHERRY CREEK AREA,
KAMLOOPS M.D., B.C.

LINE NO.- 800W (B/L-A)

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: ... 1972

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE: 29/8/72

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — PHILIP G. HALLOF

Expiry Date: February 25, 1973

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION