2488

REPORT ON
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
OF
PROJECT 82 - FLAGSTONE MINES
KAMLOOPS M.D.
HIGHLAND VALLEY AREA, B.C.
FOR
PHELPS DODGE CORPORATION
OF CANADA LIMITED

92 I/6E
no deposit plotted

BY


ROBERT A. BELL, Ph.D.

DAVID KIRKMAN FOUNTAIN, P.Eng.


NAME AND LOCATION OF PROPERTY

PROJECT 82 - FLAGSTONE MINES, HIGHLAND VALLEY AREA,

KAMLOOPS MINING DIVISION, B.C. 50°N, 121°W, SE

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# McPHAR GEOPHYSICS

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

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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 ($\Delta V$) 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 ($\Delta V$) 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 noisy 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

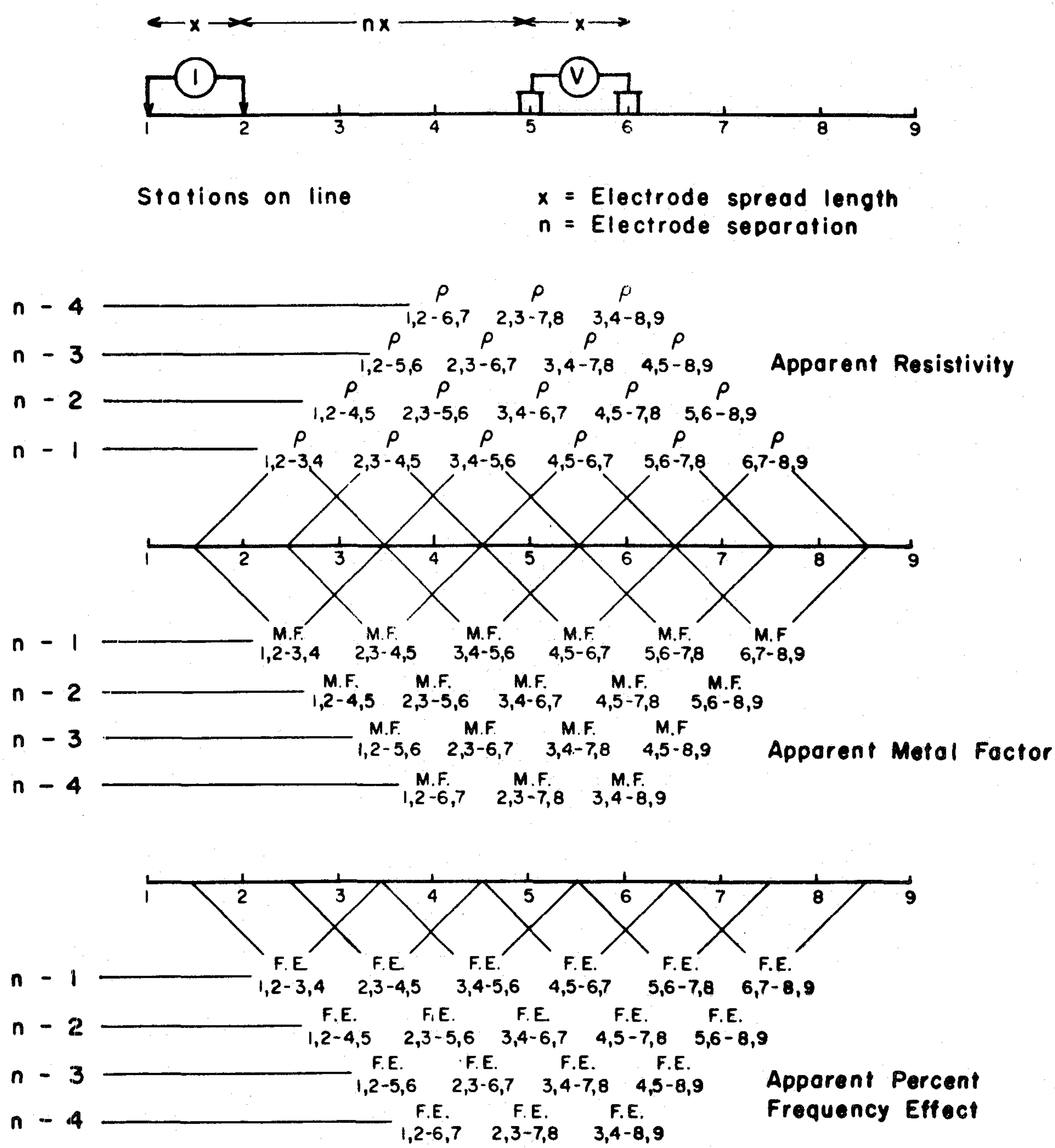


Fig. A

# McPHAR GEOPHYSICS LIMITED

## REPORT ON
## INDUCED POLARIZATION
## AND RESISTIVITY SURVEY
## OF
## PROJECT 82 - FLAGSTONE MINES
## KAMLOOPS M.D.
## HIGHLAND VALLEY AREA, B.C.
## FOR
## PHELPS DODGE CORPORATION OF CANADA LIMITED

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## 1. INTRODUCTION

At the request of Mr. John Ratcliffe, geophysicist for the Company, we have carried out a combined induced polarization and resistivity survey of the BIN claim group, referred to as Project 82 - Flagstone Mines, in the Highland Valley Area of southern British Columbia. The property is situated in the Kamloops Mining Division, about 20 miles southeast of Spences Bridge, and is in the southeast quadrant of the one degree quadrilateral whose southeast corner is at 50° North latitude and 121° West longitude.

Access to the property is via a jeep road, leading from the Chataway Lake road. No detailed geological information is available but the claims are believed to be underlain by acid intrusive rocks of the Guichon Batholith.

The purpose of the survey was to test for the presence of large low-grade disseminated sulphide deposits such as are known to occur in similar geologic settings in the area. Field work was carried out in November and December of 1969 using a McPhar variable frequency Induced Polarization system operating at 0.3 Hz and 5.0 Hz. East-west lines were surveyed at 400-foot intervals employing a 200-foot dipole-dipole electrode array with four dipole separations (n = 1, 2, 3, 4).

The claims covered by the survey are identified as BIN 49 - BIN 62 inclusive and BIN 65 - BIN 78 inclusive, all in the Kamloops Mining Division. All of the claims are believed to be owned by, or under option to, Phelps Dodge Corporation of Canada Limited.

## 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 12N | 200 foot spreads | Dwg.IP 5377-1 |
| Line 8N | 200 foot spreads | Dwg.IP 5377-2 |
| Line 4N | 200 foot spreads | Dwg.IP 5377-3 |
| Line 0 | 200 foot spreads | Dwg.IP 5377-4 |
| Line 4S | 200 foot spreads | Dwg.IP 5377-5 |
| Line 8S | 200 foot spreads | Dwg.IP 5377-6 |
| Line 12S | 200 foot spreads | Dwg.IP 5377-7 |
| Line 16S | 200 foot spreads | Dwg.IP 5377-8 |
| Line 20S | 200 foot spreads | Dwg.IP 5377-9 |
| Line 24S | 200 foot spreads | Dwg.IP 5377-10 |

| | | |
|---|---|---|
| Line 28S | 200 foot spreads | Dwg.IP 5377-11 |
| Line 32S | 200 foot spreads | Dwg.IP 5377-12 |
| Line 36S | 200 foot spreads | Dwg.IP 5377-13 |
| Line 40S | 200 foot spreads | Dwg.IP 5377-14 |

Enclosed with this report is Dwg. I.P.P. 4591, a plan map of the grid at a scale of 1" = 400'. 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 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 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 location of survey lines relative to the claim boundaries, and the names and relative position of the claims are based upon information supplied by Phelps Dodge Corporation of Canada Limited.

## 3. DISCUSSION OF RESULTS

### Line 12N

The geophysical results from this traverse are typical of the entire grid, with moderate to high resistivities and low background IP effects. Minor increases in the Apparent Metal Factor values were measured at a few locations but for the most part these are not accompanied by any significant increase in Apparent Frequency Effect. These features have been shown on the data plot, and accompanying plan, as possible anomalies but they are considered to be too weak to represent significant amounts of metallic mineralization.

