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Original McPhar
Report returned
10-14-63.

J. H.

REPORT ON THE
INDUCED POLARIZATION SURVEY
FOR
B. S. & K. MINING COMPANY, ARIZONA
PART II

McPHAR GEOPHYSICS LIMITED

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

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

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

The blocking action or induced polarization mentioned above, which depends upon the chemical energies necessary to allow the ions to give up or receive electrons from the metallic surface, increases with the time that a d. c. current is allowed to flow through the rock, i. e. as ions pile up against the metallic interface the resistance to current flow increases. Eventually, there is enough polarization in the form of excess ions at the

interfaces to effectively stop all current flow through the metallic particle. This polarization takes place at each of the infinite number of solution-metal interfaces in a mineralized rock.

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

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

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

For example, in one of the large porphyry copper pits, the resistivity contrast between the protore and the enriched zone was found to be only 180/18 or 10/1. The contrast in metal factor in the same pit was found to be 20/10,000. There was less than 1% sulphides in the protore and 5-9% sulphides in the enriched zones. As the sulphide content is increased the metal factor increases until for massive sulphides the values apparently are measured in hundreds of thousands.

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

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

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

Apropos of this, it should be stated that the induced polarization measurements indicate the total amount of metallic constituents in the rock. Thus all of the metallic minerals in the rock, such as pyrite, as well as

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

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the rocks to be separated from the effects of vertical changes in the properties. Current is applied to the ground at one point, the sender location, and voltage difference measurements are made at several other spots, the receiver locations. The sender location is then changed and the procedure is repeated. The value of apparent resistivity and apparent metal factor for any given pair of sender and receiver locations is plotted on the map at the intersection of grid lines, one from the sender location and one from the receiver location. The resistivity values are plotted above the line and the metal factor values below the line. The lateral displacement of a given value is determined by the location along the survey line of the centre point between the sender and receiver locations. The distance of the value from the line is determined by the separation between the sender and receiver that gave that particular value.

The separation between sender and receiver is only one factor which determines the depth to which the ground is being sampled in any particular measurement. These plots then, when contoured, are not section maps of the electrical properties of the ground under the survey line.

The interpretation of the results from any given survey must be carried out using the combined experience gained from field, model and theoretical investigations.

In the field procedure, the interval over which the potential differences are measured is the same as the interval over which the sender is moved after a series of 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 interval over which the transmitter is moved each time. In the past, intervals have been used ranging from 100 feet to 1000 feet for the basic distance. In each case, the decision as to spread distance 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 speed at which measurements can be made along a line is directly related to the length of spread used. In some detailed surveys in which the area of interest had been outlined by previous drilling and/or geology, spreads of 200 feet have been used. In these cases, distances ranging from 2500 feet to 3500 feet may be covered in a normal day's operation by one crew. In reconnaissance work using a 1000 foot spread distances of 5000 to 8000 feet may be surveyed in one day.

McPHAR GEOPHYSICS LIMITED

REPORT ON THE

INDUCED POLARIZATION SURVEY

, FOR

B. S. & K. MINING COMPANY, ARIZONA

PART II

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1. INTRODUCTION

During June 1960, an Induced Polarization survey was carried out over a portion of the B. S. & K. Mining Company property in the Silver Bell area of southern Arizona. The investigation revealed the presence of an interesting anomaly to the west of the mine workings and in our report of June 28, 1960, additional surveying was recommended.

This report describes the results obtained from the subsequent investigations carried out in October of this year.

2. PRESENTATION OF RESULTS

The Induced Polarization and Resistivity data are plotted in the manner described in the notes accompanying this report and are shown on the data plots as follows.

Line 2 + 00S	300 foot spreads	Dwg. IP 2771-1
Line A	300 foot spreads	Dwg. IP 2771-2
Line A	200 foot spreads	Dwg. IP 2771-3
Line 2 + 00N	300 foot spreads	Dwg. IP 2771-4
Line 10 + 00W	300 foot spreads	Dwg. IP 2771-5

A sketch of the grid is shown on drawing Misc. 3298 at a scale of 1" = 200'. This is approximate only, being based on pace-and-compass traverses. 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 center of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

Unfortunately the station numbers on the two surveys do not agree. Although the lines coincide in location, the zero point on the present survey is 400' east of the zero point on the original survey. A numbered picket has been placed at each station to avoid any possible confusion in the future.

3. DISCUSSION OF RESULTS

The June survey indicated an interesting anomaly on Line A between stations 4 + 00W and 8 + 00W (i.e. 8 + 00W - 12 + 00W on the new grid). The source appeared to be a sub-vertical tabular body at shallow depth relative to the spread (i.e. less than 400 feet). Line A was re-surveyed in October using 300 foot spreads to confirm the anomaly. Parallel lines were then run 200 feet to the north and south to trace the zone and a fourth line was run along the strike of the anomaly. The results from each line are described below.

Line 2 + 00S

There is an anomaly of moderate strength and intermediate depth at about 9 + 00W on this line. The apparent Metal Factors are smaller than on Line A suggesting that the source is becoming smaller or deeper, or that the line is near the south end of the zone. The results on Line 10 + 00W indicate that this latter interpretation is correct.

Anomalous Metal Factors were also encountered at the west end of the line. These values are based on very low voltages and small frequency effects (1/4 - 3/4%) and hence cannot be considered to be reliable. The associated resistivity low may represent the boundary fault assumed to occur along the west side of the hills.

Line A

The 300 foot data show a moderate anomaly centered at 9 + 00W, corresponding with the feature outlined during the June

survey. Several anomalous values were repeated using a greater frequency spread (D. C. - 2-1/2 cps) with a resultant large increase in the apparent Metal Factor indicative of a metallic source.