The incomplete anomaly at the east end of the line apparently correlates with similar effects on the lines to the south, forming a continuous zone.

### Line 8N

Similar weak responses were obtained at the east and west ends of this line.

### Line 4N

A variable zone of weakly anomalous effects occurs from 26E to at least 38E, still open to the east. Included in this is a narrow feature at 32E to 34E that may represent a mineralized shear or fracture zone. Detailing with 100-foot dipoles would be required for a more complete evaluation.

### Line 0

Again there is a weak, incomplete anomaly at the east end of the line.

Line 4S

Moderately high IP effects were measured at the east end of the line. These should be confirmed by repeating the data with the electrodes shifted to the odd stations; if possible the traverse should be extended farther east.

Line 8S

The eastern zone is weaker here and centred at station 34E. Above background effects were measured just west of the Base Line but these may simply reflect lower resistivities due to an increased thickness of overburden.

Line 12S

Only the east half of Line 12S was surveyed. A possible narrow weak source occurs between 20E and 22E and the east zone appears to be terminating.

Line 16S

Narrow weak sources are interpreted between 40W and 42W and between 22E and 24E; the latter may correlate with the anomaly centred at 21E on Line 12S.

Line 20S

Only the west half of this line was run and the results are essentially blank. The narrow resistivity low centred at 39W, and accompanying slight increase in the M.F. values, may correlate with the feature at 41W on Line 16S.

Line 24S

The increase in M.F. values between 0 and 2W and from 10W to 20W occur in an area of decreased resistivity suggesting heavier overburden. This interpretation might be confirmed by detailing with 100-foot dipoles.

Line 28S

The feature at 14W to 18W is one of the most definite anomalies located by the survey, but appears to represent a shallow narrow source rather than a broad area of disseminated mineralization. Detailing with shorter electrode intervals would be required for a more complete evaluation.

Line 32S

Possible narrow weak sources are indicated at 47W and 37W. A minor increase in the IP effects was measured at the extreme eastern end of the line but the pattern is incomplete.

Line 36S

Similar results were obtained on this traverse.

Line 40S

A low magnitude, but definite anomaly was found at 16E to 18E; the source is shallow and narrow relative to the 200-foot electrode interval.

## 4. SUMMARY AND RECOMMENDATIONS

No definite anomalies suggestive of widespread mineralization of the "porphyry" type were found on the BIN Claims. An extensive zone of weakly anomalous IP effects occurs along the eastern side of the grid from Line 12N to Line 8S or Line 12S with the strongest section on Line 4S. On most of the lines the anomaly is incomplete and therefore the data should be extended farther east to permit a more complete evaluation.

Several weak anomalies were found scattered throughout the grid. Generally these appear to represent narrow sources of minor metallic mineral content and therefore would not be of interest. The low magnitude, but definite , anomalies at 17W, Line 28S and 17E, Line 40S may merit further investigation.

Throughout most of the grid the resistivity level is moderate to high. Locally there are narrow lows suggesting faults or shear zones. Near the centre of the grid, from Line 4S to Line 28S, there is an extensive zone of near-surface low resistivity suggesting an area of alteration, or more likely, increased depth of overburden.

McPHAR GEOPHYSICS LIMITED

Robert A. Bell.

Robert A. Bell,
Geologist.

David K. Fountain

David K. Fountain, P. Eng.
Geophysicist.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN

Dated: January 27, 1970

Expiry Date: April 25, 1970

## ASSESSMENT DETAILS

PROPERTY: Project 82

MINING DIVISION: Kamloops

SPONSOR: Phelps Dodge Corporation of Canada Limited

PROVINCE: British Columbia

LOCATION: Flagstone, Highland Valley

TYPE OF SURVEY: Induced Polarization

| | | | |
|---|---|---|---|
| OPERATING MAN DAYS: | 184 | DATE STARTED: | November 6, 1969 |
| EQUIVALENT 8 HR. MAN DAYS: | 276 | DATE FINISHED: | December 22, 1969 |
| CONSULTING MAN DAYS: | 4 | NUMBER OF STATIONS: | 632 |
| DRAUGHTING MAN DAYS: | 15 | NUMBER OF READINGS: | 6,500 |
| TOTAL MAN DAYS: | 295 | MILES OF LINE SURVEYED: | 23.4 |

CONSULTANTS:
R.A. Bell, 50 Hemford Crescent, Don Mills, Ontario
D.K. Fountain, 44 Highgate Road, Toronto 18, Ontario

FIELD TECHNICIANS:
J. Parker, Box 340, Choiceland, Saskatchewan

8 Helpers: -
M. Bennet, 453 West Battle Street, Kamloops, British Columbia
H. Parent, General Delivery, Monte Lake, British Columbia
L. Ferguson, General Delivery, Kamloops, British Columbia
D. Kushner, General Delivery, Kamloops, British Columbia
M. Heureux, General Delivery, Kamloops, British Columbia
R. Thiemer, 2683 Ord Road, Kamloops, British Columbia
T. Keehn, 1231 Shubert Drive, Kamloops, British Columbia
L. Lapine, General Delivery, Kamloops, British Columbia

DRAUGHTSMEN:
P. Coulson, 77 Peter Street, Markham, Ontario
J. Duffy, 7 Waddington Crescent, Willowdale, Ontario
N. Lade, 1355 Lakefield Street, Oshawa, Ontario

McPHAR GEOPHYSICS LIMITED

David K. Fountain

D.K. Fountain
Geophysicist

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN

Expiry Date: April 25, 1971

Dated: January 27, 1970

# STATEMENT OF COST

## Highland Valley - Project 82

**Crew (1 man)**

| | | | | |
|---|---|---|---|---|
| 33½ days Operating: - | | | | |
| 20 days | | @ $220.00/day | 4,400.00 | |
| 13½ days | | @ $210.00/day | 2,835.00 | |
| | | | | 7,235.00 |
| 1½ days Travel ) | | | | |
| 2 days Bad Weather ) | 6 days | @ $ 85.00/day | | 510.00 |
| 2½ days Preparation ) | | | | |

**Crew Expenses**

| | | | |
|---|---|---|---|
| Vehicle Expense | 942.70 | | |
| Mileage Allowance | 73.00 | | |
| Meals & Accommodation | 3,816.53 | | |
| Freight & Brokerage | 100.25 | | |
| Telephone & Telegraph | 35.90 | | |
| Supplies | 44.19 | | |
| | | 5,012.57 | |
| + 10% | | 501.25 | |
| | | | 5,513.82 |
| Extra Labour | 4,020.00 | | |
| + 20% | 804.00 | | |
| | | | 4,824.00 |
| | | | $18,082.82 |

McPHAR GEOPHYSICS LIMITED

D. K. Fountain,
Geophysicist

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN

Expiry Date: April 25, 1971

Dated: January 27, 1970

## CERTIFICATE

I, Robert Alan Bell, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geologist residing at 50 Hemford Crescent, Don Mills, (Toronto) Ontario.

2. I am a graduate of the University of Toronto in Physics and Geology with the degree of Bachelor of Arts (1949); and a graduate of the University of Wisconsin in Economic Geology with the degree of Ph.D. (1953).

3. I am a member of the Society of Economic Geologists and a fellow of the Geological Association of Canada.

4. I have been practising my profession for over fifteen 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 Phelps Dodge Corporation of Canada Limited 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 27th day of January 1970

Robert A. Bell

Robert A. Bell, Ph.D.

## CERTIFICATE

I, David Kirkman Fountain, of the City of Toronto, Province of Ontario, do certify that:

1. I am a geophysicist residing at 44 Highgate Road, Toronto 18, Ontario.

2. I am a graduate of the University of Toronto with a Bachelor of Applied Science Degree in Engineering Physics (Geophysics).

3. I am a member of the Society of Exploration Geophysicists, the European Association of Exploration Geophysicists and the Canadian Institute of Mining and Metallurgy.