In addition, there is a small shallow anomaly centered at about station 0 + 00. The east part of the line was re-surveyed using 200 foot spreads in order to obtain greater detail. This work confirmed the location of the anomaly and indicated a depth of the order of 100 - 150 feet to the source.

Line 2 + 00N

Considerable difficulty was encountered on this line because of interference from the numerous surface features. Even with the power turned off at the mill, it was not possible to obtain reliable data on part of the line. However, the resistivity data indicate the presence of the anomaly on this line and such I. P. values as were obtained seem to confirm that the zone extends this far north.

Line 10 + 00W

A line was run along the axis of the anomaly to determine the length of the zone. The results indicate that the south end occurs near station O or between O and 3S. Reliable data could not be obtained to the north because of excessive electrical noise from the power lines. The source appears to be shallower on this line, but there may be complicating factors present, especially the tailings dump.

4. SUMMARY & RECOMMENDATIONS

The October survey has confirmed the I. P. anomaly on Line A and has traced the zone farther to the north and south. A second smaller anomaly has been indicated on the eastern part of Line A.

While there are several surface features (mill, tailings dump, water pipe, etc.) which may be expected to interfere with the measurements or give rise to spurious local effects, it is felt that the main anomaly is primarily due to a sub-surface metallic source. Consequently it is recommended that a drill test be carried out to determine the cause of the anomaly. It is suggested that either a 400 foot vertical hole be drilled at 9 + 00W on Line A, or an inclined hole at 12 + 00W, Line A, drilling east at 45° for 450 - 500 feet.

From discussions with Mr. A. Kalaf, it would seem that the anomaly at 0 + 00, Line A is not related to any known ore lenses, but some interesting mineralization is known to occur in this area from previous underground work. If this is the case, then this anomaly should also be drilled. A hole is recommended at 2 + 00W, drilling east at 45°.

On completion of this test programme, the geophysical results should be reviewed in order to plan additional drilling if warranted and to plan a more extensive survey of the remainder of the property.

McPHAR GEOPHYSICS LIMITED

Robert A. Bell,
Geologist.

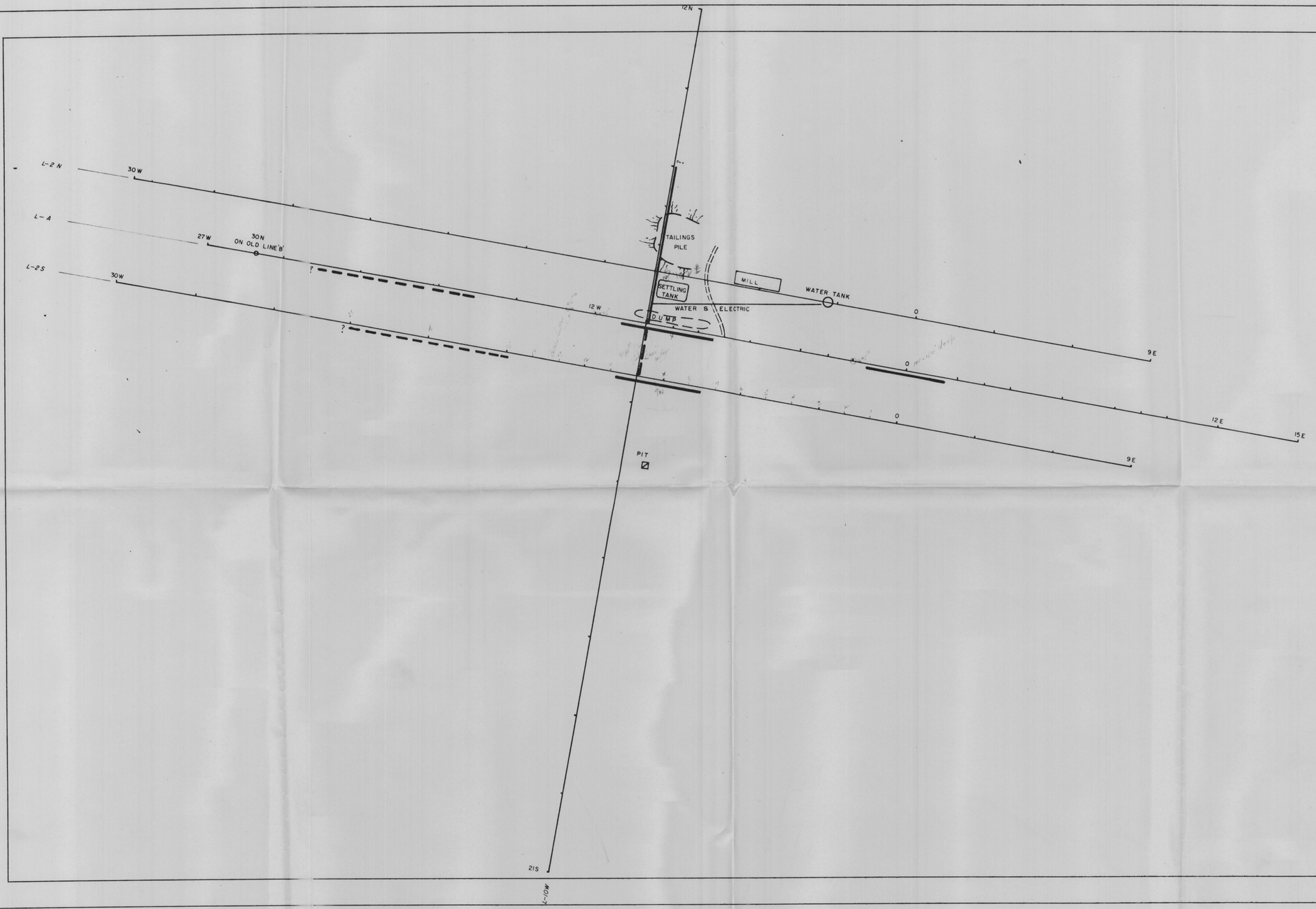
Philip G. Hallof,
Geophysicist.