4. I am a registered Professional Engineer in the Province of British Columbia and Ontario, and have been practising my profession for eight years.

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

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

Dated at Toronto

This 27th day of January 1970

David Kirkman Fountain, B.A.Sc. P.Eng.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. K. FOUNTAIN

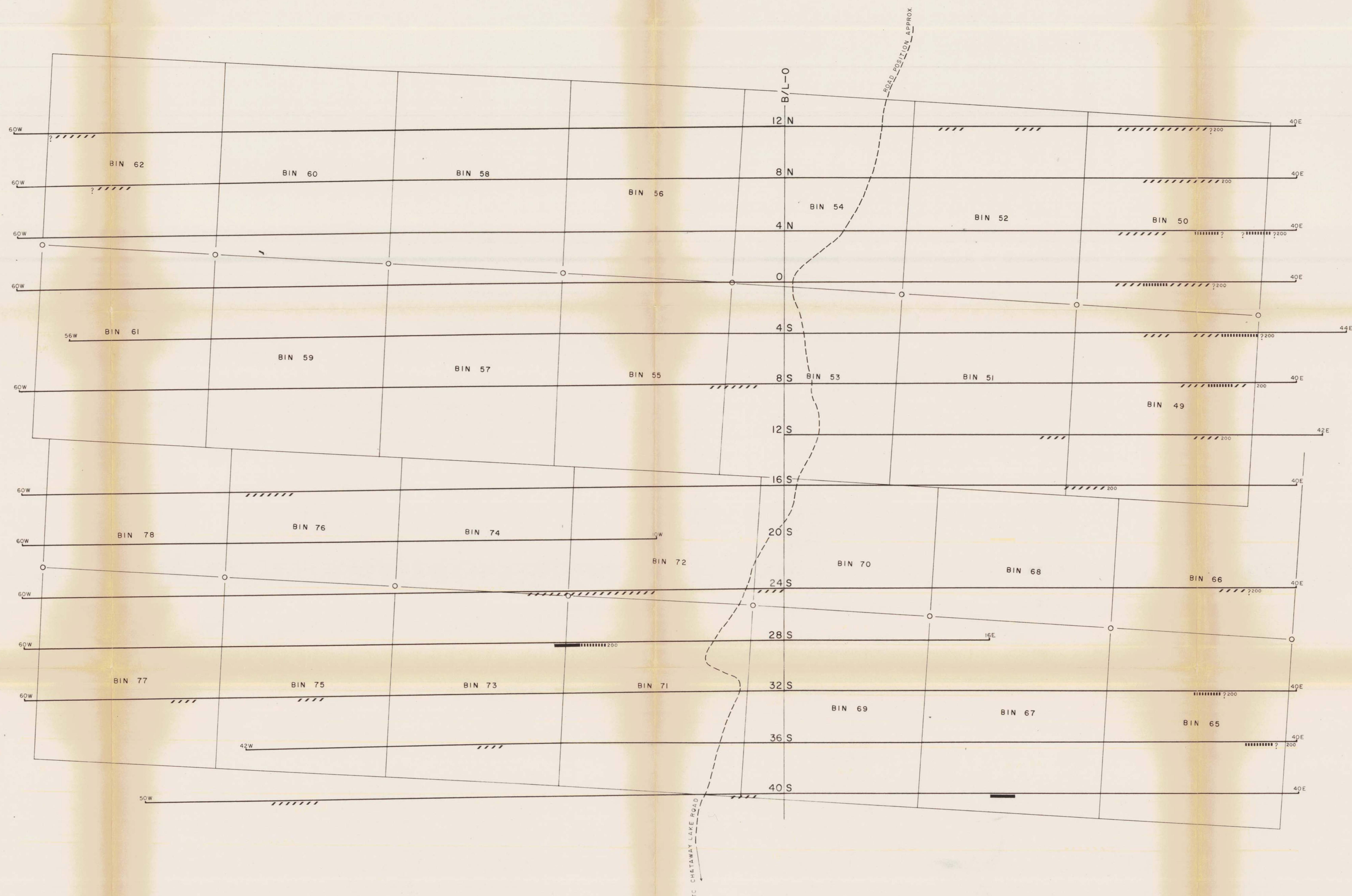
Expiry Date: April 25, 1970

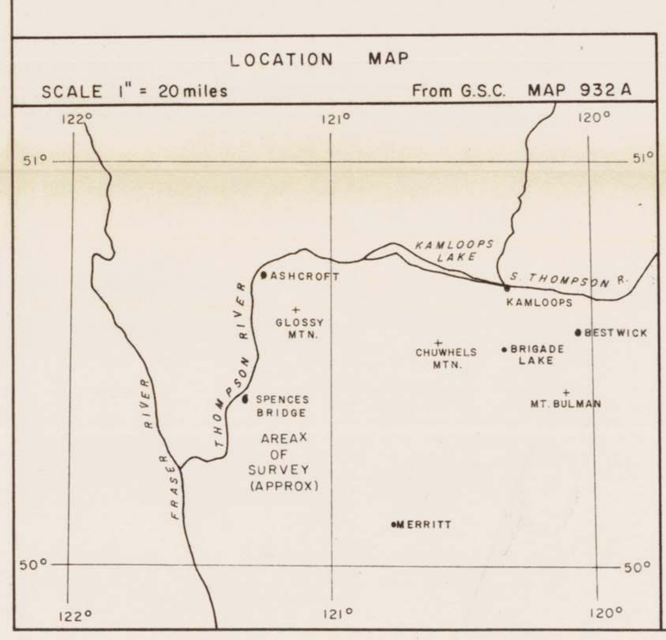
DWG. IPP-4591

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP




NOTE:

TO ACCOMPANY GEOPHYSICAL REPORT BY R.A. BELL (GEOLOGIST) AND D. K. FOUNTAIN (P. ENG.), FOR PHELPS DODGE CORPORATION OF CANADA LIMITED ON PROJECT No. 82, FLAGSTONE, KAMLOOPS MINING DIVISION, HIGHLAND VALLEY, B. C.

DATED: JAN. 27, 1970

2488

N

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2488 MAP #1

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

Number at the end of anomaly indicates spread used.

## PHELPS DODGE CORPORATION OF CANADA LIMITED

PROJECT No. 82, FLAGSTONE, KAMLOOPS M.D., HIGHLAND VALLEY, B. C.

SCALE

ONE INCH EQUALS FOUR HUNDRED FEET

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA

David K. Fountain

Jan 29/70

DWG. IPP-4591

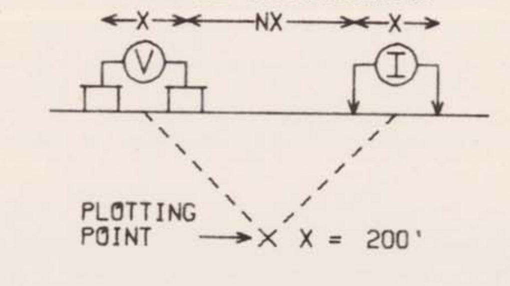

DWG. NO.- I.P.-5377-14

# PHELPS DODGE CORP.
OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 40S

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: NOV 1969

APPROVED:

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

DATE:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA
Expiry Date: April 25, 1970

2488

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-13

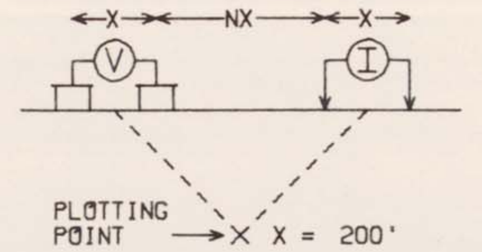
# PHELPS DODGE CORP.

OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 36S

ELECTRODE CONFIGURATION




PLOTTING POINT → X   X = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED: David K. Fountain

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

DATE: Jan 27/70

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. K. FOUNTAIN
Expiry Date: April 25, 1970

2488

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-12

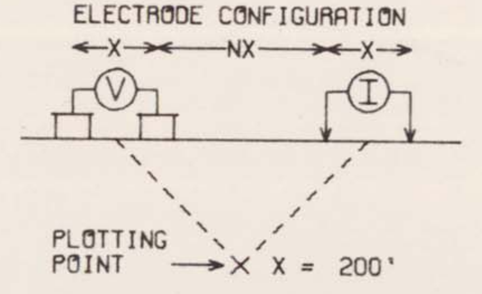
# PHELPS DODGE CORP.

OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 32S

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: NOV 1969

APPROVED: David K. Fountain

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

DATE: Jan 22/70

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA
Expiry Date: April 25, 1970

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# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-11

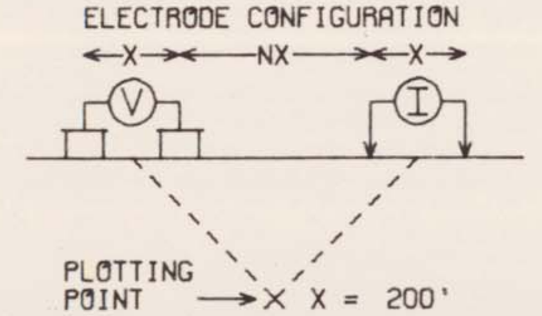
# PHELPS DODGE CORP.
OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.

HIGHLAND VALLEY, B.C.

LINE NO.- 28S

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED: D. K. Fountain

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

DATE: Jan 27/70

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, D. K. FOUNTAIN

Expiry Date: April 25, 1970

2488

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-10

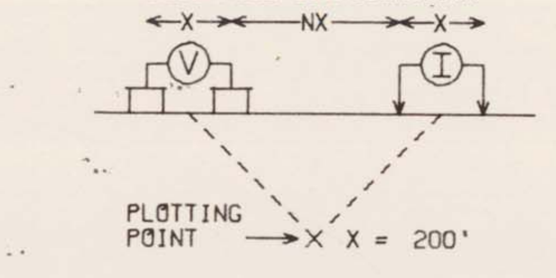
# PHELPS DODGE CORP.

OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 24S

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: NOV 1969

APPROVED: David K. Fountain

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, D. K. FOUNTAIN

DATE: Jan 27/70

Expiry Date: April 25, 1970

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

2488

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

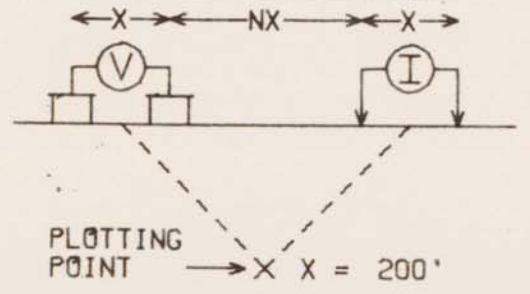

DWG. NO.- I.P.-5377-9

# PHELPS DODGE CORP.
OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 20S

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED:

DATE:

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

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: April 25, 1970

2488

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

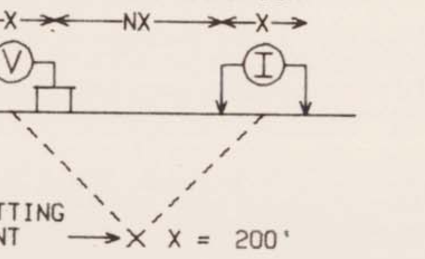

DWG. NO.- I.P.-5377-8

# PHELPS DODGE CORP.
OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 16S

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: NOV 1969

APPROVED: D. K. Fountain

DATE: Jan 22/70

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, D. K. FOUNTAIN

Expiry Date: April 25, 1970

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

2488

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-7

# PHELPS DODGE CORP.
OF CANADA LIMITED
PROJECT NO. 82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 12S

ELECTRODE CONFIGURATION
X — NX — X
PLOTTING POINT X = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED: [signature]