Dated : November 8, 1960.

DWG. MISC. 3298

McPHAR GEOPHYSICS LIMITED

LOCATION MAP



N

ANOMALOUS ZONE
POSSIBLE ANOMALOUS ZONE

B.S.& K. MINING COMPANY

PIMA COUNTY – ARIZONA.

SCALE

200 150 100 50 0 200 400 600 800 1000
FEET FEET

One Inch = Two Hundred Feet

NOTE LINES BY PACE AND COMPASS

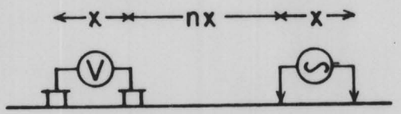
DRAWN F.R.P.
DATE NOV 17/1960
APPROVED
RAB
DATE
Nov. 2/60.

DWG. MISC. 3298

DWG. NO.-I.P.-2771-5

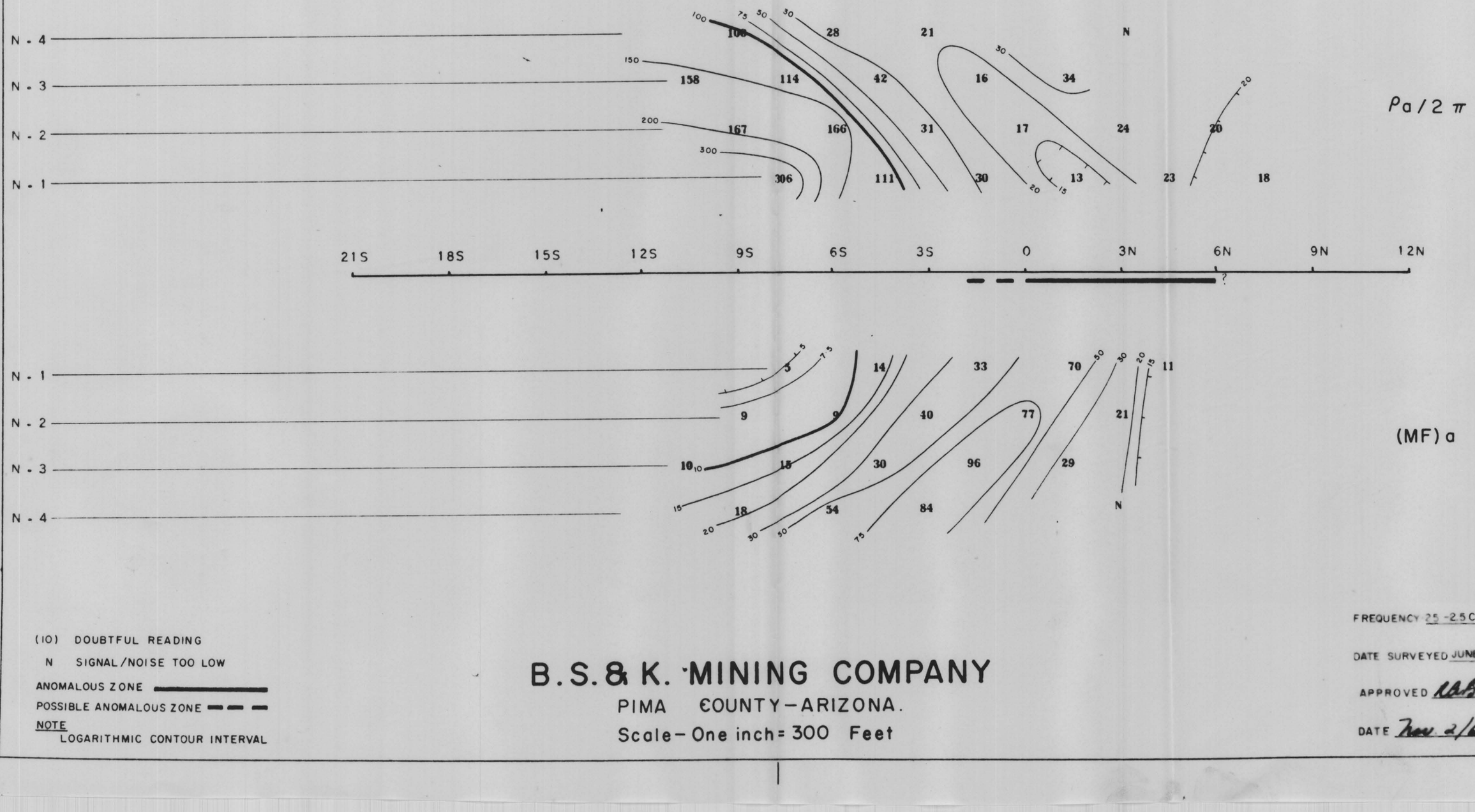
McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY



ELECTRODE CONFIGURATION

X - 300



Pa/2π

(MF)a

LINE NO.10W

(10) DOUBTFUL READING

N SIGNAL/NOISE TOO LOW

ANOMALOUS ZONE ———

POSSIBLE ANOMALOUS ZONE — — —

NOTE

LOGARITHMIC CONTOUR INTERVAL

B.S.& K. MINING COMPANY

PIMA COUNTY-ARIZONA.

Scale-One inch=300 Feet

FREQUENCY 25-2.5 C.P.S.

DATE SURVEYED JUNE/60

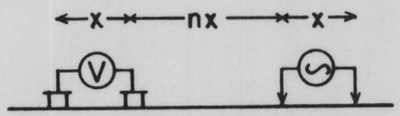
APPROVED [illegible]

DATE Nov 2/60.

DWG. NO.-I.P.-2771-1

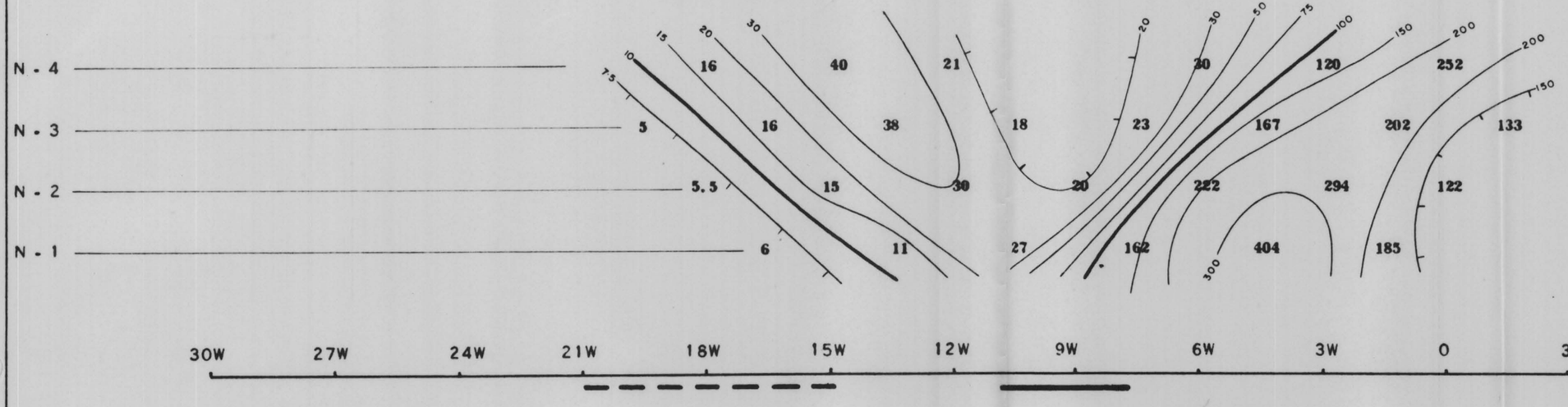
McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

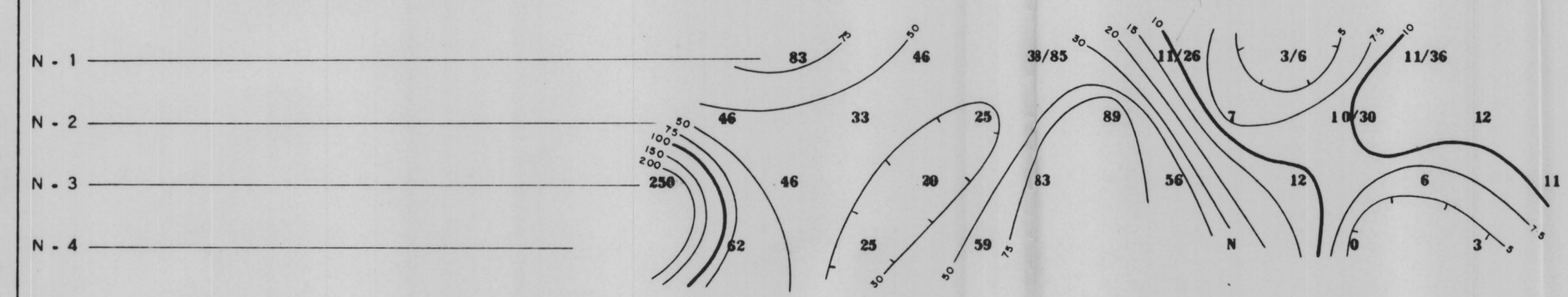


ELECTRODE CONFIGURATION

X - 300



Pa/2π



(MF) a

(10) DOUBTFUL READING

N SIGNAL/NOISE TOO LOW

ANOMALOUS ZONE ——————

POSSIBLE ANOMALOUS ZONE — — —

NOTE
LOGARITHMIC CONTOUR INTERVAL

B.S.& K. MINING COMPANY

PIMA COUNTY-ARIZONA.

Scale-One inch=300 Feet

FREQUENCY 25 -2.5 C.P.S.

DATE SURVEYED JUNE/60

APPROVED RAB.

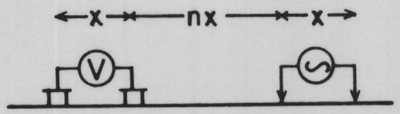
DATE Nov. 2/60.

LINE NO. 2S

DWG. NO.-I.P.-2771-4

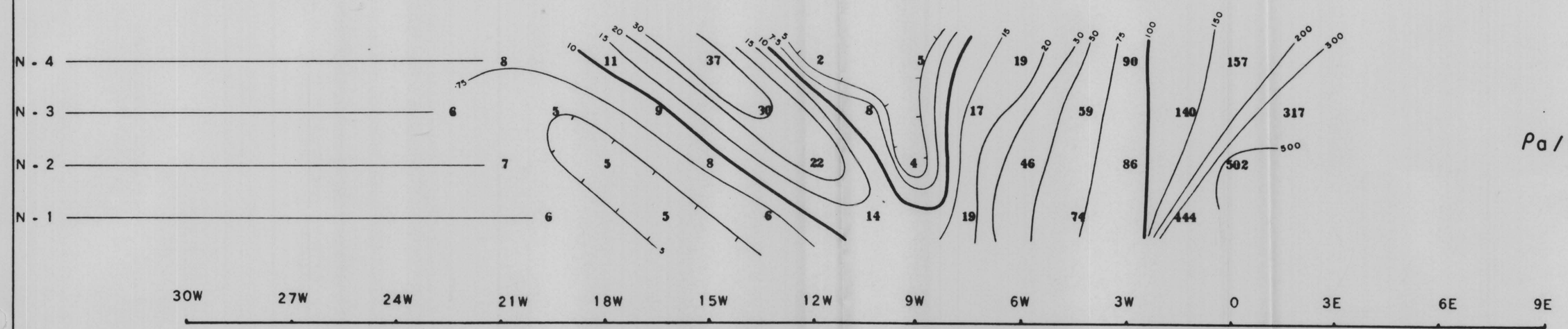
McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

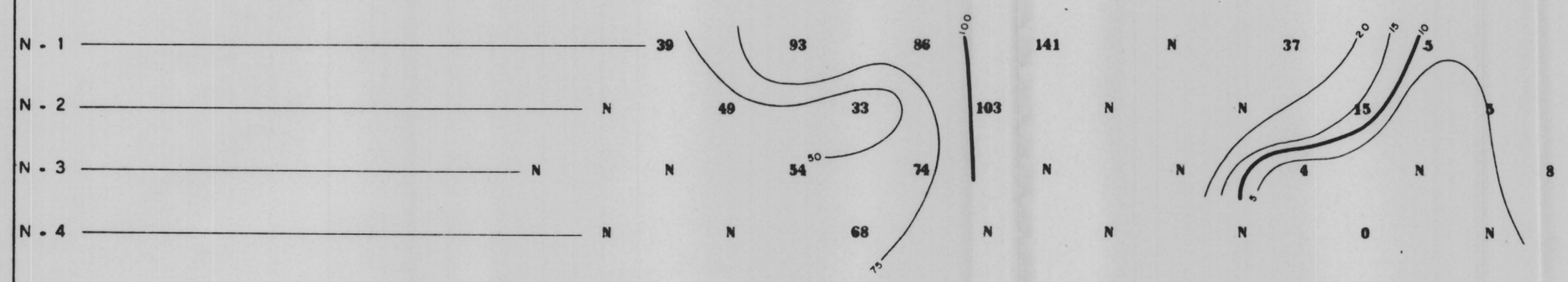


ELECTRODE CONFIGURATION

X . 300



Pa/2 π



(MF) a

(10) DOUBTFUL READING

N SIGNAL/NOISE TOO LOW

ANOMALOUS ZONE ———

POSSIBLE ANOMALOUS ZONE — — —

NOTE

LOGARITHMIC CONTOUR INTERVAL

B.S.& K. MINING COMPANY

PIMA COUNTY – ARIZONA.

Scale – One inch = 300 Feet

FREQUENCY 25 -2.5 C.P.S.

DATE SURVEYED JUNE/60

APPROVED R.A.B.

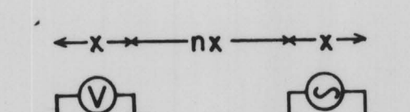
DATE Jan. 2/60

LINE NO. 2N

DWG. NO.-I.P.-2771-3

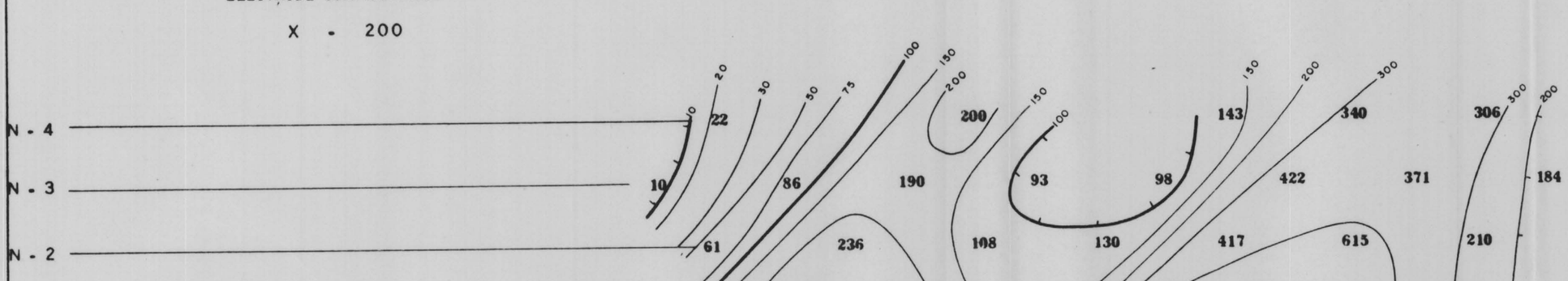
McPHAR GEOPHYSICS LIMITED

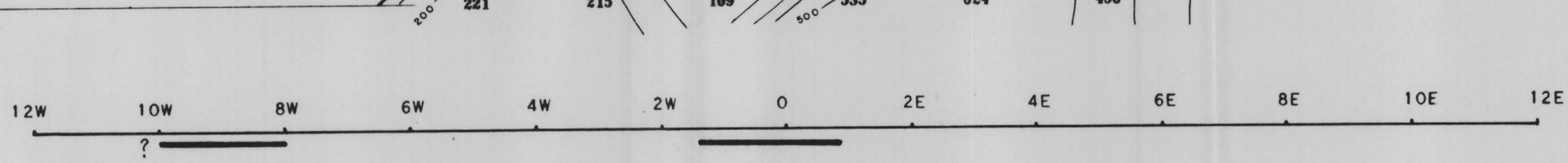
INDUCED POLARIZATION AND RESISTIVITY SURVEY

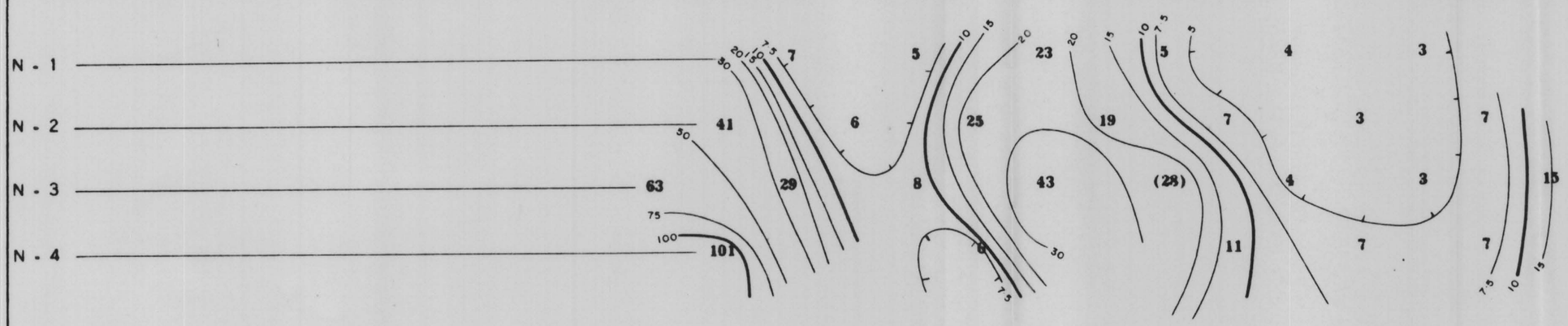


ELECTRODE CONFIGURATION

X - 200







Pa/2π

(MF) a

Metal Factor

(10) DOUBTFUL READING

N SIGNAL/NOISE TOO LOW

ANOMALOUS ZONE ———

POSSIBLE ANOMALOUS ZONE — — —

NOTE

LOGARITHMIC CONTOUR INTERVAL

B.S.& K. MINING COMPANY

PIMA COUNTY-ARIZONA.

Scale-One inch=200' Feet

FREQUENCY 25 -2.5 C.P.S.

DATE SURVEYED JUNE/60

APPROVED [illegible]

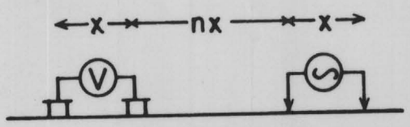
DATE Nov 2/60

"A" LINE NO.

DWG. NO.-I.P.-2771-2

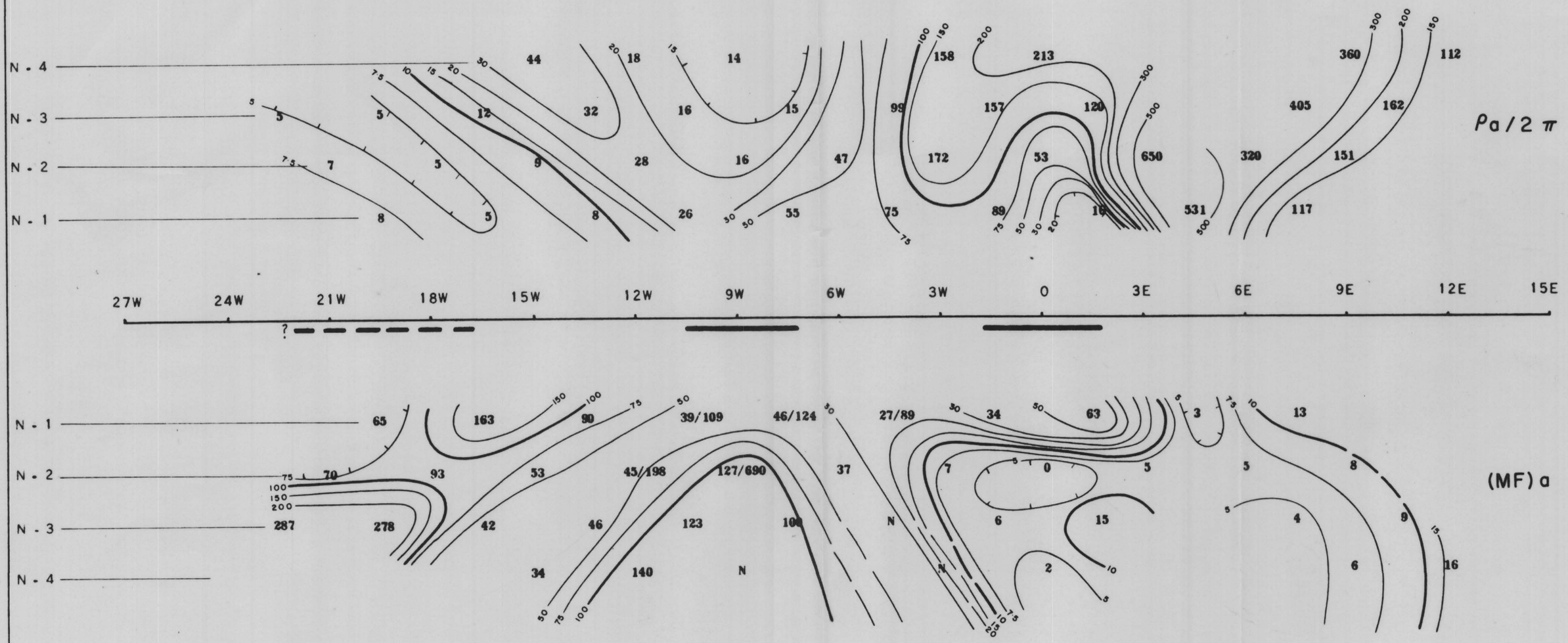
McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY



ELECTRODE CONFIGURATION

X - 300



34/106 —— ·25-2·5/D.C.-2·5 CPS

(10) DOUBTFUL READING

N SIGNAL/NOISE TOO LOW

ANOMALOUS ZONE ——————

POSSIBLE ANOMALOUS ZONE — — —

NOTE
LOGARITHMIC CONTOUR INTERVAL

B.S.& K. MINING COMPANY

PIMA COUNTY - ARIZONA.

Scale - One inch = 300 Feet

FREQUENCY 2·5 -2·5 C.P.S.

DATE SURVEYED JUNE/60

APPROVED [illegible]

DATE Nov 2/60

LINE NO. "A"

HEINRICHS GEOEXPLORATION COMPANY
MINERAL ENGINEERING CONSULTANTS AND CONTRACTORS
GEOPHYSICAL, GEOLOGICAL AND ECONOMIC APPRAISALS
TUCSON, ARIZONA, 85703

AREA CODE 602
PHONES: 622-4202, 623-6541
806-808 WEST GRANT ROAD
MAIL: P. O. BOX 5671

WALTER E. HEINRICHS, JR.
E. GROVER HEINRICHS

October 8, 1963

Mr. A. M. Kalaf, President
B. S. & K. Mining Company
P. O. Box 18
Silverbell, Arizona

Re: Letter Report

Dear Abe:

On September 26, 1963, Mr. J. W. Marlatt of Heinrichs Geoexploration Company visited the B. S. & K. Atlas Mine, Silverbell District, Pima County, Arizona with you and briefly discussed an induced polarization survey run on the property by McPhar Geophysics Ltd. in 1960 and subsequent drilling of an anomaly disclosed by this work. The ground location of the drill holes was looked at, the core inspected and the McPhar report brought to this office for study and evaluation.

CONCLUSIONS

After examination of the McPhar report we conclude that for the objective as you stated, the following points:

1. The dipole spacing was satisfactory.
2. The orientation of lines satisfactory.
3. Spacing of lines too close.
4. Frequencies generally used were too close together and not nearly optimum -- DC/2.5 cycles per second would have been prefereble.
5. Data plots would be more readily interpretable if per cent frequency effects were included.
6. Depth of penetration was probably 400' - 500'.
7. Anomalism is moderate to weak and indication of perhaps 1% - 3% total sulfide.
8. Results from two holes drilled prove the existence of sufficient sulfide to account for the geophysical anomaly.
9. This survey did not test the potential of all the B. S. & K. property.

RECOMMENDATIONS

A three fold evaluation of the property should be planned and executed.

1. Compile in concise form all known geology from past private work as well as public sources. Initiate some additional competent geologic mapping, both surface and underground. Accurately log and sample all stored drill core and plot on maps.

2. Run a geophysical survey by three methods; reconnaissance in the initial stages, induced polarization to locate metallic sulfides, gravity to locate areas of potential massive ore (such as sphalerite) not detectable by I. P., and magnetics to map structure and changes in rock types where there may be considerable change in magnetic susceptibility.
3. Drilling as indicated by the above two, and planned allowance for depths much in excess of previous holes.

The program can be planned and stretched out over any period of time according to budget or other considerations.

For details of execution of the geophysical phases, the I. P. should start with a double density line run over what is presently known to be the best ore occurrence. By double density we mean the same line run twice using different dipole spacings each time for different resolution, detail and depths of penetration. From this and the geology the better spacing can be selected for future, other lines. In general, the lines should be oriented N-S, or across the known or inferred regional or major strikes of mineralization. Spacing between lines should be wide to get definite background and good reconnaissance coverage. Additional fill in lines can be run when any thing of interest is disclosed.

Gravity stations should be read on a grid, with initial stations several hundred feet apart and filled in as initial data warrants.

Magnetic reconnaissance is fairly rapid and should be on 100' stations, lines 300' apart and can be run using Brunton and pace for control.

Order of magnitude costs, including the ground survey, vehicle costs, and office time for computations, plotting, interpretation and reports are about as follows: More accurate estimates can be made when the extent of a planned survey is known.

I. P. per line----------$600.00
Magnetics, per mile---- 100.00
Gravity per station---- 25.00

Naturally, the larger the program, the lower per unit cost.

EXAMINATION OF CORE

Holes #12 and #100 were in porphyry, apparently granite, mineralized with sulfide, mostly pyrite but some chalcopyrite especially in #100. This kind of mineralization will give I. P. anomalism and the greater the per cent of metallic sulfides the greater the anomalism. It is not possible to distinguish the various kinds of sulfides so an I. P. anomaly cannot be related to economic versus non-economic content.

The sphalerite and garnet as found in Hole #102 could be difficult to locate directly by geophysical methods, except that the density contrast may give a response by gravity measurements, as an indirect approach.

Oxidizing zones may be detected directly by self potential work. Otherwise, these most likely could be detected only by indirect means. Complete oxidation and reduction of mafic minerals in an area enclosed by unaltered material might show as a magnetic low, though possibly only a slight one.

It is not practical to consider using the magnetometer underground in the mine because of the track, pipe, etc. The workings are not sufficiently extensive to allow much coverage by underground gravity or electrical work although some useful

application of electrical methods such as hole logging, etc., may be possible.

Very truly yours,

HEINRICHS GEOEXPLORATION COMPANY

Walter E. Heinrichs, Jr.
President & General Manager

J. W. Marlatt
Geologist

C. S. Ludwig
Geophysicist

jh
will follow
~~Enclosure~~: McPhar Report
Extra copies

PHONE ALpine 4-9973

B S & K MINING CO.
First National Bank Building
411 NORTH CENTRAL AVENUE
PHOENIX, ARIZONA

October 22, 1963

Mr. Walter E. Heinrichs, Jr.
Heinrichs Geoexploration Company
Mineral Engineering Consultants and Contractors
P. O. Box 5671
Tucson, Arizona

Dear Walter:

I am in receipt of your report and recommendations regarding the McPhar Geophysical examination of our property. I have duly noted your recommendation program; and at this particular time, in the light of developments at the property, I wish to defer at arriving at a decision regarding additional geophysical work as recommended.

Enclosed please find check for your services rendered. Thank you kindly for your cooperation in this matter.

Very truly yours,

B S & K MINING CO.

A. M. Kalaf
President

AMK:jc

Enclosure

Abe M.

September 26, 1963

M E M O:

Visit with Abe M. Kalaf, B.S.& K. Atlas Mine, Silverball Dist, Pima Co. Ariz.

He will be in to see Walt early part of next week.

I brought in his copy of McPhar I. P. report which he will want back when he comes in.

This I. P. report consists of 4 I. P. lines (or 5 as one was 2 different dipole spacings).

My impressions: (to be gone over carefully by Walt & Chris). Lines too close; more should have been across strike instead of along strike; No PFE's; anomalism pretty weak; some interference from cultural things; drilling found about what would be expected from this anomalism.

Two holes were drilled on this anomaly. Looked at all of core from one hole and part of other. Basic log: probably quartz monzonite, mafic minerals altered to green and pink, pyritized throughout but likely not more than 1% except on fractures, where in some cases the pyrite may be crushed from minor movements. Top is altered and pyrite changed to iron oxides. No, or very scarce sulfides other than pyrite.

Looked at core from another hole--location unknown. Basic log: most of hole is limestone and white marbelized lime. A good green garnet zone with strong sphalerite. In places other sulfides including chalcopyrite, possibly better below the sphalerite, and some association with the marbelization. Kalaf wants to know if or what geophysics will do any good over this.

Also, what geophysiss over oxide copper.

Will want to discuss if/what geophysics--I.P. he should do--location, spacing, etc. Suggested a 500' to 1,000' repeat, double line to see which is best and do some deeper recon over broader area.

He asked about underground geophysics--too restricted in drift areas for electrical, too much track for mag. (lateral extent of)

Mining confined to date to a block about 450' x 250' by 500' + deep. High grade sphalerite, occasional galena, 5 copper sulfides, some silver, zones of hematite probably after magnetite.

Various limestones and marble and garnetite, dacite, quartz monzonite and I think he mentioned some basic dike type such as diabase. Complex faulting. They do a lot of localized EX drilling looking for ore. Don't really map geology--just head in and experience.

I have a couple of core samples.

J.W.M.

9/26/63

B.S.K - Atlas Mine - A.B. Kalaf

Inspection of core, Hole # 12 (the south one of two drilled on McPhar I.P.)
11 boxes of EX - recovery good.

10'-70' Alt. por. - mon.? or Alask.? Limonite casts after py. Broken core.

70'-124' Same. core frags 2"-3".

124-158' Fresh sulfides show at about 145' 3 one in altered & reheated

158'-198' Crushed py. concentrated on fractures at top of interval. Py. generally less than 1%.

198-228' Py. from low to +1%. Considerable alteration of feld. & mafics.

228'-252' still altered but harder and core pieces are longer. Py 1%

252'-287' SAME

287'-314' SAME

314-337' A little less altered. crushed py. - total +1%

338'-370' SAME

370-400' " . Diss. Py - 1%

Hole # 100 north one of the two
Total depth 596' in 17 boxes.
At 540'-546' some chalcopyrite
Otherwise similar to Hole # 12 though I did not look in every box.

Hole # S 102 Total Depth 718' - 25 boxes.
I did not look at top of hole - first four boxes. Think the top is the porphory, to about 220' where it changes to siliceous limestone. Rest of hole is limestone and white marbleized Lime. Minor pyrite high in hole. By 250' several sulphides appear, but spotty. By 300' 10% - 40% sulphide, predominantly sphalerite, and mostly in green garnet gangue. Some Chalcopyrite & pyrite. Below 335 much marble and considerably less sulphide but what there is is often Cu sulp. Bottom of hole has low diss. Sulp. but think the hole should have gone deeper. Kalaf mentioned moly. for down hole - maybe I saw a little, maybe not. He wants to know what G.P. will do for him over such ground, + thinks maybe at bottom of Lime-marble is a high grade Cu. sulp. zone.

Also showed me a bag of Cu. ox. and wondered if we had anything to use over such.

HEINRICHS GEOEXPLORATION COMPANY
MINERAL ENGINEERING CONSULTANTS AND CONTRACTORS
GEOPHYSICAL, GEOLOGICAL AND ECONOMIC APPRAISALS
TUCSON, ARIZONA

WALTER E. HEINRICHS, JR.
E. GROVER HEINRICHS

PHONE: MAIN 2-4202
806-808 WEST GRANT ROAD
MAIL: P. O. BOX 5671

May 6, 1960

B. S. & K. Mining Company
702 First National Bank Bldg.
Phoenix, Arizona

Attn: Mr. A. M. Kalaf

Dear Mr. Kalaf:

This is in response to your and Mr. M. F. Reeves' visit to our office on 13 April 1960.

On the strength of your inquiry, we have been able to contract the new construction of an ultra modern set of I. P. equipment of our own, with delivery scheduled early July 1960. We anticipate this unit will be similar in principal to P.D., Kennecott and AS&R equipment,but will embody all of the latest improvements and ideas in technology for maximum utility, penetration, accuracy and reliability, including semi conductor controlled rectifiers, etc.

For maximum mutual benefit this seemed to be the best and cheapest solution all around. Lease-rental is also possible, but the timing would not be much better and the arrangements would be much more complex.

When convenient, we would appreciate your reaction if this sounds generally O.K. If so, meanwhile, at some mutually convenient time, we might get together on a date for one of our men to look over the area for general planning and to size up the problem, etc.

Let us know if you have any questions.

Sincerely,

Walter E. Heinrichs, Jr.

WEH:jh

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WEH: jh