DATE: Jan 27/70

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

Expiry Date: April 25, 1970

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

2488

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-6

# PHELPS DODGE CORP.

OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 8S

ELECTRODE CONFIGURATION
←X→←NX→←X→
V I
PLOTTING POINT → X   X = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE ▬▬▬
PROBABLE ||||||||
POSSIBLE /////

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED: David K. Fountain

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

DATE: Jan 27/70

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D.K. FOUNTAIN
Expiry Date: April 25, 1971

2488

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-5

# PHELPS DODGE CORP.
OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 4S

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT → X  X = 200'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED:

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

DATE: Jan 27/70

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Expiry Date: April 25, 1970

2488

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

DWG. NO.- I.P.-5377-4


# PHELPS DODGE CORP.

OF CANADA LIMITED

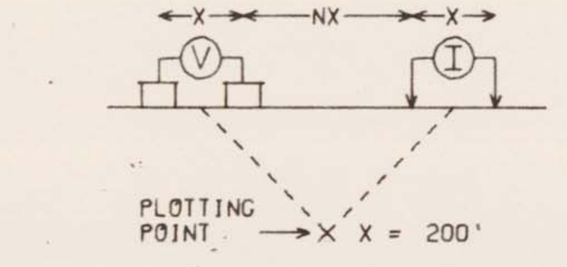
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.

HIGHLAND VALLEY, B.C.

LINE NO.- 0

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED:

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

DATE:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D.K. FOUNTAIN

Expiry Date: April 25, 1970

2488

# McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-3

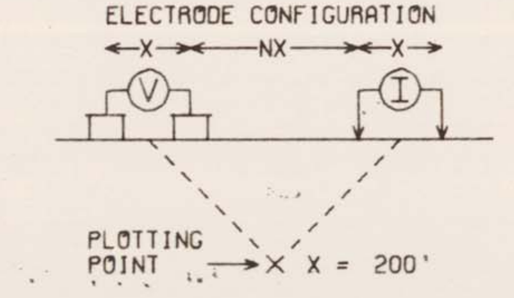
# PHELPS DODGE CORP.

OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 4N

ELECTRODE CONFIGURATION




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED: David K. Fountain

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

DATE: Jan 27/70

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. K. FOUNTAIN

Expiry Date: April 25, 1970

2488

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

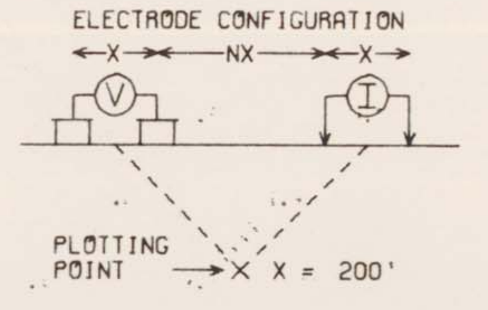
NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-2

# PHELPS DODGE CORP.
OF CANADA LIMITED
PROJECT NO. 82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 8N




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED:

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

DATE:

2488

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

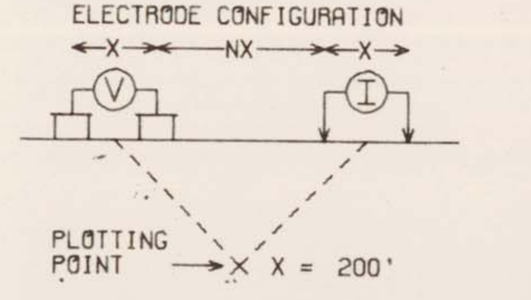
NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER


DWG. NO.- I.P.-5377-1

# PHELPS DODGE CORP.
OF CANADA LIMITED
PROJECT NO.82

FLAGSTONE, KAMLOOPS M.D.
HIGHLAND VALLEY, B.C.

LINE NO.- 12N




SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE ▬▬▬
PROBABLE ||||||||||||
POSSIBLE / / / / /

FREQUENCIES: 0.31-5.0 CPS

DATE SURVEYED: DEC 1969

APPROVED: David K. Fountain

D. K. FOUNTAIN
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA

DATE: Jan 27/70

Expiry Date: April 25, 1970

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

2488

## McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER